केंद्रीय विद्यालय संगठन क्षेत्रीय कार्यालय एर्नाकुलम

Kendriya Vidyalaya Sangathan Regional Office Ernakulam

CLASS-X

STUDENT SUPPORT MATERIAL

Term-II

2021-2022

SCIENCE-086

Based on Latest CBSE Exam Pattern for the Session 2021-22

आर सेन्दिल कुमार
उपायुक्त

R. Senthil Kumar
Deputy Commissioner

तत् त्वं पूषन् अपावृणु
केन्द्रीय विद्यालय संगठन

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Message

I feel immense pleasure to publish the study material for class X Science . This support material is prepared incorporating all the recent changes in curriculum and assessment process made by CBSE. I am sure it will definitely be of great help to class X students of all Kendriya Vidyalayas.

Getting acquainted with the latest changes will help students to prepare well for the board examination and enable students to face case based and Multiple-Choice Questions with confidence. This support material has been prepared by a team of dedicated and veteran teachers with expertise in their respective subjects.

The Support material contains all the important aspects required by the students- the term wise split up syllabus, summary of all the chapters, important formulas, Sample question papers, problem solving and Case study questions.

I hope that this Support Material will be used by students and teachers as well and will prove to be a good tool for quick revision.

I would like to express my sincere gratitude to the In- charge principal and all the teachers who have relentlessly worked for the preparation of this study material. Their enormous contribution in making this project successful is praiseworthy.

Meticulous planning blended with hard work, effective time management and sincerity will help the students to reach the pinnacle of success.

Wish you all the best

(R Senthil Kumar)

Kendriya Vidyalaya Sangathan Regional Office Ernakualm

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CONTENT INDEX

TERM II SYLLABUS

COURSE STRUCTURE

EVALUATION SCHEME		
THEORY		
Units	**Term - I**	**Marks**
I	Chemical Substances-Nature and Behaviour: Chapter 1,2 and 3	16
II	World of Living: Chapter 6	10
III	Natural Phenomena: Chapter 10 and 11	14
Units	**Term - II**	**Marks**
I	Chemical Substances-Nature and Behaviour: Chapter 4 and 5	10
II	World of Living: Chapter 8 and 9	13
IV	Effects of Current: Chapter 12 and 13	12
V	Natural Resources: Chapter 15	05
Total Theory (Term I+II)		**80**
Internal Assessment: Term I		**10**
Internal Assessment: Term II		**10**
Grand Total		**100**

TERM – II

Theme: Materials

Unit I: Chemical Substances - Nature and Behaviour

Chapter – 4 Carbon and its compounds

Carbon compounds: Covalent bonding in carbon compounds. Versatile nature of carbon. Homolous series.

Chapter – 5 Periodic classification of elements

Periodic classification of elements: Need for classification, early attempts at classification of elements (Dobereiner's Triads, Newland's Law of

Octaves, Mendeleev's Periodic Table), Modern periodic table, gradation in properties, valency, atomic number, metallic and non-metallic properties. Unit II: World of Living.

Theme: The world of Living

Chapter – 8 How do organisms reproduce?

Reproduction: Reproduction in animals and plants (asexual and sexual) reproductive health-need and methods of family planning. Safe sex vs HIV/AIDS. Child bearing and women's health.

Chapter – 9 Heredity and Evolution

Heredity: Heredity; Mendel's contribution- Laws for inheritance of traits: Sex determination: brief introduction;

Theme: Natural Phenomena

Unit IV: Effect of Current

Chapter – 12 Electricity

Ohm's law; Resistance, Resistivity, Factors on which the resistance of a conductor depends. Series combination of resistors, parallel combination of resistors and its applications in daily life. Heating effect of electric current and its applications in daily life. Electric power, Interrelation between P, V, I and R.

Chapter – 13 Magnetic effects of current

Magnetic effects of current: Magnetic field, field lines, field due to a current carrying conductor, field due to current carrying coil or solenoid; Force on current carrying conductor, Fleming's Left Hand Rule, Electric Motor, Electromagnetic induction. Induced potential difference, Induced current. Fleming's Right Hand Rule.

Theme: Natural Resources

Unit: V Natural Resources

Chapter – 15 Our Environment

Our environment: Eco-system, Environmental problems, Ozone depletion, waste production and their solutions. Biodegradable and non-biodegradable substances.

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ONLY FOR INTERNAL ASSESSMENT

Note*: *Learners are assigned to read the below listed part of Unit V. They can be encouraged to prepare a brief write up on any one concept of this Unit in their Portfolio. This may be an assessment for Internal Assessment and credit may be given (Periodic assessment/Portfolio). This portion of the Unit is not to be assessed in the year-end examination.

Chapter – 16 Management of natural resources: Conservation and judicious use of natural resources. Forest and wild life; Coal and Petroleum conservation. Examples of people's participation for conservation of natural resources. Big dams: advantages and limitations; alternatives, if any. Water harvesting. Sustainability of natural resources.

CARBON AND ITS COMPOUNDS

CONCEPT MAPS

CONCEPT AREAS

*REASON FOR FORMATION OF COMPOUNDS

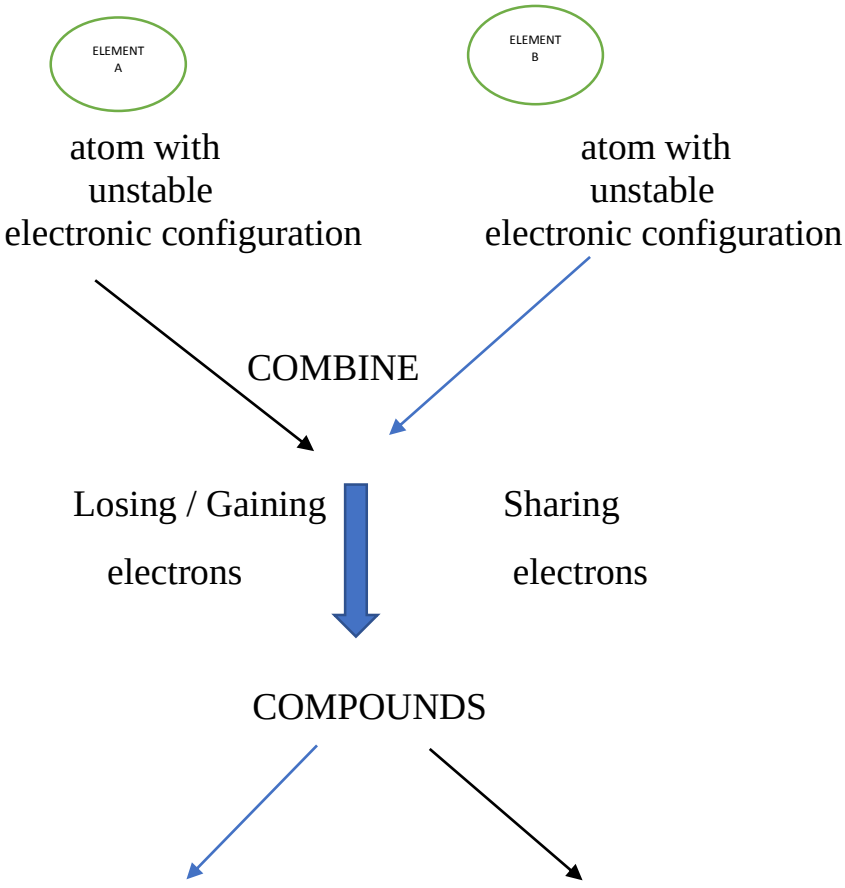
*REASON FOR VERSATILITY OF CARBON

*ALLOTROPES OF CARBON

*ELECTRON DOT STRUCTURE

*BASE FOR CLASSIFICATION AND NOMENCLATURE OF CARBON COMPOUNDS

CONCEPT MAP 1 : REASON FOR FORMATION OF COMPOUNDS



*charged particles

*ionic bond

*high melting & boiling points

*good conductors of Electricity

*no charged particles

*covalent bond

*low melting & boiling points

*poor conductors of electricity

CONCEPT MAP 2 : REASON FOR VERSATILITY OF CARBON

(mass number) A 12 electronic configuration valency

C (CARBON) K L 4

(atomic number) Z 6 2 4 sharing

presence in earth`s crust

presence in earth`s atmosphere

VERSATILE NATURE OF CARBONS

LARGE NUMBER OF COMPOUNDS

*****TETRAVALENCY**:** Carbon atomic number 6 hence its electronic configuration is 2,4 and 4 valency electrons are used by carbon to form bonds with itself and other atoms and form large number of compounds**.**

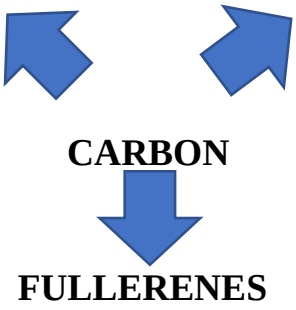
*CATENATION: - self linking ability of an atom to form long chains, branched chains and closed rings)
*COVALENT BONDING: - always shares electrons and forms saturated & unsaturated hydrocarbons.
*TETRAVALENT: - four electrons for bonding.
*TETRAHEDRAL: - arrangement of electrons provide least repulsion.

CONCEPT MAP 3:- ALLOTROPES OF CARBON

*Diamond, Graphite and Fullerenes
*All are purest forms of carbon with same chemical properties but with different physical properties.

DIAMOND	GRAPHITE
*each C atom bonded to four C atoms.	*Each C atom bonded to three C atoms. *double bonds are also there.
*only single bonds.	
*Three dimensional network structure	*two dimensional sheet like structure
*hardest natural substance known	*soft and greasy
*transparent	*opaque
*high melting point	*high melting point
	*good conductor of heat and electricity

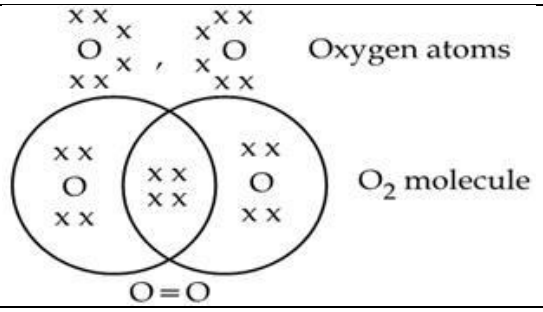
*bad conductor of electricity and good *unreactive	conductor of heat *reactive

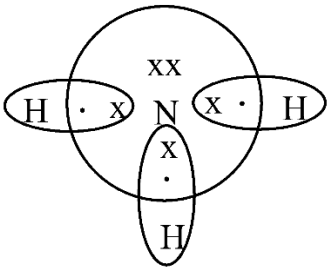
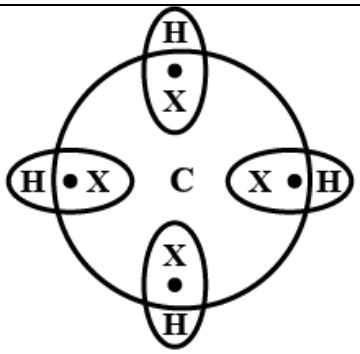
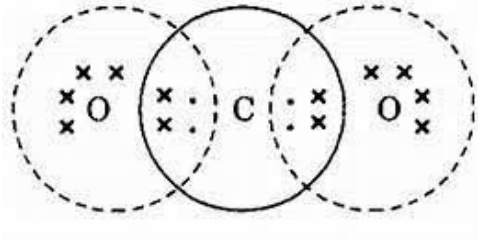


FULLERENES: - Contains even number of carbon atoms ranging from 60 - 350 or above. C_{60} fullerene is the most stable form in the shape of a football.

ELECTRON DOT STRUCTURES

Covalent compounds are formed by mutual sharing of electrons. They do so as to attain stability by gaining nearest noble gas electronic configuration. It is expressed as electron dot structures. In electron dot structures only valance electrons are shown as dots. In a given molecule, atoms are arranged in such a way that each of the atoms can share electrons to attain octet(for hydrogen it is duplet).Steps to write electron dot structures(also called Lewis structure of molecules) is explained below under the sub title 'KEY POINTS'

molecule	Valence electrons Of constituent atoms	Electron dot structure	number of bond pair(Shared pair of electrons)
Hydrogen H_2	H=1	H:H	1(each hydrogen atom shares two electrons to attain near by noble gas configuration(He)
Oxygen(O_2)	O=6		2 Each atom completes the octet

Nitrogen(N_2)	N=5	:N:::N: :N≡N:	3
Ammonia(NH_3)	N=5 H=1		3 Hydrogen completes duplet and nitrogen attains octet Here two electrons on nitrogen is not shared with others. This electron pair is called lone pair. In this molecule there is one lone pair.
Methane(CH_4)	C=4 H=1	 (Methane)	4 There are no lone pairs in methane molecule.
Carbon dioxide	C=4 O=6		4 Remaining electrons on oxygen atoms which are not participating in bond formation are the lone pairs. Here there are 4 lone pairs in this molecule.

CONCEPT MAP 5:- BASE FOR CLASSIFICATION AND NAMING OF CARBON COMPOUNDS

HYDROCARBONS			
TYPE	SATURATED	UNSATURATED	
FAMILY	ALKANES	ALKENES	ALKYNES
GENERAL FORMULA	C_nH_{2n+2}	C_nH_{2n}	C_nH_{2n-2}
BONDS	SINGLE	DOUBLE	TRIPLE
MEMBERS DIFFER BY	$-CH_2-$	$-CH_2-$	$-CH_2-$

Serial no.	Functional group/ compound	Formulae of functional group	Prefix / Suffix
1	Halogens	-Cl, -Br	Prefix- chloro, bromo etc
2	Alcohol	-OH	Suffix - ol
3	Aldehyde	-CHO	Suffix – al
4	Ketone	-CO	Suffix – one
5	Carboxylic Acid	-COOH	Suffix – oic acid

KEY POINTS

1.Carbon is a non-metal

2. It belongs to 14^{th} group of periodic table.

3.Other elements of the group are silicon, germanium, tin and lead

4.Tin and lead are metals.

5. Atomic number of carbon is 6

6.Its electronic configuration is 2, 4

7. Valency of carbon is 4.

8.Valence electrons of carbon is also 4.

9.Stable isotope of carbon is carbon12.

10.There are 6 protons and 6 neutrons in it.

11.Carbon-14 is another isotope of carbon which has 6 protons and 8 neutrons in its nucleus.

12.Carbon 14 is used to determine the age of fossils (Carbon dating)

13.Carbon exists in different physical forms (Allotropes).

14.Main allotropes of carbon are diamond, Graphite, carbon black and fullerenes.

15.Chemical property of elements depends on valence electrons.

16.Carbon forms covalent compounds with other elements.

17.Due to small size and the 4 valence electrons carbon exhibits self-linking property(catenation).

18.Catenation helps carbon to form long chains and also cyclic compounds.

19.Hydrocarbons are compounds that contains carbon and hydrogen. They are of petroleum origin. Derivatives of hydrocarbon may contain other elements also.

20.Petroleum is a fossil fuel. Various components of petroleum are separated by the process of fractional distillation. It is done in petroleum refineries.

21.Hydrocarbons are classified into aliphatic saturated, unsaturated hydrocarbons (open chain or closed chain).

22.If all the carbon bonds are satisfied by single covalent bonds, they are said to be saturated.

23.In saturated hydrocarbons no more atoms can be ADDED.

24.If at least one carbon-carbon bond in a hydrocarbon is satisfied by double or triple bonds, they are said to be unsaturated hydrocarbons.

25.Saturated, aliphatic hydrocarbons are called alkanes. They can be expressed by a general formula C_nH_{2n+2}

26.Unsaturated, aliphatic hydrocarbons with at least one carbon double bond are called

Alkenes. They can be expressed by a general formula C_nH_{2n}

27.Unsaturated, aliphatic hydrocarbons with at least one carbon triple bond are called

Alkynes. They can be expressed by a general formula C_nH_{2n-2}

28.If a hydrocarbon is cyclic, and if it contains carbon-carbon single bond only, it is a cyclic saturated hydrocarbon. If the ring has double or triple bonds, they are unsaturated cyclic hydrocarbons.

29.To form a ring at least three carbon atoms are required.

30.Series of hydrocarbons in which the consecutive members differ by an atomic mass of 14u is called homologous series.

31.Members of a given homologous series are referred as homologues.

32.Homologues of a particular series exhibit gradation in physical properties and similarities in chemical properties. They may have a common method of preparation. A given

homologous series can be denoted by a general formula and adjacent members differ by -CH2-

33.Examples of homologous series: Alkanes, Alkenes, Alkynes, Alcohols, Aldehydes and carboxylic acids.

34.General formula of alkanes, alkenes and alkynes are C_nH_{2n+2}, C_nH_{2n}, C_nH_{2n-2} respectively.

35.Cyclo alkanes have the general formula of C_nH_{2n}

36.Cyclic compounds are again classified into aromatic hydrocarbons. Benzene with molecular formula C_6H_6 is an aromatic compound. It has alternative single and double bonds in the carbon ring.

Section -1 (MULTIPLE CHOICE QUESTIONS): 1M

1. Pentane with molecular formula C_5H_{12} has
(a) 12 covalent bonds (b) 16 covalent bonds (c) 18 covalent bonds (d) 15 covalent bonds

2. Which of the following statements is incorrect regarding a homologous series?
(i) Compounds in a homologous series can have the same or different functional group.
(ii) Compounds in a homologous series have very less similarity in chemical properties.
(iii) Difference between the two successive compounds in a homologous series differ by a CH_2 group.
(iv) Successive members in a homologous series differ in molecular mass by 14 units
(a) i and ii
(b) ii and iii
(c) iii and iv
(d) i and iv

3. Which of the following aliphatic compounds, is saturated molecule?
(a) C_6H_{12} (b) C_2H_2 (c) C_5H_{10} (d) C_4H_{10}

4. Three of the four compounds belong to a homologous series. Identify the odd one out.
(a) C_4H_{10} (b)C_2H_4 (c) C_3H_8 (d) C_5H_{12}

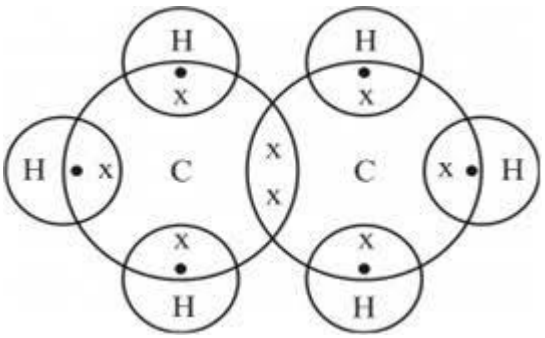
5. Which of these is not a property of Carbon?
(a) Catenation (b) Tetravalency
(c) Formation of ionic bonds (d) Tendency to form multiple bonds

6. Name the metal that is not present in carbon family
a) Si b) Ge c) Sb d) Sn

7. Which among the following is an unsaturated molecule that has the molecular formula of a cycloalkane.

a) C_3H_6 b) C_8H_{18} c) C_5H_{12} d) C3H4

8. which of the following statements is correct about the given electron dot structure



a. The compound has 8 bonds of which one is a double bond

b. The compound is formed of all single bonds of which one is a C-C bond.

c. The electrons in every shell of the atoms are shown in the structure.

d. Electron dot structure doesn't help to identify the bonds in a compound

9.Which of the following is unsaturated molecule?

a) C_3H_8 b) C_2H_2 C) C5H12 d) C_4H_{10}

10. 3rd homologue of alkyne series is---

a) Propyne b) propene c) butyne d) butane

11. Number of covalent bonds in cyclobutane is

a) 12 b) 10 c) 4 d)14

12. Which of the following is not an alkane, alkene or alkyne?

a) CH_4 b) C_2H_2 c) CH_3 d) C_5H_8

13. Which of the statement regarding homologous series is wrong?

a) only alkanes have homologous series

b) consecutive members of a homologous series differ by an atomic mass of 14u

c) A given homologous series can be expressed by a general formula

d) Homologues of a given series show gradation in physical properties.

14.. Which of the following homologue does not belong to a given homologous series

a) C_5H_{12} b)C_8H_{18} c)CH_4 d)C_2H_4

SECTION -2 (ASSERTION REASON TYPE QUESTIONS): 1M

Following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true

1. Assertion(A): Diamond and graphite are allotropes of carbon.
Reason (R): Some elements can have several different structural forms while in the same physical state. These forms are called allotropes.

2. Assertion(A): Carbon compounds can form chain, branched and ring structures.
Reason (R): Carbon exhibits the property of catenation.

3. Assertion (A): Graphite is a good conductor of electricity.
Reason (R): It has one free valence electron.

4. Assertion (A): Diamond is not good conductor of electricity.
Reason: It has no free electrons.

5. Assertion (A): Graphite is slippery to touch.
Reason: The various layers of carbon atoms in graphite are held together by weak forces of attractions.

6. Assertion (A): Covalent compounds are generally poor conductor of electricity.
Reason (R): They consist of molecules and not ions which can transfer charge.

7. Assertion(A): The functional group present in alcohols is – OH.

Reason (R): It is the same group as present in water, hence water and alcohol have similar properties.

SECTION -3 (DESCRIPTIVE TYPE QUESTIONS):

1. An element of group 14 has two common allotropes, A and B. A is very hard and is bad conductor of electricity while B is soft to touch and good conductor of electricity. Identify the element and its allotropes. **3M**

2. Identify the following-
(i) An allotrope of carbon which has a two-dimensional layered structure consisting of flat hexagonal rings.
(ii) An allotrope of carbon which looks like a soccer ball.
(iii) An allotrope of carbon which contains both single and double bonds. **3M**

3. A hydrocarbon molecule contains 3 carbon atoms. What would be its molecular formula in case it is (i) an alkane (ii) an alkene (iii) an alkyne? **3M**

4. A hydrocarbon molecule has 4 carbon atoms. What would be its molecular formula in case it is (i) an alkane (ii) an alkene (iii) an alkyne? **3M**

5. Allotropes of carbon has same chemical properties. Give reason. **1M**

6. How many non-bonded electrons are there in?
a) Ammonia b) Methane c) Nitrogen **3M**

7.Alkenes and alkynes are unsaturated. What does it mean? **2M**

8. List any two properties of homologous series. **2M**

9. Compare the catenation ability of Carbon and Silicon. **2M**

10. Atom of an element contains 5 electrons in the valence shell. This element exists as diatomic molecules, and is a major component of air. **3M**
(a) Identify the element.
(b) Show the bond formation between two atoms of this element.
(c) What is the nature of bond formed between the 2 atoms.

11. An element X found in nature in solid form has 4 electrons in valence shell of its atom. Its allotrope Y has properties that allows it to be used as a dry lubricant, as also as a part of pencil lead. **5M**
(a) Identify the element.
(b) What is this allotrope Y?

(c) Write any 1 other use of this allotrope other than those mentioned here.
(d) Predict the ability of this allotrope to conduct electricity. Give reason.
(e) Name two other allotropes of this element other than Y.

12. Two elements A and B have the property C by which they can combine with more atoms of their same type. Element A is a component of the gas D that is a respiratory byproduct, while element B is the second most abundant element in the crust. **5M**
(a) Identify the elements A and B.
(b)What is the property C?
(c) Identify the gas D.
(d) Among A and B, which one shows the property C to a greater extent? Why?

13. A and B are two organic compounds with the same molecular formula C_5H_{10}. Write their names and structural formulae in case **5M**
(a) A is a cyclic compound.
(b) B is a straight chain compound.
(c) Among A and B, which one will have only single bonds?
(d) Will it be A or B that has both single and double bonds?

14. In the electron dot structure of hydrogen molecules, each individual atom is not satisfying the octet. Justify. **2M**

15. How many saturated hydrocarbons can be made using three carbon atoms? and hydrogen atoms? Name them. **2M**

16. Carbon cannot make ionic compounds. Why? **2M**

17. Give the general formula of alkanes. Write the name, structural formula and physical state of the compound containing: **3M**

(i) 3-carbon atoms

(ii) 8-carbon atoms.

18. Why does carbon form compounds mainly by covalent bonding? **2M**
19. List the common physical properties of carbon compounds. **2M**
20. Compare the structures of diamond and graphite. **2M**
21. Write the general IUPAC names of alcohol, carboxylic acid, aldehyde and ketone. **2M**
22. Draw the electron dot structure of ethyne and also draw its structural formula. **2M**

23. Draw the electron dot structure of O_2 and N_2 molecules

24. Define homologous series of organic compounds. List its two characteristics. **5M**

Write the name and formula of the first member of the series of alkenes.

25. Why homologous series of carbon compounds are so called? Write chemical formula of two consecutive members of a homologous series and state the part of these compounds that determines their
(i) physical properties, and (ii) chemical properties. **5M**

26. (a) State two characteristic features of carbon which when put together give rise **5M**

to a large number of carbon compounds.

(b) Catenation is the ability of an atom to form bonds with other atoms of the

Same element. It is exhibited by both carbon and silicon. Compare the ability

Of catenation of the two elements. Give reasons.

27. a) How can you prove that butene and propane are not in a given homologous Series? **5M**

a) Name the first four homologues of alkene series?
b) How many covalent bonds are there in propene?

CASE STUDY BASED **5M**

1. Read the following carefully.

In covalent compounds atoms share valence electrons to satisfy the octet. Each atom shares one pair or two pairs or three pairs of electrons depending on their combining capacity. In electron dot structures only number of valence electrons are shown around the symbols of constituent atoms. Carbon using its valency of four can make either single, double or triple bonds with other carbon atoms or any other atoms. Carbons self-linking property is called catenation. In hydrocarbons carbon makes aliphatic or cyclic molecules they are either saturated or unsaturated. Based on these facts Read the following paragraph and answer the questions given below.

An element X combines with Y to form a colourless odourless gas, Z which turns lime water milky is the major constituent of all organic molecules. Five X atoms combines with hydrogens to form a cyclic saturated hydrocarbon J and aliphatic unsaturated hydrocarbon Q.Q is used in gas welding.

a) Identify compound Z and draw its electron dot structure.
b) Write the chemical formula and IUPAC name of compound Q
c) What is the common name of Q
d) How many single covalent bonds are present in compound J?
e) Draw the structure of J and write its chemical formula.

2. Read the following and answer any four questions from (i) to (v **5M**

The compounds which have the same molecular formula but differ from each other in physical or chemical properties are called isomers and the phenomenon is called isomerism. When the isomerism is due to difference in the arrangement of atoms within the molecule, without any reference to space, the phenomenon is called structural isomerism. In other words. Structural isomers are compounds that have the same molecular formula but different structural formulas, i.e., they are different in the order in which different atoms are linked. In these compounds, carbon atoms can be linked together in the form of straight chains, branched chains or even rings.

(i) Which of the following sets of compounds have same molecular formula?
(a) Butane and iso-butane
(b) Cyclohexane and hexene
(C) Propanal and propanone
(d) All of these

(ii) In order to form branching, an organic compound must have a minimum of
(a) four carbon atoms
(b) three carbon atoms
(c) five carbon atoms
(d) any number of carbon atoms.

(iii) Which of the following is an isomeric pair?
(a) Ethane and propane
(b) Ethane and ethene
(c) Propane and butane
(d) Butane and 2-methylpropane

(iv) Among the following the one having longest chain is
(a) neo-pentane
(b) iso-pentane
(C) 2-methylpentane
(d) 2,2-dimethylbutane.

(v) The number of isomers of pentane is
(a) 2
(b) 3
(c) 4
(d) 5

3. Read the following and answer any four questions from 1(i) to 1(v). **5M**

A series of organic compounds having the same functional group, with similar or almost identical chemical characteristics in which all the members can be represented by the same

general formula and the two consecutive members of the series differ by -CH_2 group or 14 mass unit in their molecular formulae is called a homologous series. For example, all the members of the alcohol family can be represented by the general formula, $C_nH_{2n+1}OH$ where n may have the values 1, 2, 3, etc. The various members of a particular homologous series are called homologues. The physical properties such as density, melting point, boiling point, solubility etc. of the members of a homologous series show almost regular variation in ascending and descending the series.

(i) Which one of the following is not a characteristic of members of a homologous series?

(a) They possess varying chemical properties.

(b) Their physical properties vary in a regular and predictable manner.

(c) Their formulae fit the general molecular formula

(d) Adjacent members differ by one carbon and two hydrogen atoms

(ii) All the members of homologous series of alkynes have the general formula

(a) CnH2n

(b) CnH2n+2

(c)CnH2n-2

(d) CnH2n-4

(iii) Which of the following statements is not correct?

(a) A common functional group is present in different members of a homologous series.

(b) Two consecutive members of a homologous series differ by a -CH3 group.

(c) The molecular mass of a compound in the series differs by 14 a.m.u. from that of its neighbour.

(d)All the members of a homologous series have common general methods of preparation.

(iv) Identify the correct statements:

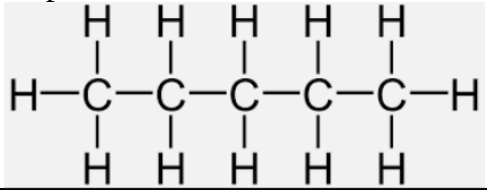
(a) As the molecular mass increases in any homologous series, a gradation in physical properties is seen.

(b) The melting and boiling points decrease with increasing molecular mass.

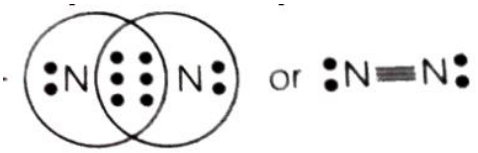
(c) As the molecular mass increases in any homologous series, variation in chemical properties is observed a gradation in physical properties is seen.

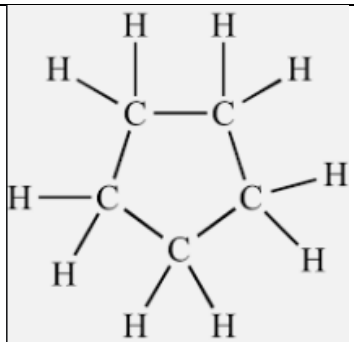
(d) Adjacent members in a homologous series differ by 18u.

Answers

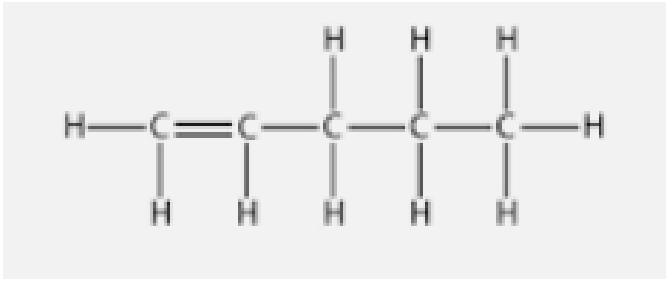
	SECTION-1(MULTIPLE CHOICE QUESTIONS):
1	(b) Explanation: 4 C-C bonds, 12 C-H bonds = 16 covalent bonds 
2	(a) Explanation: Chemicals in a homologous series have same functional group and therefore have similar chemical properties.
3	(d) Explanation: Alkanes are saturated with general formula C_nH_{2n+2}
4	(b) Explanation: $C_2H_4$is an alkene (general formula C_nH_{2n}). All the other 3 are alkanes with general formula C_nH_{2n+2}
5	(c) Formation of ionic compounds Explanation: Carbon has a valency of four. So, it neither loses nor gains four electrons while forming bonds. Its valence electrons are shared with four other atoms of carbon or any other monovalent element. Hence, carbon forms covalent bonds.
6	**c)**
7	a) C_3H_6 propene is an unsaturated molecule and cyclopropane(saturated) also has the same chemical formula
8	b
9	b
10	c
11	a
12	c
13	a
14	d(others are alkanes)
	SECTION -2(ASSERTION REASON TYPE QUESTIONS):
1	(a) Explanation: The phenomenon of existence of an element in 2 or more forms which have different physical structure, but similar chemical properties is called allotropism.

2	(a) Explanation: The unique property of self- linking of carbon atoms through covalent bonds to from long straight or branched chains and rings of different sizes is called catenation.
3	(a) Explanation: In graphite, each carbon atom is covalently bonded with three other carbon atoms. So, only 3 valence electrons are used in bond formation and the 4^{th} valence electron is free to move. Due to the presence of these free electrons (1 per carbon atom), graphite is a good conductor of electricity.
4	(a) Explanation: In a diamond crystal, each carbon atom is linked to four other carbon atoms by covalent bonds. So, all 4 valence electrons are used up in bond formation. Due to the absence of any free electron, diamond cannot conduct electricity.
5	(a) Explanation: The various layers formed of flat hexagonal rings of carbon atoms in graphite are quite far apart so that no covalent bond exists between them. The layers are held together by weak Van der Waals forces and so can slide over one another, making them slippery to touch
6	a) Explanation: Covalent compounds are formed by sharing of electrons. Since there is no loss or gain of electrons, there is no ion formation.
7	(c) Explanation: Water does not have -OH as functional group. So, reason statement is false.
	SECTION -3 (DESCRIPTIVE TYPE QUESTIONS):
1	Ans. Element is carbon A is Diamond. B is graphite
2	Ans. (i) Graphite (ii) Buckminsterfullerene (iii) Graphite
3	Ans. (i) General formula of alkanes = C_nH_{2n+2}; if n=3, formula will be C_3H_8 (ii) General formula of alkanes = C_nH_{2n}; So, if n=3, formula will be C_3H_6 (iii) General formula of alkanes = C_nH_{2n-2}. So, if n=3, formula will be C_3H_4
4	Ans. (i) General formula of alkanes = C_nH_{2n+2}; if 2n+2 =10, n=4; so, formula will be C_4H_{10} (ii) General formula of alkanes = C_nH_{2n}; So, if 2n=8, n=4; so, formula will be C_4H_8 (iii) General formula of alkanes = C_nH_{2n-2}. So, if 2n-2=6, n=4; so, formula will be C_4H_6
5	Chemical properties of an element depends on valence electrons. Allotropes have same number of valence electrons, hence same chemical properties.

6	a) two electrons(1 pair) b) 0 c) 4(two pairs)
7	Unsaturated molecules have carbon carbon double bonds or triple bonds.Alkenes and alkynes contain double or triple bond between carbon atoms, hence they are unsaturated. Unsaturated molecules are those in which more atoms can be added.(They undergo addition reaction)
8	i) They show gradation in physical properties. ii) Similarity in chemical properties iii) They can be represented by a general formula (any two properties can be written)
9	Ans. Carbon and Silicon, both with valency 4, have the ability to form covalent bonds by sharing of electrons. Both show the ability of self- combination- catenation. In Carbon, the small size of carbon atoms, as also the formation of strong bonds by Carbon atoms among themselves and with atoms of other elements, makes carbon compounds very stable. Silicon can form compounds having Si chains of up to 7 or 8 atoms. But due to weak bonds, these compounds are not stable.
10	(a) Nitrogen (b)  (c) Covalent bond
11	(a) Carbon (b) Graphite (c) Used for making electrodes in dry cells. (d) It is a good conductor of electricity. Reason: In graphite, each carbon atom is covalently bonded with three other carbon atoms. So, only 3 valence electrons are used in bond formation and the 4^{th} valence electron is free to move. Due to the presence of these free electrons (1 per carbon atom), graphite is a good conductor of electricity. (e) Diamond, Buckminsterfullerene.
12	(a) A is Carbon; B is Silicon. (b) Catenation. (c) Carbon dioxide. (d) A (Carbon) shows greater extent of catenation than B (Silicon) Reason: Carbon atoms are smaller than that of silicon. So, carbon- carbon bonds are much stronger than silicon- silicon bonds.
13	(a) A is Cyclopentane.

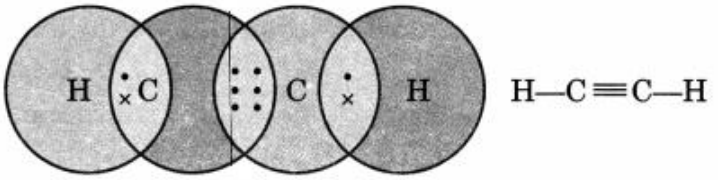
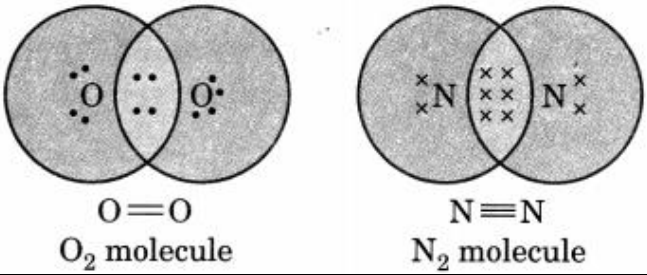


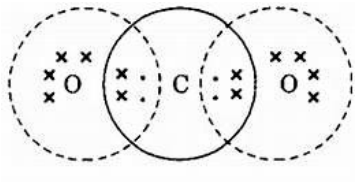
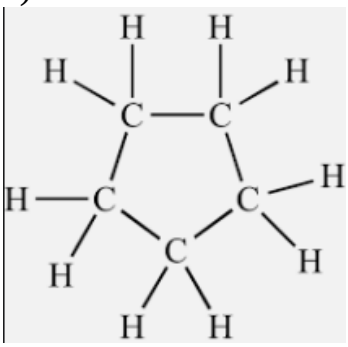
(b) B is Pentene.



(Note: the double bond can be between any 2 of the 5 carbon atoms)
(c) A (Cyclopentane).
(d) B (Pentene)

14	For hydrogen atom as there is only a K shell,it can occupy a maximum of two electrons.
15	Ans. Two. Propane and cyclopropane.
16	Due to small size and high effective nuclear charge, carbon cannot lose electrons to form C4+ ion and as carbon with 6 protons cannot afford four more electrons in its L shell, it cannot form C4- ions, As carbon cannot form an anion or cation, it cannot make ionic bonds.
17	General formula of alkanes is $CnH2n_{+2}$ where n = 1, 2, 3… (i) Propane, CH3—CH2—CH3 Propane is a gas. (ii) CH3—CH2—CH2—CH2—CH2—CH2—CH2—CH3 Octane is a liquid
18	Carbon atoms have 4 valence electrons in their valence shell, it needs to gain or lose 4 electrons to attain the noble gas configuration. (i) It could gain four electrons forming C^{4-} anion. But it would be difficult for the nucleus with six protons to hold on to ten electrons. (ii) It could lose four electrons forming C^{4+} cation. But it would require a large amount of energy to remove four electrons from its outermost shell. Therefore, carbon shares its valence electrons to complete its octet with other atoms to form covalent bonds.
19	They have covalent bonds between their atoms therefore they do not form ions. So they are poor conductors of electric current. These compounds have low melting and

	low boiling points. They are generally insoluble in water but soluble in the organic solvents like ether, carbon- tetrachloride, etc.
20.	In diamond, each carbon atom is bonded to four other carbon atoms forming a rigid three dimensional structure. In graphite, each carbon atom is bonded to three other carbon atoms in the same plane giving a hexagonal array. One of these bonds is a double bond.
21.	**Compound** / **General IUPAC name** Alcohol — alkanol Carboxylic acid — Alkanoic acid Aldehyde — Alkanal Ketone — Alkanone
22.	
23	
24.	The series of organic compounds having same functional group and similar chemical properties is called homologous series. Each member differs from successive member by —CH_2— group. The difference in molecular weight between two successive members is 14 u. Characteristics: (i) It has same general formula, from which, all members can be derived. (ii) They have similar chemical properties. C_2H_4, CH_2=CH_2, Ethene is first member of alkene series.
25	The series consists of members of same family with similar physical and chemical properties, therefore, called homologous series (i) CH_3OH, and (ii) CH_3CH_2OH are two consecutive members of homologous series. Alkyl group —CH_3 and —CH_3CH_2 part determines physical properties. Functional group —OH determines chemical properties of the compounds.

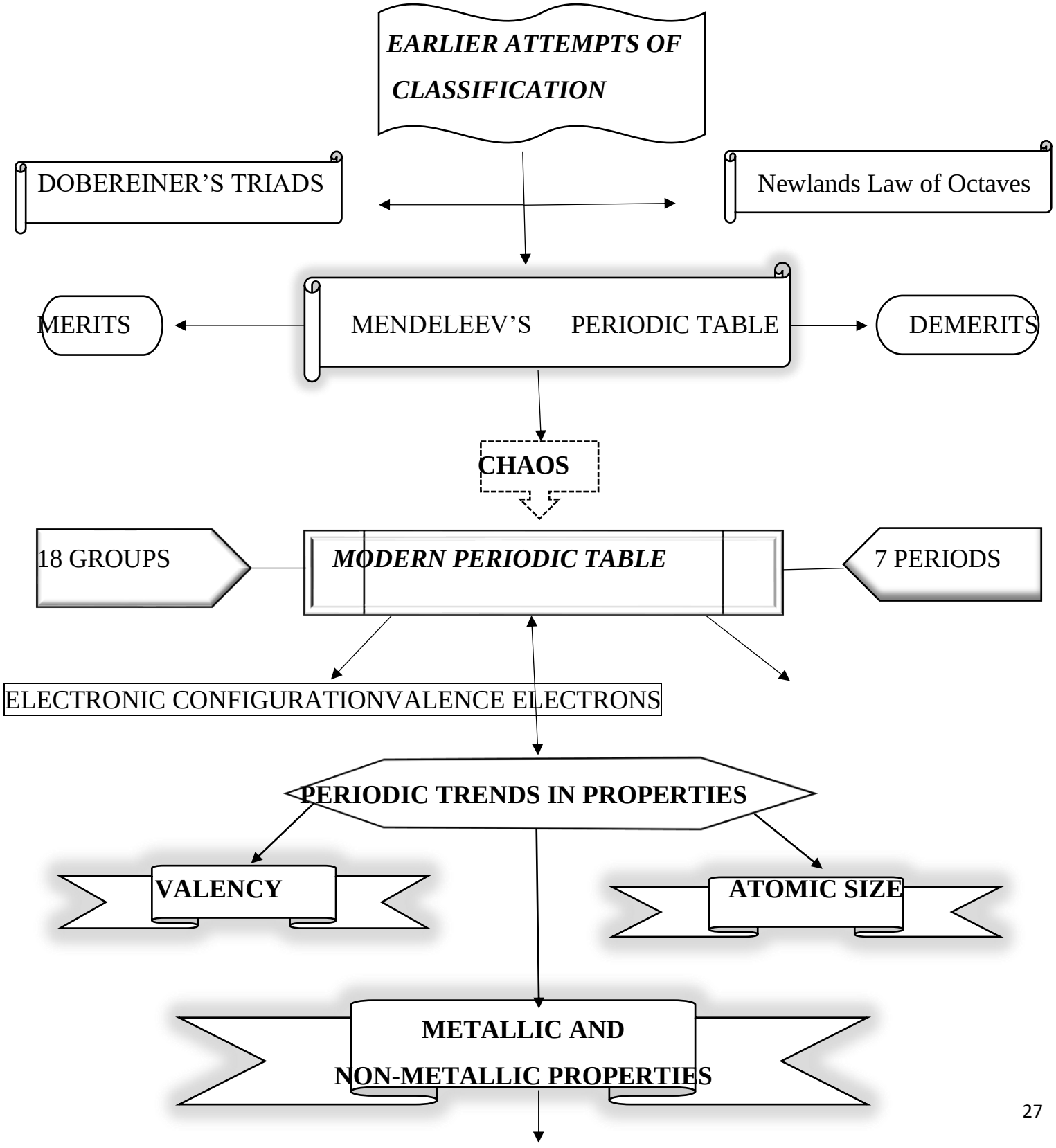
26	(a) The size of carbon atom is very small (Atomic radius = 77 pm) The strength C—C bond is quite high (355 kJ mol^{-1}) Therefore, any number of carbon atoms can be linked by covalent bonds, This self-linking property is called catenation. (b) Carbon shows catenation to large extent as compared to silicon as well as any other element due to smaller size of carbon. C—C bond is stronger than Si-Si bond because Si is larger in size, forms weaker bond.
27	a) Propane has the formula C_3H_8 and butene is C_4H_8. C_3H_8 is of the form C_nH_{2n+2} and belongs to alkane homologous series and C_4H_8 has the general formula C_nH_{2n+2} which shows that it is an alkene. Hence those molecules are not in the same homologous series. Mention their chemical formula b) Ethene(C_2H_4),Propene(C_3H_6), Butene(C_4H_8),Pentene(C_5H_{10}) 7 single covalent bond and one double bond
1	**CASE STUDY BASED** a) Z is CO_2 its electron dot structure is  b)C_2H_2,ethyne c) Acetylene d) 15 e)  C_5H_{10} Its chemical formula is C_5H_{10}
2	(i) (d) All of these (ii) (a) four carbon atoms (iii) (d) Butane and 2-methylpropane

	(iv) (C) 2-methylpentane (v) (b) 3
3	(i) a (ii) c (iii) b (iv) (a)

CHAPTER 5

PERIODIC CLASSIFICATION OF ELEMENTS

CONCEPT MAP



CHEMICAL REACTIVITY

GIST OF THE LESSON

- Making order out of chaos: Early attempts of classification of elements

The periodic table is a tabular method of displaying the elements in such a way, that the elements having similar properties occur in the same vertical column or group.

1. **DOBEREINER'S TRIADS**– Dobereiner identified groups of three elements each called **Triads**.

   In a Triad the three elements were arranged in increasing order of atomic masses and the atomic mass of the middle element was nearly the average of the atomic masses of the first and the third.

Example 1:

Triad	Atomic mass	Average
Li	7	(7+39)/2 =23
Na	23	
K	39	

Example 2:

Triad	Atomic mass	Average
Cl	35.5	(35.5+127)/2 =81.25=80
Br	80	
I	127	

Example 3:

Triad	Atomic mass	Average
P	31	(31+120)/2 =75.5
As	75	
Sb	120	

Example4:

Triad	Atomic mass	Average
S	32	(32+127)/2 =79.5
Se	79	
Te	127	

Example 5:

Triad	Atomic mass	Average
Ca	40	(40+137)/2 =88.5
Sr	88	
Ba	137	

Limitation: It fails to arrange all the known elements in the form of triads, even having similar properties.

2. **NEWLAND'S LAW OF OCTAVES:** According to this 'when elements are placed in order increasing atomic masses, the physical and chemical properties of every 8th element are a repetition of the properties of the first element.'

sa (do)	*re (re)*	*ga (mi)*	*ma (fa)*	*pa (so)*	*da (la)*	*ni (ti)*
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co and Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce and La	Zr	—	—

Limitations

- Law of octaves was applicable only up to calcium (only for lighter elements).
- Newland adjusted two elements in the same slot (e.g. Co and Ni), having different properties. For example; Co and Ni with Fluorine, Chlorine, Bromine and Iodine.
- According to Newland, only 56 elements existed in nature and no more elements would be discovered in future.

3. MENDELEEV'S PERIODIC TABLE:

Mendeleev's periodic table is based on the physical and chemical properties of elements and their atomic masses.

Mendeleev's periodic table is based on Mendeleev's periodic law which is stated below:

"The physical and chemical properties of the elements are the periodic function of their atomic masses." – Mendeleev's Periodic table

- Mendeleev's periodic table consists of 7 horizontal rows numbered from 1 to 7 called PERIODS and 8 vertical columns numbered I,II,III,IV,V, VI, VII and VIII called GROUPS.
- Groups I to VII consist of two subgroups designated as A and B, and Group VIII consists of Triads (3 elements each) from 4^{th} period.

Merits of Mendeleev's Periodic Table

a. Mendeleev's left vacant places in his table which provided an idea for the discovery of new elements. Example: Eka-boron (Scandium), Eka-aluminium (Gallium) and Eka-silicon (Germanium).
b. Mendeleev's periodic table was predicted properties of several undiscovered elements on the basis of their position in Mendeleev's periodic table.
c. It is useful in correcting the doubtful atomic masses of some elements.

d. Noble gases could accommodate in the Mendeleev's periodic table without disturbing the periodic table after discovery.

Limitations of Mendeleev's Periodic Table

(a) No fixed position for hydrogen: No correct position of the hydrogen atom was in Mendeleev's periodic table.

Example: Position of hydrogen with alkali metals and halogens (17th group).

(b) Isotopes of an element have different atomic masses. Each isotope was not given separate place in the periodic table.

Example: Cl-35 and Cl-37.

(c) Position of some elements with lower atomic masses were placed before with higher atomic mass.

Example: Ni-58.7 before Co-58.9.

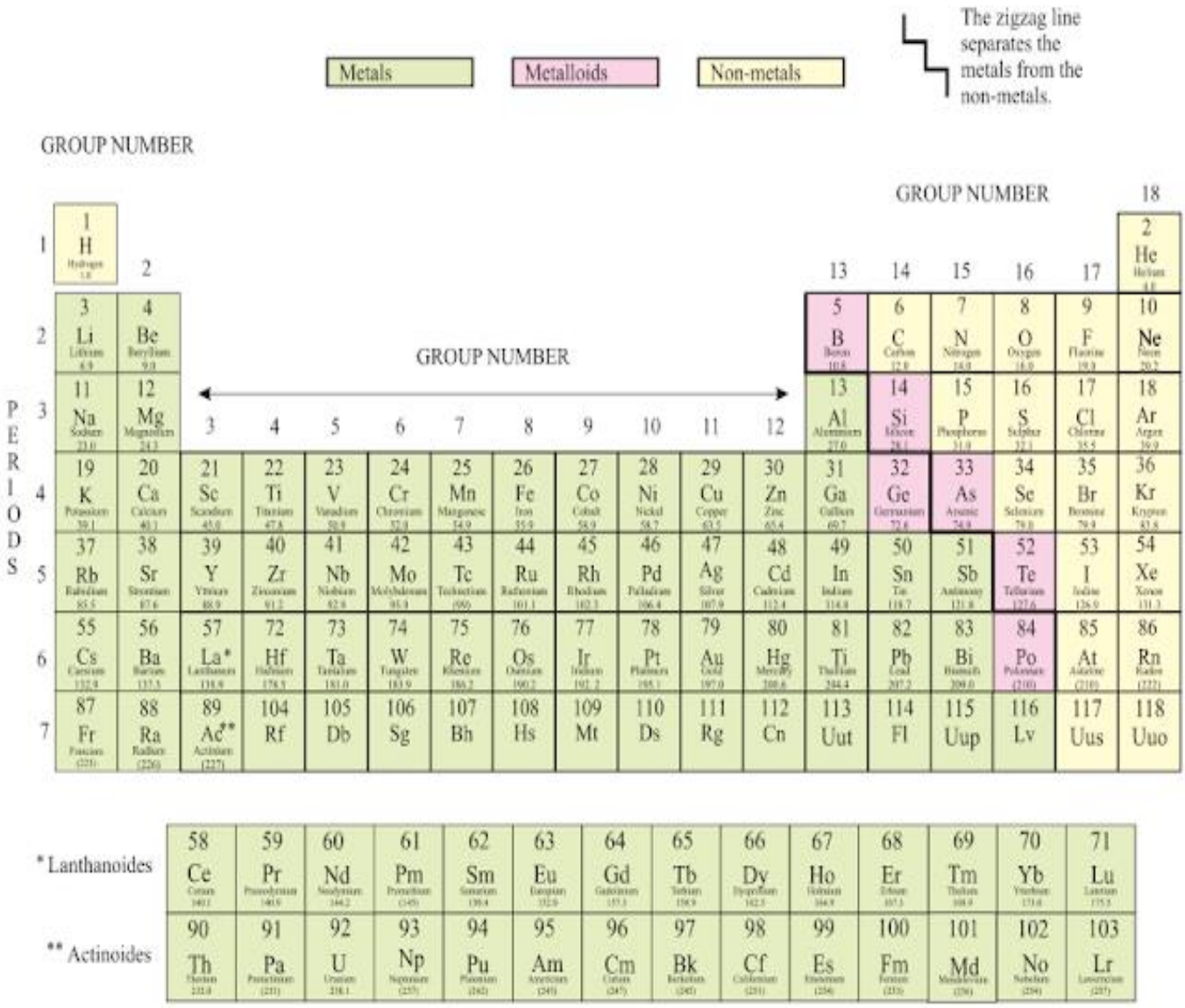
Mendeleev's Periodic table

Group →	I	II	III	IV	V	VI	VII	VIII
Oxide Hydride:	R_2O RH	RO RH_2	R_2O_3 RH_3	RO_2 RH_4	R_2O_5 RH_3	RO_3 RH_2	R_2O_7 RH	RO_4
Periods ↓	A B	A B	A B	A B	A B	A B	A B	Transition series
1.	H 1.008							
2.	Li 6.939	Be 9.012	B 10.81	C 12.011	N 14.007	O 15.999	F 18.998	
3.	Na 22.99	Mg 24.31	Al 29.98	Si 28.09	P 30.974	S 32.06	Cl 35.453	
4. First series : Second series	K 39.102 Cu 63.54	Ca 40.08 Zn 65.37	Sc 44.96 Ga 69.72	Ti 47.90 Ge 72.59	V 50.94 As 74.92	Cr 50.20 Se 78.96	Mn 54.94 Br 79.909	Fe Co Ni 55.85 58.93 58.71
5. First series : Second series	Rb 85.47 Ag 107.87	Sr 87.62 Cd 112.40	Y 88.91 In 114.82	Zr 91.22 Sn 118.69	Nb 92.91 Sb 121.75	Mo 95.94 Te 127.60	Tc 99 I 126.90	Ru Rh Pd 101.07 102.91 106.4
6. First series : Second series :	Cs 132.90 Au 196.97	Ba 137.34 Hg 200.59	La 138.91 Tl 204.37	Ht 178.49 Pb 207.19	Ta 180.95 Bi 208.98	W 183.85		Os Ir Pt 190.2 192.2 195.0

4. THE MODERN PERIODIC TABLE:

- In 1913, Henry Moseley showed that the atomic number of an element is a more fundamental property than its atomic mass.
- The modern periodic table is based on Modern periodic law
- **Modern Periodic Law:** The physical and chemical properties of elements are the periodic function of their atomic number.
- All anomalies in Mendeleev's periodic table disappear.

- Modern periodic table is based on atomic number of elements.
- Atomic number (Z) is equal to the number of protons present in the nucleus of an atom of an element.
- Modern periodic table contains 18 vertical columns known as **groups** and 7 horizontal rows known as **periods**.
- All elements present in a group have the same number of valence electrons.
- The number of shells increases down a group.
- On moving from left to right in a period, the number of valence electrons increases from 1 to 8 in the elements present.
- On moving from left to right in a period, number of shells remains same.
- All the elements of a group of the periodic table have the same number of valence electrons.
- The maximum number of electrons that can be accommodated in a shell depends on the formula $2n^2$ where 'n' is the number of the given shell from the nucleus.
  Eg: No of elements in K shell – $2x1^2=2$
  No of elements in L shell – $2 \times 2^2 = 8$



Trends in Modern Periodic Table:

Periodic properties: Valency, Atomic size, metallic and non-metallic characters, and Chemical reactivity.

(i) Valency: The valency of an element is determined by the number of valence electrons present in the outermost shell of its atom (i.e. the combining capacity of an element is known as its valency).

In Period: On moving from left to right in a period, the valency first increases from 1 to 4 and then decreases to zero (0).

Example ; Valency of 2nd period elements are :

	Li	Be	B	C	N	O	F	Ne
Valency	1	2	3	4	3	2	1	0

In Groups: On moving from top to bottom in a group, the valency remains same because the number of valence electrons remain the same.

Group no	No. of valence electrons	Valency
1	1	1
2	2	2
13	3	3
14	4	4
15	5	3,5
16	6	2,6
17	7	1
18	8	0

(ii) Atomic size:

- Atomic size refers to radius of an atom. It is a distance between the centre of the nucleus and the outermost shell of an isolated atom.
- In Period: On moving from left to right in a period, atomic size decreases because nuclear charge increases.
  Example: Size of second period elements: Li > Be > B > C > N > O > F
- The atomic size of noble gases in corresponding period is largest due to presence of fully filled electronic configuration (i.e. complete octet).
- In Group: Atomic size increases down the group because new shells are being added in spite of the increase in nuclear charge.
  Example; Atomic size of first group element: Li < Na < K < Rb < Cs < Fr
  Atomic size of 17th group elements: F < Cl < Br < I

(iii) Metallic character:

- It is the tendency of an atom to lose electrons.
- In Period: Along the period from left to right, metallic characters decreases because a tendency to lose electron decreases due to the increase in nuclear charge.
  Example: Metallic character of second period elements: Li > Be > B > C >> N > O > F
- In Group: Metallic character, when moving from top to bottom increases because the atomic size and tendency to lose electrons increases.
  Example: First group element : Li < Na < K < Rb < Cs
  17th group elements: F < Cl < Br < I

(iv) Non-metallic character:

- It is tendency of an atom to gain electrons.
- Along the period from left to right, non-metallic character increases because tendency to gain electrons increases due to increase in nucleus charge. Example; Non-metallic character of 2nd period elements : Li < Be < B < C < N < O < F
- On moving from top to bottom in a group, non-metallic character decreases because atomic size increases and tendency to gain electrons decreases. Ex. Non-metallic character of 17th period element: F > Cl > Br > I

(v) Chemical Reactivity

- Chemical reactivity of metals increases down the group because tendency to lose electrons increases.
  Example; Li < Na < K < Rb < Cs (1st group)
- Chemical reactivity of non-metals decreases down the group because tendency to gain electrons decreases.
  Example: F > Cl > Br > I (17th group)

Summary of periodic trends in properties with reference to MODERN PERIODIC TABLE

S No	Property	Down the group	From left to right across the period
1	Valency*(Groups 3 to 12 not included)	Remains the same	Increases till group 14 and then decreases
2	Atomic size	Increases	Decreases
3	Metallic character	Increases	Decreases
4	Non-metallic character	Decreases	Increases
5	Chemical reactivity	Increases for metals Decreases for non-metals	Decreases for metals Increases for non-metals

QUESTION BANK

(i) Multiple choice questions

1. According to Mendeleev's Periodic Law, the elements were arranged in the periodic table in the order of

(a) increasing atomic number
(b) decreasing atomic number
(c) increasing atomic masses
(d) decreasing atomic masses

2. Which of the following statement(s) about the Modern Periodic Table are incorrect

(i) The elements in the Modern Periodic Table are arranged on the basis of their decreasing atomic number
(ii) The elements in the Modern Periodic Table are arranged on the basis of their increasing atomic masses

(iii) Isotopes are placed in adjoining group (s) in the Periodic Table
(iv) The elements in the Modern Periodic Table are arranged on the basis of their increasing atomic number
(a) (i) only
(b)(i), (ii) and (iii)
(c) (i), (ii) and (iv)
(d) (iv) only

3. On the basis of electronic configuration of $_5X$, the group number and period of the element 'X' is:
(a) Group 15 period 2
(b) Group 13 period 2
(c) Group 19 period 5
(d) Group 13 period 5
4. An element 'X' is forming an acidic oxide. Its position in modern periodic table will be
(a) Group 1 and Period 3
(b) Group 2 and Period 3
(c) Group 13 and Period 3
(d) Group 16 and Period 3
5. Elements P, Q, R and S have atomic numbers 11, 15, 17 and 18 respectively. Which of them are reactive non-metals?
(a) P and Q
(b) P and R
(c) Q and R
(d) R and S
6. Which of the following elements has 2 shells and both are completely filled?
(a) Helium
(b) Neon
(c) Calcium
(d) Boron
7. Which of the following are the characteristics of isotopes of an element?
(i) Isotopes of an element have same atomic masses
(ii) Isotopes of an element have same atomic number
(iii) Isotopes of an element show same physical properties
(iv) Isotopes of an element show same chemical properties
(a) (i), (iii) and (iv)
(b) (ii), (iii) and (iv)

(c) (ii) and (iii)
(d) (ii) and (iv)
8. Three elements B, Si and Ge are
(a) metals
(b) non-metals
(c) metalloids
(d) metal, non-metal and metalloid respectively
9. Which of the given elements A, B, C, D and E with atomic number 2, 3, 7, 10 and 30 respectively belong to the same period?
(a) A, B, C
(b) B, C, D
(c) A, D, E
(d) B, D, E

10. Where would you locate the element with electronic configuration 2, 8 in the Modern Periodic Table?
(a) Group 8
(b) Group 2
(c) Group 18
(d) Group 10
11. Newlands relation is called
(a) Musical Law
(b) Law of Octaves
(c) Periodic Law
(d) Atomic Mass Law
12. The properties of Eka-aluminium predicted by Mendeleev are the same as the properties of later discovered element:
(a) Scandium
(b) Germanium
(c) Gallium
(d) Aluminium
13. The arrangement of elements in the Modem Periodic Table is based on their
(a) increasing atomic mass in the period
(b) increasing atomic number in the horizontal rows
(c) increasing atomic number in the vertical columns
(d) increasing atomic mass in the group

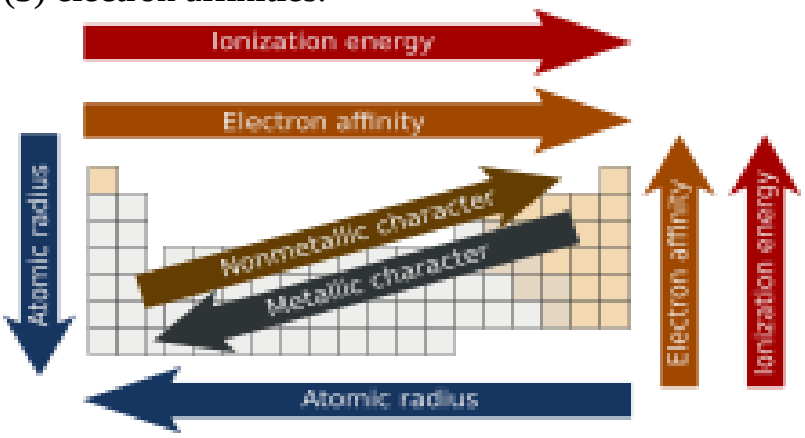
14.Element ‘X’ forms a chloride with the formula XCl_2, which is a solid with high melting point. X would most likely be in the same group of the periodic table as:
(a) Si
(b) Mg
(c) Al
(d) Na
15. What is the atomic number of element of period 3 and group 17 of the Periodic Table?
(a) 10
(b) 4
(c) 17
(d) 21
16.An element X from group 2 of the Periodic Table reacts with Y from group 17 to form a compound. Give the formula of the compound.
(a) XY_2
(b) XY
(c) X_2Y
(d) $(XY)_2$

17. A metal ‘M’ is in the first group of the Periodic Table. What will be the formula of its oxide?
(a) MO
(b) M_2O
(c) M_2O_3
(d) MO_2
18.An element X has mass number 40 and contains 21 neutrons in its atom. To which group of the Periodic Table does it belong?
(a) Group 1
(b) Group 4
(c) Group 2
(d) Group 3
19.What is the other name for group 18th elements?
(a) Noble gases
(b) Alkali metals
(c) Alkali earth metals
(d) Halogens
20. The atom of an element has electronic configuration 2, 8, 7. To which of the following elements would it be chemically similar?
(a) $_7N$
(b) $_{15}P$

(c) $_{11}Na$
(d) $_{9}F$

(ii)Case based Questions

Q1 Today, 118 elements are known, the first 94 of which occur in nature. Of the 94 natural elements, eighty are stable.The periodic table is a graphic description of the periodic law, which states that the properties and atomic structures of the chemical elements are a periodic function of their atomic number.
Elements are placed in the periodic table by their electron configurations, which exhibit periodic recurrences that explain the trends of properties across the periodic table. As we go across a period from left to right, we add a proton to the nucleus and an electron to the valence shell with each successive element. As we go down the elements in a group, the number of electrons in the valence shell remains constant, but the principal quantum number increases by one each time.
An understanding of the electronic structure of the elements allows us to examine some of the properties that govern their chemical behavior. These properties vary periodically as the electronic structure of the elements changes.
They are
(1) size (radius) of atoms and ions,
(2) ionization energies, and
(3) electron affinities.



1. Which of the following set of elements is written in order of their increasing metallic character?
(a) Na, Li, K
(b) C, O, N
(c) Mg, Al, Si
(d) Be, Mg, Ca
2. Which of the following is the correct order of the atomic radii of the elements oxygen, fluorine and nitrogen?
(a) O < F < N
(b) N < F < O
(c) O < N < F
(d) F < O < N
3. What happens to tendency to gain electron in a period?

(a) Increases,
(b) Decreases,
(c) Remaining same,
(d) First increases then decreases.

4. Which of the following elements would lose an electron easily?
(a) Mg
(b) Na
(c) K
(d) Ca

5. Atomic size decreases from left to right in a period because
(a) Effective nuclear charge increases
(b) Number of shells remains the same
(c) Force of attraction between the nucleus and valence electrons increases
(d) All of these

Q2. Atoms of eight elements A, B, C, D, E, F, G and H have the same number of shells but different number of electrons in their outermost shell. It was found that elements A and G combine to form an ionic compound. This compound is added in a small amount to almost all vegetable dishes during cooking. Oxides of elements A and B are basic in nature while those of E and F are acidic. The oxide of D is almost neutral.

Based on the above information answer the following questions:

(1) To which group or period of the Periodic Table do the listed elements belong?

(2) What would be the nature of compound formed by a combination of elements B and F?

(3) Which two of these elements could definitely be metals?

(4) Which one of the eight elements is most likely to be found in gaseous state at room temperature?

(5) If the number of electrons in the outermost shell of elements C and G be 3 and 7 respectively, write the formula of the compound formed by the combination of C and G.

(iii)Assertion Reason type Questions

In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.
(A) Both assertion and reason are true and the reason is the correct explanation of assertion.
(B) Both assertion and reason are true and the reason is not the correct explanation of assertion.
(C) Assertion is true but the reason is false.
(D) Both assertion and reason are false.
(E) Assertion is false but reason is true.

1.**Assertion**: Properties of an atom and its corresponding ion remains the same.

Reason: Electronic configurations of both atom and ion remain same.

2.**Assertion**: Elements in the same vertical column have similar properties.

Reason: The properties of elements are periodic functions of their atomic numbers.

3.**Assertion**: Fluorine is more reactive than Chlorine.

Reason: The chemical reactivity of non-metals increases down the group.

4.**Assertion**: Group 18 elements are inert.

Reason: They have completely filled valence shell.

5.**Assertion**: Isotopes of an element were given separate places in Mendeleev's periodic table.

Reason: Isotopes of an element have different atomic masses.

6. **Assertion :** In Mendeléev Periodic Table, cobalt was placed before nickel.

Reason : The atomic mass of cobalt is less than nickel

7. **Assertion :** According to Mendeleev, periodic properties of elements is a function of their atomic number.
Reason : Atomic number is equal to the sum of number of protons and neutrons.

8. **Assertion**: Li,Na,K belong to Dobereiner's triads

Reason: The atomic mass of Na is the average of atomic masses of Li and K

9. **Assertion :** Atomic size decreases along a period.

Reason : Effective nuclear charge decreases as the atomic number increases resulting in the increased attraction of electrons to the nucleus

10. **Assertion:**Mendeleev left some gaps in his Periodic Table

Reason: Mendeleev believed that some elements would be discovered later

DESCRIPTIVE QUESTIONS OF 1 MARK (PART A- ANSWER THE FOLLOWING QUESTIONS IN ONE SENTENCE)

1.What is the basis for arrangement of elements in the Mendeleev periodic table?

2.If Lithium, sodium and potassium form a Dobereiner's triad, and if the atomic masses of Li and K are 7 and 39, respectively, Predict the atomic mass of sodium?

3.Name the two elements for which temporary names were given as Eka-aluminium and Eka-silicon and spaces were left by Mendeleev in his table even before their discovery.

4 Write the formulae of chlorides of Eka-silicon and Eka-aluminium, the elements predicted by Mendeleev.

5 State Mendeleev periodic law

6 How does atomic size vary from left to right in a period?

7. State one reason for placing Mg and Ca in the same group of the periodic table.

8. Name any three metalloids.

9. State the modern periodic law of classification of elements.

10. Write the number of groups or vertical columns and periods or horizontal rows in the modern periodic table.

SHORT ANSWER TYPE QUESTIONS [2 MARKS]

11(a). On moving from left to right in the second period when happens to the number of valence electrons?
(b). How does reactivity of metals vary down a group?
12. The elements of the second period of the Periodic Table are given below: Li Be B C N O F
(a) Give reason to explain why atomic radii decrease from Li to F.
(b) Identify the most (i) metallic and (ii)non-metallic element.
13. The elements of the third period of the Periodic Table are given below:
Na, Mg, Al, Si, P,S, Cl, Ar
(a) Which atom is bigger, Na or Mg? Why?
(b) Identify the most (i) metallic and (ii) non-metallic element in Period 3.
14. Mention three achievements of Mendeleev's periodic table and one defect.
15.How can the valency of an element be determined if its electronic configuration is known? What will be the valency of an element of atomic number 9 (nine)?

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

16.(a). How does the electronic configuration of an atom of an element related to its position in the modern periodic table? Explain with one example.
(b)Find the group and period of element with Z=12?

17.The atomic numbers of three elements, X, Y and Z are 9,11 and 17 respectively. Which two of these elements will show similar chemical properties? Why?

18 How does the metallic character of elements change along a period of the periodic table from the left to the right and in a group from top to bottom .why?

19. How does the valency of elements vary (a) in going down a group, and (b) in going from left to right in a period of the periodic table

20(a) In the Mendeleev's Periodic table, why does Argon with atomic mass 39.9 appear before Potassium having atomic mass 39.1? (b) Why is atomic number a more important property than atomic mass?

5 MARK QUESTIONS

21. a. Calcium is an element with atomic number 20.
(i) Is it a metal or non-metal?
(ii) Will its size be more or smaller than that of potassium?
(iii) Write the formula of its chloride.

b. An element 'X' has mass number 35 and number of neutrons 18. Write atomic number and electronic configuration of 'X'. Also write group number, period number and valency of 'X'.

22. From the part of the periodic table given, answer the following questions.

1 **Lithium**	**2**	**13**	**14** **Carbon**	**15**	**16** **Oxygen**	**17** **L**	**18** **Neon**
X			S		P	Q	
Y						R	

Z						T	

(a)Which is the most reactive metal?
(b) Name the family of L, Q, R, T.
(c) Name one element of group 2 and 15,
(d) Name one member of group 18 other than neon.
(e) Give the name of the element S placed below carbon in group 14.

23. Two elements X and Y belong to group 1 and 2 respectively in the same period of periodic table. Compare them with respect to:
(i) the number of valence electrons in their atoms;
(ii) their valencies;
(iii) metallic character;
(iv) the sizes of their atoms;
(v) the formulae of their oxides;
(vi) the formulae of their chlorides.

24. An element is placed in 2nd Group and 3rd Period of the Periodic Table, burns in presence of oxygen to form a basic oxide.

(a) Identify the element

(b) Write the electronic configuration

(c) Write the balanced equation when it burns in the presence of air

(d) Write a balanced equation when this oxide is dissolved in water

(e) Draw the electron dot structure for the formation of this oxide

25. An element X (atomic number 17) reacts with an element Y (atomic number 20) to form a divalent halide.

(a) Where in the periodic table are elements X and Y placed?

(b) Classify X and Y as metal (s), non-metal (s) or metalloid (s)

(c) What will be the nature of oxide of element Y? Identify the nature of bonding in the compound formed

(d) Draw the electron dot structure of the divalent halide

26. Atomic number of a few elements are given below 10, 20, 7, 14

(a) Identify the elements

(b) Identify the Group number of these elements in the Periodic Table

(c) Identify the Periods of these elements in the Periodic Table

(d) What would be the electronic configuration for each of these elements?

(e) Determine the valency of these elements

27. Mendeleev ′ predicted the existence of certain elements not known at that time and named two of them as Eka-silicon and Eka-aluminum.

(a) Name the elements which have taken the place of these elements

(b) Mention the group and the period of these elements in the Modern Periodic Table.

(c) Classify these elements as metals, non-metals or metalloids

(d) How many valence electrons are present in each one of them?

28. (a) Electropositive nature of the element(s) increases down the group and decreases across the period

(b) Electronegativity of the element decreases down the group and increases across the period

(c) Atomic size increases down the group and decreases across a period (left to right)

(d) Metallic character increases down the group and decreases across a period.

On the basis of the above trends of the Periodic Table, answer the following about the elements with atomic numbers 3 to 9.

(a) Name the most electropositive element among them

(b) Name the most electronegative element

(c) Name the element with smallest atomic size

(d) Name the element which is a metalloid

(e) Name the element which shows maximum valency

29. An element X which is a yellow solid at room temperature shows catenation and allotropy. X forms two oxides which are also formed during the thermal decomposition of Ferrous sulphate crystals and are the major air pollutants.

(a) Identify the element X

(b) Write the electronic configuration of X

(c) Write the balanced chemical equation for the thermal decomposition of Ferrous sulphate crystals?

(d) What would be the nature (acidic/ basic) of oxides formed?

(e) Locate the position of the element in the Modern Periodic Table.

30. An element X of group 15 exists as diatomic molecule and combines with hydrogen at 773 K in presence of the catalyst to form a compound, ammonia which has a characteristic pungent smell.

(a) Identify the element X. How many valence electrons does it have?

(b) Draw the electron dot structure of the diatomic molecule of X. What type of bond is formed in it?

(c) Draw the electron dot structure for ammonia and what type of bond is formed in it?

31. a) In this ladder (Figure 5.2) symbols of elements are jumbled up. Rearrange these symbols of elements in the increasing order of their atomic number in the Periodic Table.

(b) Arrange them in the order of their group also.

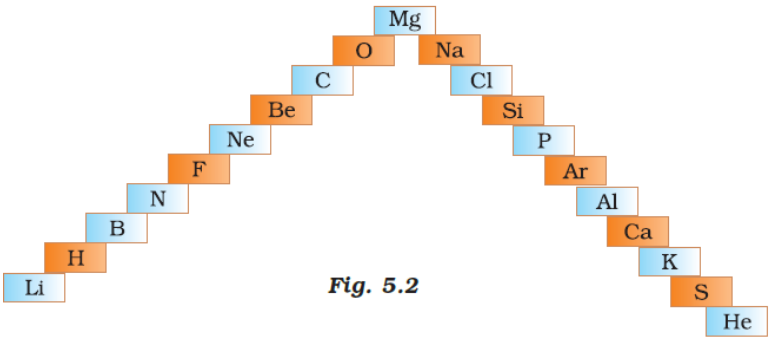


Fig. 5.2

Answers to Section (i) - mcqs

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
C	b	b	d	c	b	d	C	b	c	b	c	b	b	c	a	b	a	a	d

Answers to Section (ii) – Case based qns

Q1

1	2	3	4	5
d	d	a	c	d

Q2: 1. A and B belong to group 1 and 2 because they form basic oxides.
C belongs to group 13 as it has 3 valence electrons.
D belongs to group 14 as it forms almost neutral oxide.
E and F belong to group 15 and 16 as they form acidic oxides,
G belongs to group 17 as it has 7 valence electrons and
H belongs to group 18.

They belong to 3rd period of the Periodic Table because AG is NaCl, added in a small amount to almost all vegetable dishes during cooking and Na and Cl belong to 3rd period.

2. Ionic compounds will be formed because 'B' is metal and 'F' is non-metal. 'B' can lose two electrons and 'F' can gain two electrons.
3. A and B are definitely metals as they form basic oxides.
4. G and H are gaseous at room temperature.
5. CG3 is the formula of the compound formed by combination of C and G.

Answers to section (iii) – Assertion Reason based qns

1	2	3	4	5	6	7	8	9	10
D	B	C	A	E	C	D	A	C	A

Section (iv) – one mark questions (Descriptive)

1. Increasing order of atomic mass and similarity in chemical properties

2. Sum of atomic masses of extreme elements=7+39=46. Average at mass =46/2 =23.So sodium will have atomic mass =23

3.Gallium and Germanium

4. Formula of Chloride of Eka Silicon is GeCl4 and that of Eka Aluminium is $GaCl_3$

5. Properties of elements are a periodic function of their atomic masses.

6.Atomic size decreases from left to right in a period.

7. They have same number of valence electrons and similar chemical properties.

8. Boron, Silicon and Germanium.

9. It states that "the properties of the elements are periodic functions of their atomic numbers."

10. There are 18 vertical columns or groups and seven horizontal rows or periods in the modern periodic table.

Section (iv) – 2 marks questions (Descriptive)

11 a. Number of valence electrons increases from left to right in the second period
b. Reactivity of metals goes on increasing down a group.

12 (a) It is because nuclear charge increases due to increase in atomic number, therefore, force of Attraction between nucleus and valence electrons increases, i.e. effective nuclear charge increases, hence atomic radii decrease from Li to F.

(b) (i) Most metallic element is 'Li' as it can lose electrons easily due to larger atomic size.

(ii) Most non-metallic element is 'F' because it can gain electrons easily due to smallest atomic size.

13. (a) Sodium is bigger than magnesium as it has lesser nuclear charge so there is less force of attraction between nucleus and valence electrons and less effective nuclear charge. It is, therefore, bigger in size.

(b) (i) Sodium is the most metallic as it can lose electrons easily due to its larger atomic size,

(ii) Chlorine is the most non-metallic element because it can gain electrons easily due to its smallest atomic size.

14. Merits (a) It could classify all the elements discovered at that time.
(b) It helped in discovery of new elements.
(c) It helped in correction of atomic mass of some of the elements.
Defect;1. All isotopes of an element do not find position in this table.

15. It is the combining capacity of the element.
Generally, valency=number of valence electron or 8 - number of valence electron.
If the element has 1, 2, 3, 4 valence electrons, its valency will be 1, 2, 3, 4 respectively.
If the element has 5, 6, 7, 8 valence electrons, its valency will be 3, 2, 1, 0.
Element with atomic number 9 has electronic configuration 2, 7. So, its valency will be 1.

Section (iv) – 3 marks questions (Descriptive)

16. (a)The position of element depends upon number of valence electrons which depend upon electronic configuration. Those elements which have same valence electrons, occupy same group. Eg; those elements which have one valence electron belong to group 1. Elements with two valence electrons belong to group 2. Period number is equal to number of shells. If valence electrons are equal to 1, it belongs to group 1. If it has 2 shells, it belongs to second period, e.g. if element 'X' has atomic number 11, its electronic configuration is 2, 8,1. It has one valence electron, it belongs to group 1 and it has three shells therefore, it is in third period.
(b)Z=12and the configuration is 2,8,2So it should belong to 2 nd group and 3 rd period

17. Electronic configuration of X, Y and Z will be: X (9) : 2, 7 Y(11) : 2, 8, 1 Z(17) : 2, 8, 7
X and Z will show similar chemical properties due to same number of valence electrons.

18.The metallic character goes on decreasing along a period from left to right because atomic size goes on decreasing therefore, tendency to lose electrons decreases. But in a group from top to bottom metallic character goes on increasing due to increase in size from top to bottom giving a tendency to lose electrons which are loosely held.

19. (a) Valency remains the same in a group.
(b) Valency first goes on increasing from left to right in a period till middle of period, then Decreases

20.(a).It is because Mendeleev arranged elements giving more importance to the similarity in chemical properties of an element with the remaining members of the group .So Argon ,being an inert gas was placed along with inert gases and Potassium being an alkali metal is placed along with the other alkali metals. So Argon and Potassium are examples of anomalous pair

(b)Atomic number gives us the electronic configuration which gives the number of valence electron which decides the chemical nature of the element.

21. a.The electronic configuration of calcium (Z = 20) is 2, 8, 8, 2.
(i) Since it has only two valence electrons, it is present in group 2. It is a metal.
(ii) Both potassium (K) and calcium (Ca) are present in fourth period. Since atomic size decreases along a period, calcium is smaller in size.
(iii) The valency of calcium is 2. The formula of its chloride is $CaCl_2$.

b. Atomic number of the element 'X' = 35 – 18 = 17

Gp17, period-3

22. (a) The element Z is the most reactive metal.
(b) The elements are present in group 17. The family is that of halogens.
(c) One element belonging to group 2 is calcium (Ca) while one present in group 15 is nitrogen (N).
(d) The element argon (Ar) is also present in group 18.
(e) The element is silicon (Si)

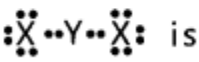
23. X and Y belong to same period, X belongs to group '1'. Y belongs to group '2'.

(i) Valence electron in X is 1 whereas valence electrons in Y are 2.
(ii) The valency of X is 1 whereas valency of Y is 2.
(iii) X is more metallic than Y because metallic character decreases on moving from left to right in a period.
(iv) The size of X is more than Y because size of the atom decreases on moving from left to right in a period.
(v) Oxide of X = X_2O, Oxide of Y = YO
(vi) Chloride of X = XCl, Chloride of Y = YCl_2

24.

(*a*) Magnesium
(*b*) Electronic configuration is 2, 8, 2.
(*c*) $2Mg + O_2 \longrightarrow 2MgO$
(*d*) $MgO + H_2O \longrightarrow Mg(OH)_2$
(*e*) $Mg \longrightarrow Mg^{2+} + 2e^-$
2, 8, 2 2, 8
$O + 2e^- \longrightarrow O^{2-}$
2, 6 2, 8
$(Mg)^{2+}$ $(:\ddot{O}:)^{2-}$ is electron dot structure.

25.

(*a*) 'X' is in group 17 and 3rd period, 'Y' is in group 2 and 4th period.
(*b*) 'X' is non-metal and 'Y' is a metal.
(*c*) 'Y' forms basic oxide. It has ionic bonding in the compound formed.
(*d*)  is the electron dot diagram.

26.

Atomic number	Element (*a*)	Group no. (*b*)	Period (*c*)	Electronic configuration (*d*)	Valency (*e*)
10	Neon	18	2nd Period	2, 8	Zero
20	Calcium	2	4th Period	2, 8, 8, 2	2
7	Nitrogen	15	2nd Period	2, 5	3
14	Silicon	14	3rd Period	2, 8, 4	4

27. (a) Eka- silicon is Germanium (Ge)

Eka- aluminium is Gallium (Ga)

(b) Eka- silicon – group 14 & period 3

Eka- aluminium – Group 13 & period 3

(c) Eka- silicon - metalloid

Eka- aluminium – metal

(d) Valence electron present in Eka- silicon is 4

Valence electron present in Eka- aluminium is 3

28.

(a) Lithium (3)
(b) Fluorine (9)
(c) Fluorine (9)

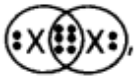
(d) Boron (5)
(e) Carbon (6). Its valency is 4.

29.

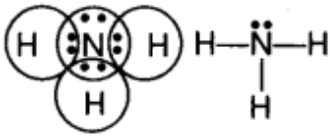
(*a*) 'X' is sulphur.
(*b*) Electronic configuration of 'X' is 2, 8, 6.
(*c*) $2FeSO_4(s) \xrightarrow{heat} Fe_2O_3(s) + SO_2(g) + SO_3(g)$
(*d*) SO_2 and SO_3 are acidic oxides.
(*e*) It belongs to Group 16 and 3rd period.

30

(*a*) 'X' is nitrogen. It has 5 valence electrons.

(*b*)  , it has triple covalent bond,

i.e. :X≡X:

(*c*) 

The bond formed is covalent bond.

31. (a) H, He, Li, Be, B, C, N, O, F, Ne, Mg, Al, Si, P, S, Cl, Ar, K, Ca

(b) Group 1:H, Li, Na, K

Group 2: Be, Mg, Ca

Group 13: B. Al

Group 14: C, Si

Group 15: N. P

Group 16: 0, S

Group 17: F. U

Group 18: He, Ne, Ar

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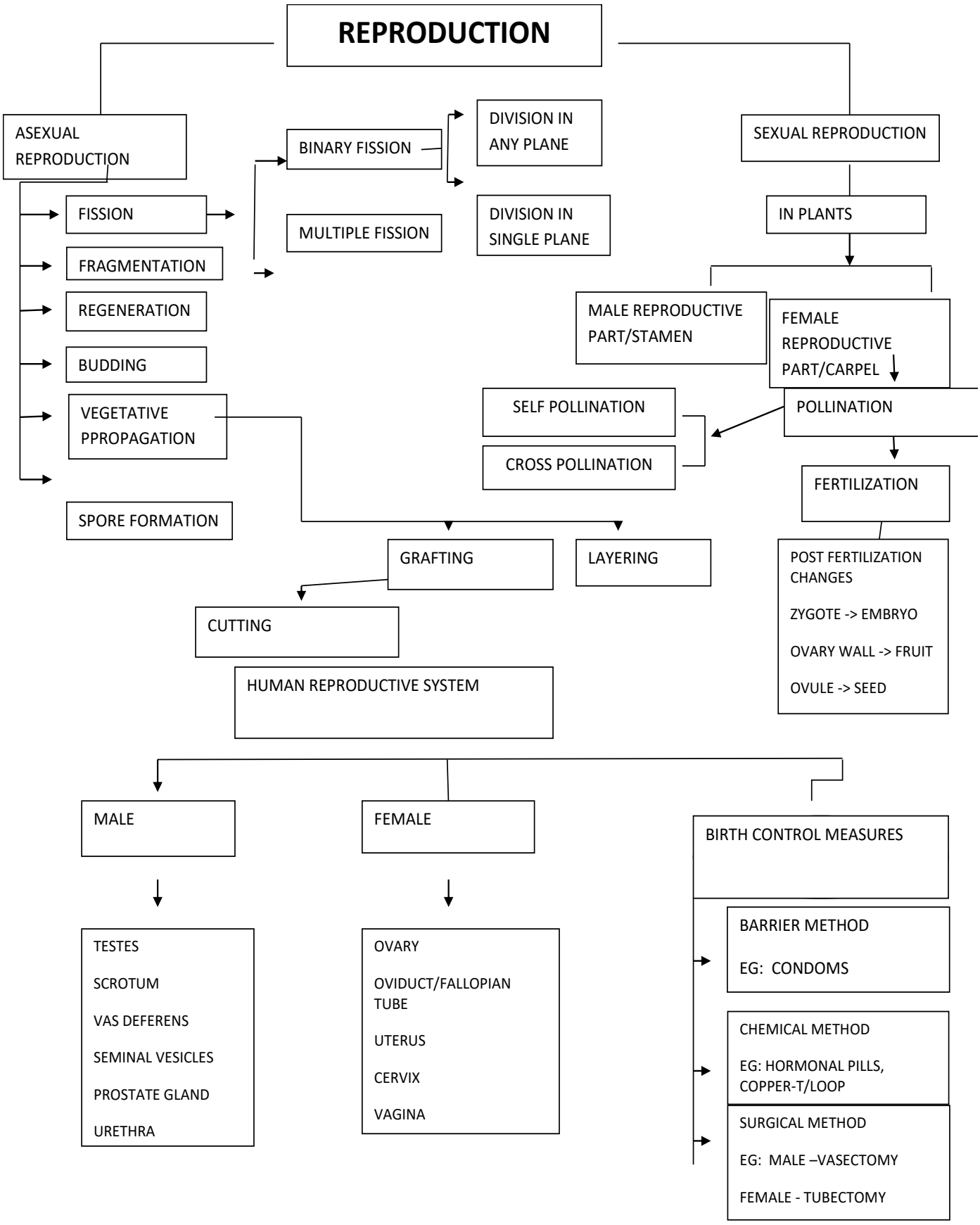
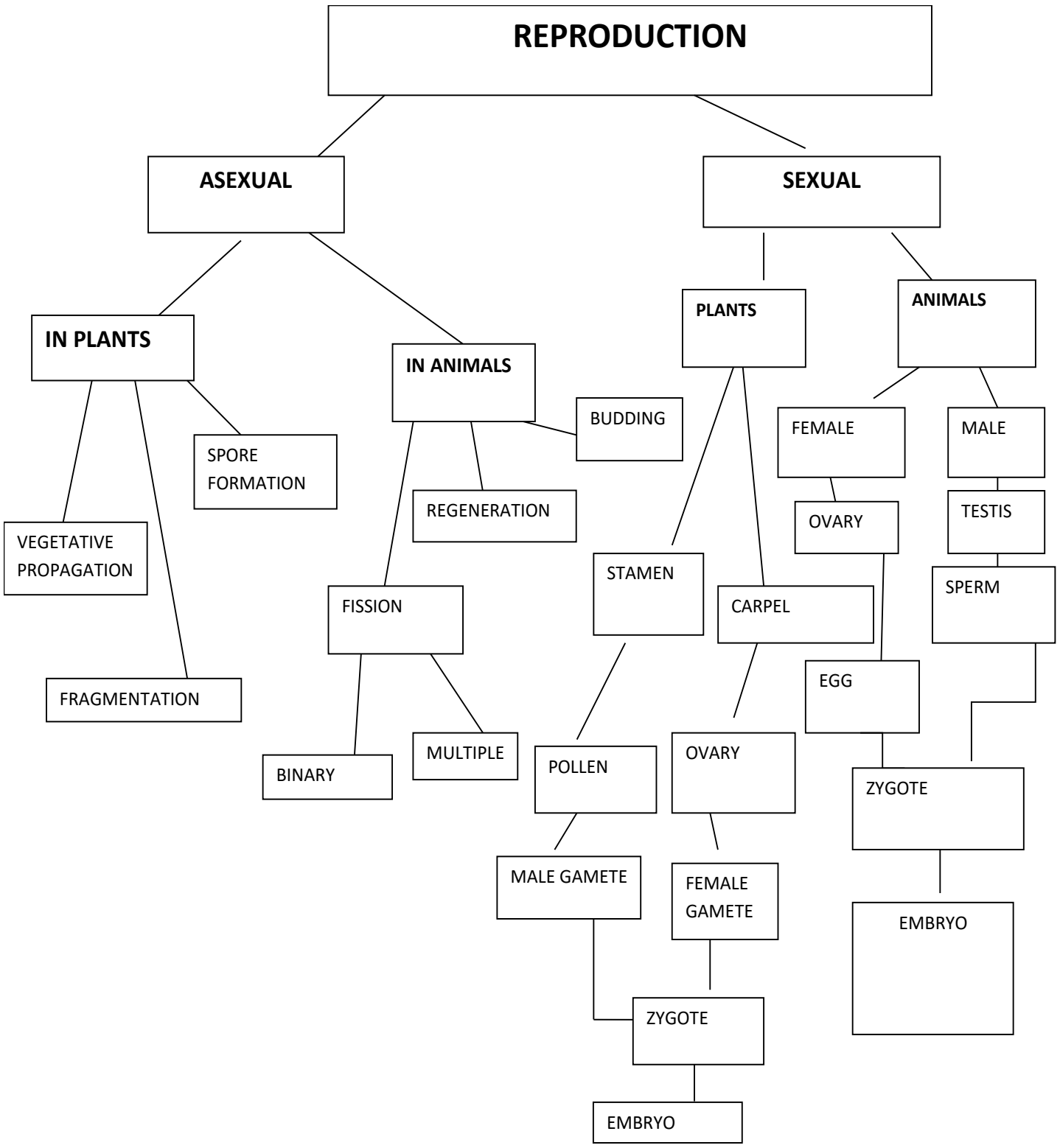
CHAPTER: 8 HOW DO ORGANISMS REPRODUCE
CONCEPT MAP





CH: 8 HOW DO ORGANISMS REPRODUCE?

Reproduction is the process by which living organisms produce newindividuals similar to themselves. It ensures continuity of life on earth.

Nucleus of the cell contains DNA (Deoxyribose Nucleic Acid) whichis the heredity material

DNA replicates and forms new cells causing variation. So, these new cells will be similar but may not be identical to original cell.

Variations are useful for the survival of the individual and species over time as well as basis for evolution.

Types of Reproduction

(a) Asexual Reproduction

- A single individual give rise to new individual.
- Gametes are not formed.
- New individual is identical to parent.
- It is extremely useful as a means of rapid multiplication.
- Adopted by lower organisms.

(b) Sexual Reproduction

- Two individuals i.e., one male and one female are needed to give riseto new individual.

- Gametes are formed.
- New individual is genetically similar but not identical to parents.
- It is useful to generate more variations in species.
- Adopted by higher organisms.

Asexual Reproduction

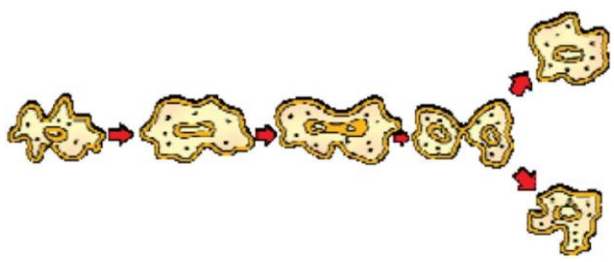
Fission

- Fission is an asexual reproduction that is common in most of the unicellular organisms. The parent cell divides into daughter cells
- When the fission results in two daughter cells, it is binary fission (e.g. paramecium).

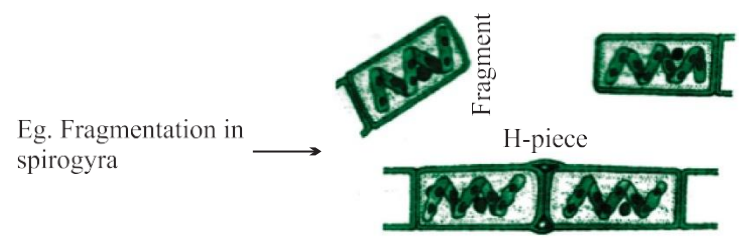
  When fission results in many daughter cells, it is called multiple fission (e.g. Plasmodium).

Planes of fission may be different for different organisms.

BINARY FISSION IN AMOEBA

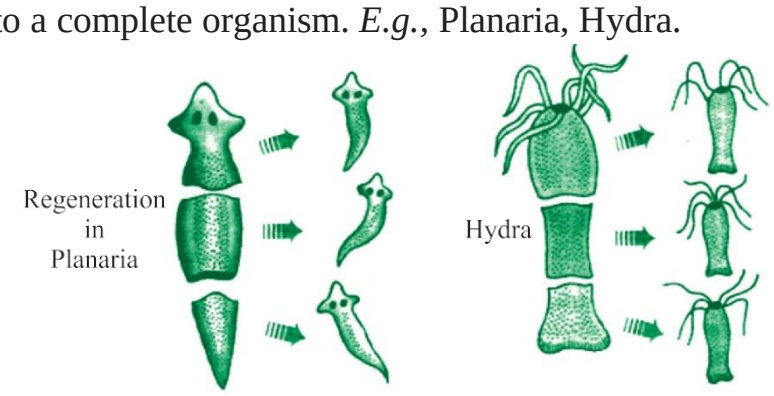


(i) Fragmentation: The organism breaks-up into smaller pieces; upon maturation, each piece develops into new individual. *E.g.*, Spirogyra.



Fragmentation in Spirogyra

(ii) Regeneration: If an organism is somehow cut or broken into many pieces, each piece grows into a complete organism. *E.g.*, Planaria, Hydra.



Regeneration in Planaria and Hydra

MCQ

1) In the list of organisms given below, those that reproduce by the asexual method are
(i) banana
(ii) dog
(iii) yeast
(iv) Amoeba

(a) (ii) and (iv)
(b) (iii) and (iv)

(c) (i) and (iv)

(d) (ii), (iii) and (iv)

2) Offspring formed by asexual method of reproduction have greater similarity among themselves because

(i) asexual reproduction involves only one parent

(ii) asexual reproduction does not involve gametes

(iii) asexual reproduction occurs before sexual reproduction

(iv) asexual reproduction occurs after sexual reproduction

(a) (i) and (ii)

(b) (i) and (iii)

(c) (ii) and (iv)

(d) (iii) and (iv

3) The ability of a cell to divide into several cells during reproduction in Plasmodium is called

(a) budding

(b) reduction division

(c) binary fission

(d) multiple fission

DESCRIPTIVE QUESTIONS

4) Can you consider cell division as a type of reproduction in unicellular organism? Give one reason.

5) What is a clone? Why do offspring formed by asexual reproduction exhibit remarkable similarity?

6) Colonies of yeast fail to multiply in water, but multiply in sugar solution. Give one reason for this.

7) What is the importance of variation?

ASSERTION REASON :

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8) Assertion(A) : Asexual reproduction is a primitive type of reproduction.
Reason (R) : Asexual reproduction involves only mitotic cell division.

9) Assertion(A) : The offspring produced by sexual reproduction is likely to adjust better in environmental fluctuation.
Reason (R) : During the fusion of gametes there is mixing of genetic material from two parents.

ANSWERS

1)B) iii) and iv 2) A) i) and ii) 3) multiple fission

4) Yes, we can because in unicellular animals there is only one cell, when it will divide to form a new cell and hence new organisms.

5) A clone refers to the offspring of an organism which is formed through asexual reproduction. Since they possess exact copies of the DNA from their parent, so clones exhibit remarkable similarity.

6) Colonies of yeast fail to multiply in water but multiply in sugar solution because sugar provides energy for sustaining all life activities in yeasts. In water, it fails to reproduce because of inadequate energy in its cells.

7) Variations help in survival of the organism by many different ways-

(i)It helps a species to survive

(ii)It also helps organisms to adapt to their environment as well as to changes which do occur in the environment.

(iii)It also helps a species to emerge strong if favoured by natural selection.

(iv)Variation helps a species to be resistant to diseases.

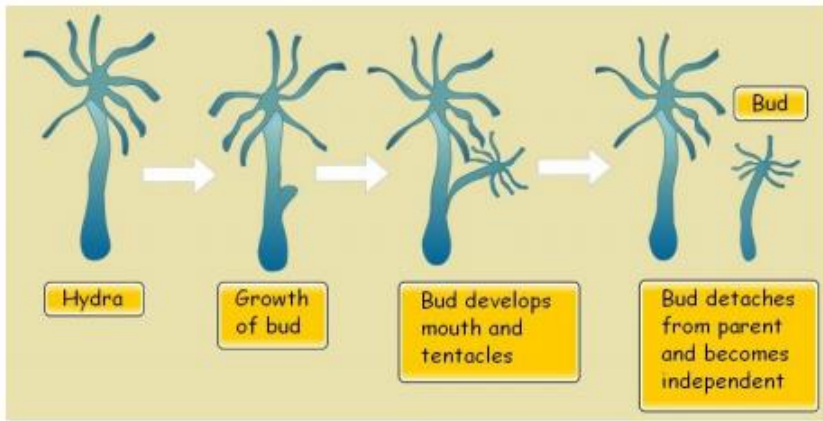
8)B) Both A and R are true but R is NOT the correct explanation of A.

9) A) Both and R are true and R is the correct explanation of A

BUDDING

Budding in biology, a form of asexual reproduction, in which a new individual develops from some generative anatomical point of the parent organism. In some species buds may be produced from almost any point of the body, but in many cases budding is restricted to specialized areas.

E.g.: Hydra, for reproduction through budding, uses regenerative cells where a bud expands as an outgrowth because of repeated cell division at one specific location. These buds then develops into new small individuals, which when completely matures, detach from the parent body.

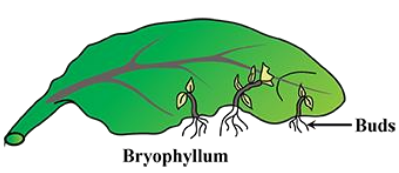


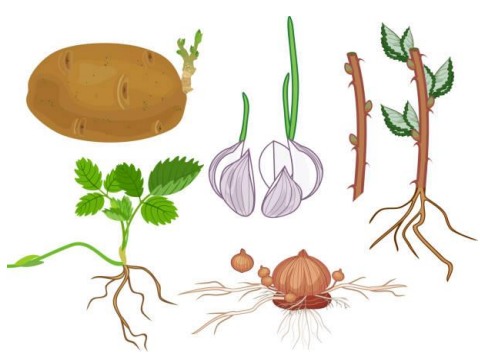
VEGETATIVE PROPAGATION

A mode of reproduction in plants in which a vegetative part, like the stem, root, leaves develop into a new plant under favourable conditions. It is also considered as a type of asexual reproduction as long as one parent is involved.

The main advantage of vegetative propagation is that the new plants contain the genetic materials of only one parent so; they are essentially clones of the parent plant. This can also help to maintain consistent quality and taste in products made from plants or crops. This process is very helpful in case of plants where they have lost the capacity to produce seeds.

E.g.: Rose (stem, branch), Bryophyllum (leaves) etc.

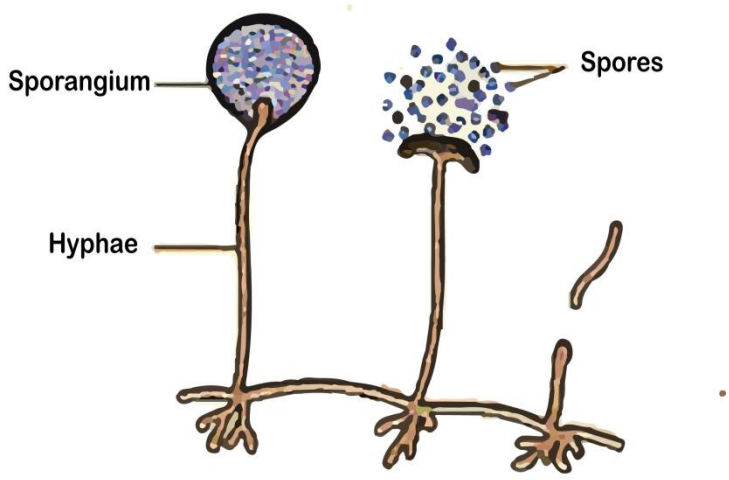




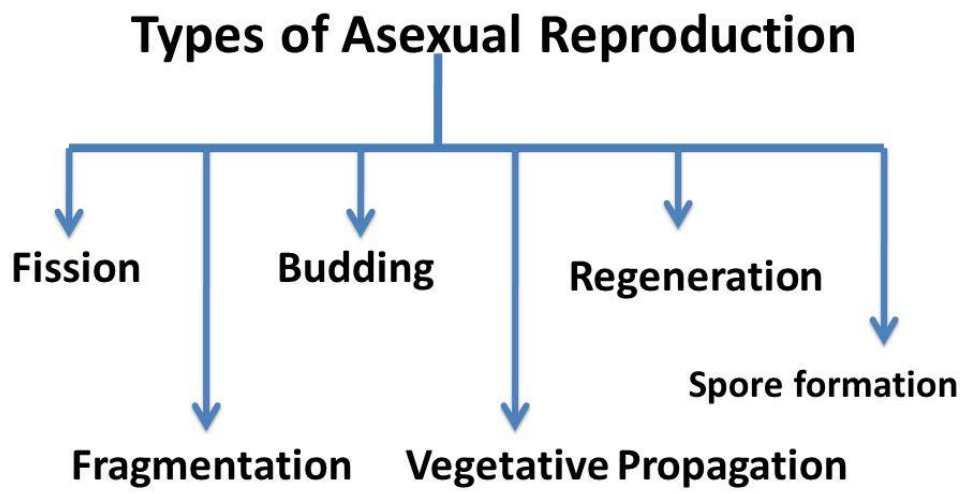
SPORE FORMATION

Spore, a reproductive cell, capable of developing into a new individual without fusion with another reproductive cell. Spores are agents of asexual reproduction, whereas gametes are agents of sexual reproduction. Spores are produced by bacteria, fungi, algae and Plants.

Rhizopus (Bread mould) grows as filamentous, branched structure. The filamentous structure that grows above it is called ***Hyphae***, which are not the reproductive parts. Hyphae give rise to a Globular structure called ***Sporangia***, which contains spores. The spores are covered by thick wall that protect them from any adverse conditions and the spores are lighter so they get dispersed to another places easily. It will provide better chances for them to survive and grow up.



Spore formation in **Rhizopus**



SEXUAL REPRODUCTION

It is the production of new organisms by the combination of genetic information of two individuals of different sexes. In most species the genetic information is carried on chromosomes in the nucleus of the reproductive cells called Gametes (haploid) which then fuse to form a Zygote (diploid). The zygote develops into a new individual. Sexual reproduction is the dominant form of reproduction in living beings.

WHY THE SEXUAL MODE OF REPRODUCTION?

Sexual reproduction causes more viable variations due to the following reasons:-

* Error in copying DNA, which are not highly significant
* Random segregation of Father and Mother Chromosomes at the time of Gamete formation
* It's a source of genetic variation among a population of organisms.
* It gives rise to individuals more adapted to the environment
* It helps in survival of species
* It helps in evolution of organisms.

During sexual reproduction Meiosis generates genetic variations in offspring because the process randomly shuffles genes across chromosomes and randomly separates half of those chromosomes into each gamete which fuses to form the new organism (zygote)

In lower form of multicellular organisms there doesn't appear much difference between the germ cells but in higher multicellular organisms the difference exist, one germ cell will be smaller and motile while the other will be storing food in it and non-motile. In

male body the germ cells are called Sperm cells and in females Ova, both having half set of chromosomes.

QUESTIONS

MULTIPLE CHOICE QUESTIONS

1) Variations occur as a result of
(a) Asexual reproduction
(b) Vegetative propagation
(c) Sexual reproduction
(d) Regeneration

2) The number of chromosomes in parents and offsprings of a particular species remains constant due to
(a) doubling of chromosomes after zygote formation
(b) halved of chromosomes during gamete formation
(c) doubling of chromosomes after gamete formation
(d) halving of chromosomes after gamete formation

3) Factors responsible for the rapid spread of bread mould on slices of bread are
(i) large number of spores
(ii) availability of moisture and nutrients in bread
(iii) presence of tubular branched hyphae
(iv) formation of round shaped sporangia
(a) (i) and (iii)
(b) (ii) and (iv)
(c) (i) and (ii)
(d) (iii) and (iv)

4) How do spores develop into Rhizopus?
(a) Spores divide and grow into new individual
(b) Spores combine with other spores and grow
(c) Spores enlarge in size for the growth of new individual
(d) Spores land on other organisms and increase with their growth in size

5) In rhizopus tubular structure bearing sporangia at their tips are called _____.
(a) Filaments
(b) Rhizoids
(c) roots
(d) Hyphae

6) Cloning is a mode of :
(a) sexual reproduction
(b) asexual reproduction
(c) both a and b
(d) none

7) **Vegetative propagation refers to formation of new plants from———-.**
(a) stem, roots, flowers
(b) stem, roots, leaves
(c) stem, flowers, fruit
(d) stem, leaves, flowers

8) Priya was writing some statements; help her to choose the correct one.
(a) The existing organisms are called parent and the new organisms produced by them are called offspring.
(b) The production of new organisms from a single parent without the involvement of sex cells or gametes is called sexual reproduction.
(c) The production of a new organism from two parents by making use of their sex cells or gametes is called asexual reproduction.
(d) All the above

9) In the last year board examination Rahul was asked a question where he had to choose the statement which was /were incorrect. Will you be able to answer the question

(a) In vegetative propagation, new plants are obtained from the parts of old plants without the help of any reproductive organs.

(b) It is necessary to plant the whole potato tuber in the ground to produce the new potato plants.

(c) Bryophyllum plants can be reproduced by vegetative reproduction by using either a piece of its stem or its leaves.

(d) The green grass grows in the fields after range from the dry, old stems of grass plants present in the fields, by the method of vegetative propagation.

10) Plants like banana, rose ,jasmine ,orange have lost the capacity to produce
(a) Seeds
(b) Buds
(c) Flowers
(d) Roots

Descriptive questions

11) **List the advantages of vegetative propagation.**
12) **Explain various steps of budding in yeast.**
13) **What is the importance of reproduction?**
14) **How are spores produced in sporangium of Rhizopus?**
15) **What is the importance of DNA copying in reproduction?**
16) What are the limitation of the asexual mode of reproduction? differentiate between asexual reproduction and sexual reproduction.
17) What are the various methods of vegetative propagation? Discuss any one method with example.

ANSWERS:

1. (c), 2. (b) , 3. (c) , 4. (a) , 5. (d) , 6. (b) ,7. (b) , 8. (a) ,9. (b), 10. (a)

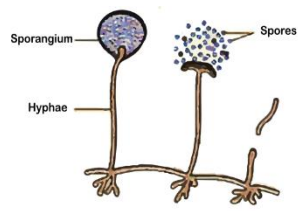
11. The advantages of vegetative propagation are as follows
• It helps in the easy propagation of non–flowering plants.
• It helps in producing hybrids of various plants, with improved qualities.
• It helps in the propagation of a large number of populations in a very short duration.
• It helps in the propagation of plants that do not produce seeds or produce them in very small quantities.

12. Budding is a form of asexual reproduction usually observed in yeast.
• During this process, a small protrusion appears on the upper portion of the body of the organism. This bulge is called a bud.
• The bud gradually grows in size and forms an individual cell.
• From this newly budded cell, another bud appears at the tip.
• This process continues and a chain of

c) Role in evolution – some variations is produced in the new organisms during reproduction which play an important role in evolution. yeast cells is obtained.

13. Importance of reproduction –
Maintenance of the existence – Organisms are maintaining their existence on the earth since their origin, million year ago, only because of reproduction.
b) Preservation of species – Species (a group of similar organisms) are preserved because of reproduction. It is possible because reproducing organisms produce new individuals which are very similar to themselves.

14. **a)** A spore is a small microscopic structure with a thick wall.
b) Spores are generally formed in a structure called sporangium which reassembles formed in a structure called sporangium which resemble blob on – a – stick.
c) Sporangia are formed at the tip of erect fungal hypha.
d) In each sporangium, a nucleus divides several times producing a large number of nuclei. Nuclei get surrounded by a little cytoplasm and develop into thick – walled cells or spores.
e) The wall of sporangium breaks to release the spores in air.
f) On germination in the presence of moist surface, each spore gives rise to a new organism.



Spore formation in **Rhizopus**

15. DNA contains information for the inheritance of features from parents to next generation. DNA presents in nucleus of cells are the information source for making protein. If information is different, different protein will be made that lead to altered body design.

16. In asexual reproduction very little variation occurs within generation. Asexual reproduction has a lesser significance for evolution of species. Asexual reproduction involves only a single individual. It does not require two sexes. Sexual reproduction involves two different individuals, male and female sexes. The offspring is produced due to fission of male and female gametes.

17. The various types of vegetative propagation are

- Cutting
- Layering
- Grafting
- Parthenogenesis
- Micro-propagation in vitro
- Grafting
- It is a method in which two parts of different plants are joined together in such a way that they unite and grow as one plant.
- The portion of the plant that is grafted onto another plant is known as the scion, and the plant on which grafting is performed is known as the stock.
- The stock and the scion are tied in such a way that the cambium of the scion and the stock come in contact with each other.
- The stock is so chosen that it possesses qualities like disease resistance, high water absorbing capacity, deep penetrating roots for a firm hold, etc. The scion is so chosen that it possesses qualities like high yield of pulp or seeds (as desired) from a single fruit, etc.
- For example, citrus-root stock is used for a variety of grafts like sweet orange, lime, grape, etc.

ASSERTION (A) AND REASON (R) TYPE QUESTIONS

Following statements consists of two statements- Assertion (A) and Reason (R) . Answer these questions selecting the appropriate option given below:
(a)Both A and R are true and R is the correct explanation of A.
(b)Both A and R are true but R is not the correct explanation of A.
(c)A is true but R is false.
(d)A is false but R is true.

18.**Assertion (A):** Spores are unicellular bodies.
Reason(R) : The parent body simply breaks up into smaller pieces on maturation.
19**.Assertion:** The offsprings produced by sexual reproduction is likely to adjust better in environmental fluctuation.
Reason: During the fusion of gametes there is a mixing of genetic material from two parents.

CASE STUDY BASED QUESTION

Read the following and answer the questions:

Preeti is very fond of gardening. She has different flowering plants in her garden. One day few naughty children entered her garden and plucked many leaves of *Bryophyllum* plant and threw them here and there in the garden. After few days, Preeti observed that new *Bryophyllum* plants were coming out from the leaves which fell on the ground.

20.What does the incidence sited in the paragraph indicate?
(a). *Bryophyllum* leaves have special buds that germinate to give rise to new plant.
(b). *Bryophyllum* an propagate vegetatively through leaves.
(c). *Bryophyllum* is a flowering plant that reproduces only asexually
(d). Both (a) and (b).

21.Which of the following plants can propagate vegetatively through leaves like *Bryophyllum*?

(a) Guava (b) Begonia (c) Ginger (d) Mint

22.Do you think any other vegetative part of *Bryophyllum* can help in propagation? If yes, then which part?

(a) Roots (b) Stems (c) Flowers (d) Fruits

23.Which of the following plant is artificially propagated (vegetatively) by stem cuttings in horticultural practices?

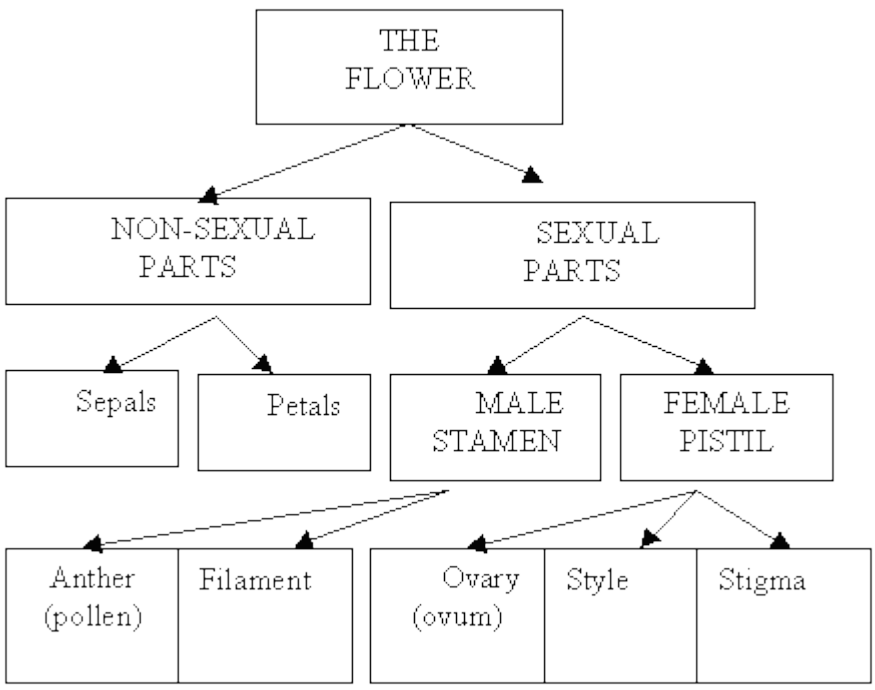
(a). Potato (b) Snake plant (c) Rose (d) Water hyacinth

ANSWERS:

18. (c) , 19. (a) 20. (d), 21. (b), 22. (b), 23. (c).

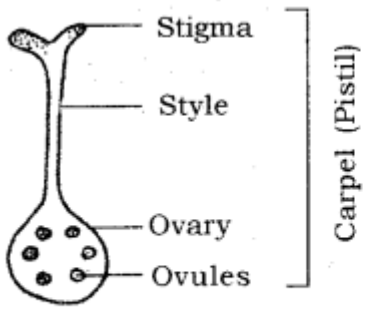
SEXUAL REPRODUCTION IN FLOWERING PLANTS

- Sexual reproduction in plants happens through flowers.
- The typical structure of flower contains essential whorls and non-essential whorls.
- Sepals and Petals are called non-essential whorls as they do not directly take part in reproduction.
- Sepals protect the inner delicate whorl during bud condition and also perform photosynthesis if they are green in colour.
- Petals, when they are coloured, attract insects for pollination.

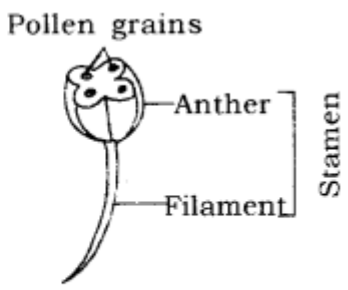


Unisexual Flowers	Bisexual Flowers
Flowers which have only one sex organ (either stamen or carpel) are known as unisexual flowers.	Flowers which have both sex organs (stamen & carpel) are known as bisexual flowers.
Only Cross pollination takes place in unisexual flowers.	Either cross pollination or self pollination can be possible in bisexual flowers.
e.g. flowers of papaya, watermelon	e.g. flowers of hibiscus, mustard plants

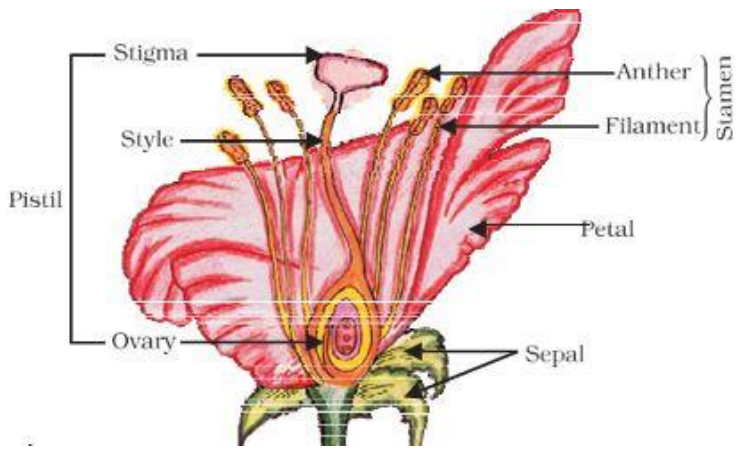
- Male reproductive structure is called a stamen and consists of anther and filament.
- Anther produces haploid pollen grains.
- Female reproductive structure is called pistil and consists of stigma, style and ovary.



Female reproductive organ of a plant (Carpel)

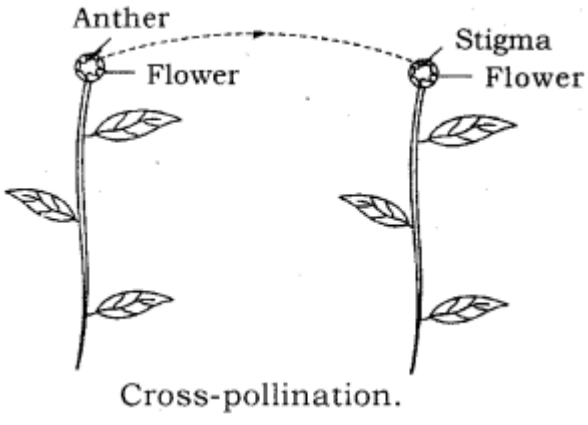


Male reproductive organ of a plant (Stamen)



STRUCTURE OF A FLOWER

Pollination: The process of transfer of pollen grains from an anther to the stigma of the flower is pollination. Two types of pollination are:
(i) Self-pollination: The transfer of pollen grains from the anther to the stigma of the same flower or another flower of the same plant.
(ii) Cross-pollination: The transfer of pollen grains from the anther to the stigma of another flower or another flower of a different plant of the same species. It generally takes place with the help of some agents like insects, birds, wind and water.

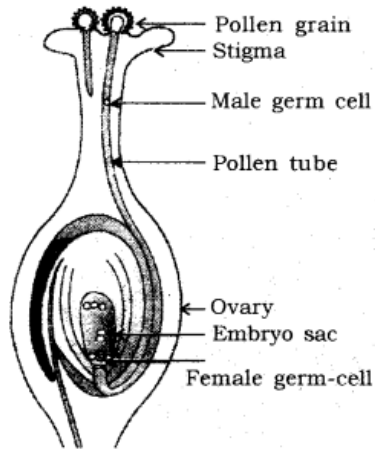


Cross-pollination.

Fertilization

Fusion of male and female gametes is known as fertilization.

- The male germ-cell produced by pollen grain fuses with the female gamete present in the ovule. This fusion of the germ-cells or fertilisation gives us the zygote which is capable of growing into a new plant.
- After fertilization, ovary becomes fruit and ovules turn into seeds. All other parts wither away.



Fertilisation in flowering plant

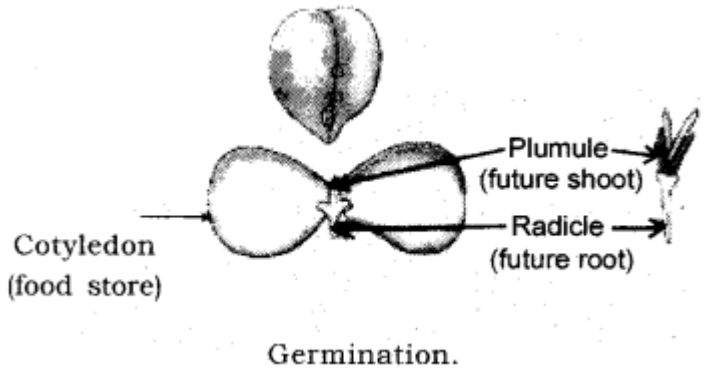
Post-fertilisation changes: After fertilisation the following changes takes place in the flower. Zygote divides several times and forms an embryo inside the ovule.

- The ovule develops a tough coat and changes into the seed.
- The ovary grows rapidly and ripens to form a fruit.
- Petals, sepals, stamens, style and stigma shrivel and fall off.

Seed and its parts: The advantage of seed is that it protects the future plant i.e. embryo.

Seed has two parts: Cotyledons and Embryo Cotyledons store food for the future plant.

Embryo has two parts: plumule and radicle. Plumule develops into shoot and radicle develops into root.
The process of development of a seedling from the embryo under appropriate conditions is known as germination.



Germination.

Reproduction in Human Beings
Humans use sexual mode of reproduction
Sexual maturation: The period of life when production of germ cells i.e. ova (female) and sperm (male) start in the body. This period of sexual maturation is called puberty.
Changes at Puberty

• Common in male and female
⟶Thick hair growth in armpits and genital area. Skin becomes oily, may result in pimples.

• In girls

⟶ Breast size begin to increase.
⟶ Girls begin to menstruate.

• In boys
⟶Thick hair growth on face. Voice begin to crack.
These changes signals that sexual maturity is taking place.

Male Reproductive System

i) Testes
A pair of testes are located inside scrotum which is present outside the abdominal cavity.
Scrotum has a relatively lower temperature needed for the production of sperms.
Male germ cell i.e. sperms are formed here.
Testes release male sex hormone (testosterone).
Function of testes:

Regulate production of sperms and bring changes at puberty.
(ii) Vas deferens It passes sperms from testes up to urethra.
(iii) Urethra
It is a common passage for both sperms and urine. Its outer covering is called penis

(iv)Associated glands

→ Seminal vesicles and prostate gland add their secretion to the sperms. This fluid provide nourishment to sperms and make their transport easy.
Sperm along with secretion of glands form semen.

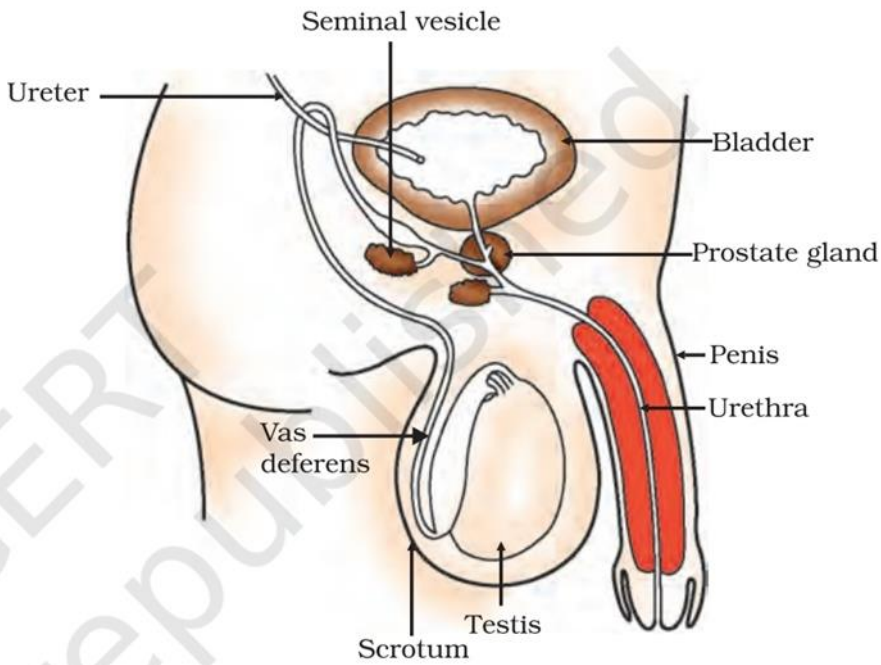


Figure 8.10 *Human–male reproductive system*

Questions

MCQ

1.The transfer of pollen from the anther to stigma is called…….
(a)Fusion (b)fertilization (c)Pollination (d)Vegetative propagation

2.Along the path of the vas-deferens the secretions of which gland provide nutrition to the sperms?
(a) Prostate glands (b) Seminal vesicles(c) Scrotum(d) Urinary bladder

3. Fruits are formed from
a. Stamen b. Stigma c. Ovary d. Ovule

4. Which of the following is the correct sequence of events of sexual reproduction in a flower?
a) pollination, fertilisation, seedling, embryo
(b) seedling, embryo, fertilisation, pollination
(c) pollination, fertilisation, embryo, seedling
(d) embryo, seedling, pollination, fertilisation

5. Length of pollen tube depends on the distance between

(a) pollen grain and upper surface of stigma
(b) pollen grain on upper surface of stigma and ovule
(c) pollen grain in anther and upper surface of stigma
(d) upper surface of stigma and lower part of style

DESCRIPTVE TYPE QUESTIONS

1.Define the terms unisexual and bisexual giving one example of each.

2.(a) Draw a diagram showing germination of pollen on stigma of a flower.
(b) Label pollen grain, male germ- cells, pollen tube and female germ-cell in the above diagram.
(c) How is zygote formed?

3.List any three differences between pollination and fertilisation.

4.Draw a longitudinal section of a flower and label the following parts:
(i) Part that produces pollen grain.

(ii)Part that transfers male gametes to the female gametes.
(iii) Part that is sticky to trap the pollen grain.
(iv) Part that develops into a fruit.

5.Name the female reproductive part of a flower. Which part of a flower develops into a seed and a fruit? Where are the male germ cell and female gamete present in the flower?

Answers MCQ

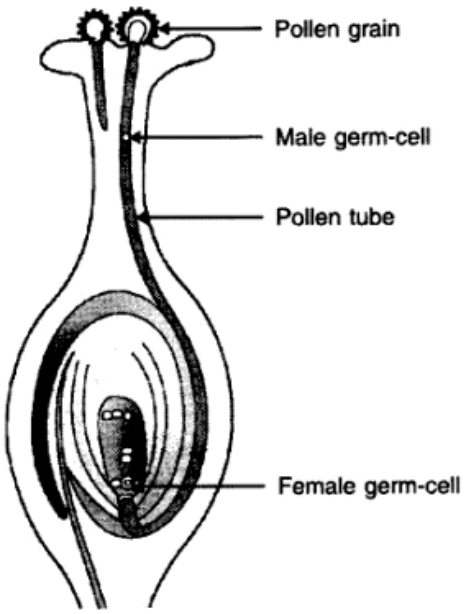
1.c. pollination
2.a. prostrate glands
3.c.ovary
4. pollination, fertilisation,embryo, seedling
5.b.pollengrain on upper surface of stigma and ovule.

Descriptive Questions

1. The flowers which contain only the male or female reproductive organs are called unisexual flowers. They are called incomplete flowers. To reproduce they undergo cross-pollination. Examples: Papaya, White mulberry and Watermelon.

The flowers which contain both male and female reproductive organs are known as full or bisexual flowers. They will self-pollinate themselves. Examples: Tulip, Sunflower and Lily.

2.a and b



C. Zygote is formed when male gamete fuses with the egg.

3.

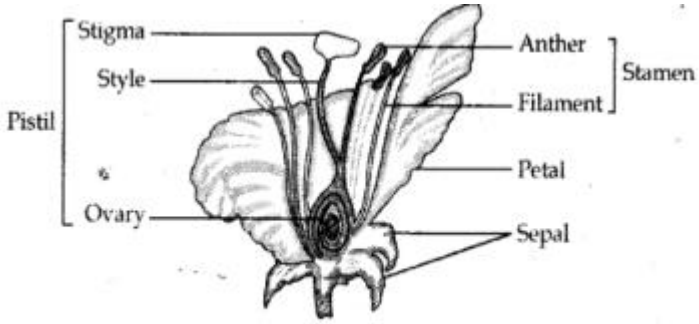
S. No.	Pollination	Fertilization
1.	It is the transfer of pollen grains from anther to stigma of a flower.	It is the process of fusion of male gamete and female gamete resulting in the formation of zygote. **[1]**
2.	Pollination facilitates formation of pollen tube which carries male gamete to the ovule.	Zygote later develops into embryo. **[1]**
3.	In this process, carrying agents are needed.	No carrying agents are needed in this process. **[1]**
4.	Occurs only in higher plants.	Occurs in all sexually reproducing organisms.

4 i)anther

ii)pollen tube

iii) stigma

iv)ovary



Longitudinal section of a flower

5. Female reproductive part of a flower is pistil. Ovary develops into fruit and ovule into seed. Male germ cell is present in pollen grain and female germ cell in the ovary.

ASSERTION REASON QUESTIONS

1. Assertion (A): Testes lie in penis outside the body.
Reason (R): Sperms require temperature lower than the body temperature for development

2. Assertion (A): Unisexual flowers have separate male and female flowers whereas a typical monocot embryo comprises an embryonal axis with single cotyledon.
Reason (R): Cucumber, pumpkin and water melon are example of unisexual flowers.

CASE STUDY QUESTIONS

Menstrual cycle is the cycle of events taking place in female reproductive organs, under the control of sex hormones, in every 28 days. At an interval of 28 days, a single egg is released from either of two ovaries. Regular menstrual cycle stopped abruptly in a married women. She got herself tested and was happy to discover that she is pregnant with her first baby.
(i) Why menstruation stops in a pregnant female?

a)The egg gets fertilised so need not to be expelled out of body
(b) Ovulation stops during pregnancy and so do menstruation
(c) Thick uterine lining is needed for proper development of embryo, so that it is retained
(d) All of these

(ii) Select the correct sequence of acts that leads to pregnancy in a female.
A. Fertilisation of egg
B. Ovulation
C. Formation of zygote
D. Implantation

(a) **(b)**
D ⇒⇒C ⇒⇒B ⇒⇒A **B⇒⇒ A⇒⇒C⇒⇒D**

(c) **(d)**
A ⇒⇒ B⇒⇒ C⇒⇒ D **D⇒⇒ C⇒⇒ A ⇒⇒B**

(iii) How is a zygote different from embryo?
(a) Zygote is formed by repeated division of embryo
(b) Zygote is formed by fusion of sperm and egg whereas embryo is formed by fusion of zygote with other zygote

(c) Zygote is single celled but embryo is multicellular
(d) Zygote is formed by fertilisation but embryo is formed without fertilisation

(iv) What change takes place in the uterus of a pregnant female?
(a) Uterine lining becomes thick and vascular
(b) Placenta develops which links the embryo to mother through umbilical cord
(c) Uterus lining containing lots of blood capillaries breaks down
(d) Both (a) and (b)

Answers

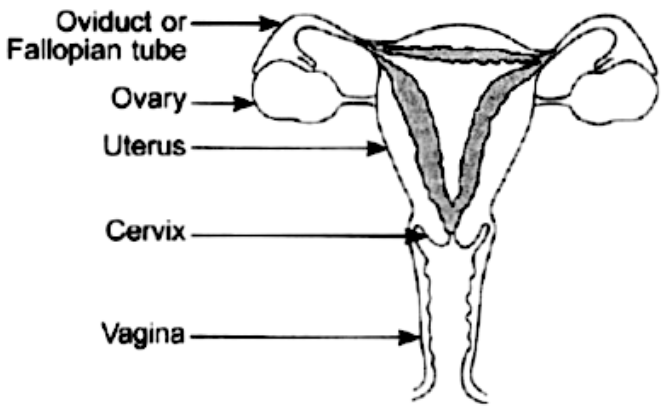
1. Assertion is false, reason is true.

2. Answer: both A and R are true but R is not the correct explanation for A.

- I-d
- II-b
- III-c
- IV-d

SEXUAL REPRODUCTION IN HUMAN BEING

FEMALE REPRODUCTIVE SYSTEM



- Two ovaries: Ovaries produce Ovum. When a girl is born, the ovaries already contain thousands of immature eggs. On reaching puberty, some of these start maturing. One egg is produced every month by one of the ovaries.
- Oviduct / Fallopian Tube: The egg is carried from the ovary to the womb (uterus) through a thin oviduct or fallopian tube. It is the site for fertilization.
- Uterus: The two oviducts unite into an elastic bag-like structure known as the uterus. The uterus opens into the vagina through the cervix.

FERTILISATION:

- The sperms enter through the vaginal passage during sexual intercourse.
- They travel upwards and reach the oviduct /Fallopian tube where one sperm fuse with the egg.

IMPLANTATION:

The fertilized egg, the zygote, gets attached in the lining of the uterus, and starts dividing.

GESTATION:

The period from fertilization to the parturition.

The development of the child inside the mother's body takes approximately nine months 280-290 days.

PREPARATION OF UTERUS:

- Uterus prepares itself every month to receive and nurture the growing embryo.
- The lining thickens and is richly supplied with blood to nourish the growing embryo.

PLACENTA:

- The embryo gets nutrition from the mother's blood with the help of a special tissue called placenta.
- This is a disc which is embedded in the uterine wall. It contains villi on the embryo's side of the tissue.
- On the mother's side are blood spaces, which surround the villi. This provides a large surface area.

Functions of Placenta:

1. Transport glucose (nutrients) from the mother to the embryo.
2. Transport oxygen from the mother's body to the embryo.
3. The developing embryo generate waste substances which are removed by transferring them into the mother's blood through the placenta.

Parturition: The child is born as a result of rhythmic contractions of the muscles in the uterus.

MENSTRUATION / MENSTRUAL CYCLE:

- If the egg is not fertilized, it lives for about one day.
- Since the ovary releases one egg every month, the uterus also prepares itself every month to receive a fertilized egg.
- Thus its lining becomes thick and spongy. This would be required for nourishing the embryo if fertilization had taken place.
- The lining of the uterus slowly breaks and comes out through the vagina as blood and mucous.
- This cycle takes place roughly every month and is known as menstruation. It usually lasts for about two to eight days.

MENARCHE – AND MENOPAUSE:

Menstruation starts in human females at the puberty. The starting of menstruation is called Menarche. Menstruation continues in human females till the age of 45-50. At this age menstruation comes to an end. Stoppage of menstruation is called Menopause.

REPRODUCTIVE HEALTH

The process of sexual maturation is gradual and takes place along with general body growth

Some degree of sexual maturation does not necessarily mean that the body or the mind is ready for sexual acts or for having and bringing up children.

Pressure on the individual:

1) Pressure from our friends for participating in many activities, whether we really want to or not.

2) Pressure from families to get married and start having children.

3) Pressure from government agencies to avoid having children.

STDs / STIs/VDs: possible health consequences of having sex:

Disease transmitted through sexual contact are called Sexually Transmitted Diseases or Sexually Transmitted Infections Venereal diseases.

Eg: *Gonorrhea and Syphilis* (caused by bacteria)

HIV-AIDS. Caused by virus.

Preventing the transmission of such diseases during the sexual act:

Using a covering, called a condom, for the penis during sex helps to prevent transmission of many of these infections to some extent.

CONTRACEPTIVE METHODS/BIRTH CONTROL METHODS:
The sexual act always has the potential to lead to pregnancy. Pregnancy will make major demands on the body and the mind of the woman, and if she is not ready for it, her health will be adversely affected. Therefore, many ways have been devised to avoid pregnancy.

1. **BARRIER METHOD/MECHANICAL METHODS**: The creation of a mechanical barrier so that sperm does not reach the egg.
Condoms on the penis or similar coverings worn in the vagina can serve this purpose.

2. **CHEMICAL METHOD/ HORMONAL METHODS/ ORAL CONTRACEPTIVES**:
Contraceptives acts by changing the hormonal balance of the body so that eggs are not released and fertilisation cannot occur. These drugs commonly need to be taken orally as pills. Oral pills change hormonal balances, they can cause side-effects.

3. **IUCDs: Intra Uterine Contraceptive Devices**:
Loop or the copper-T are placed in the uterus to prevent pregnancy. They can cause **side effects** due to irritation of the uterus.

4. **SURGICAL METHODS:** Surgical methods can be used to create such blocks.
VASECTOMY: If the vas deferens in the male is blocked, sperm transfer will be prevented.
TUBECTOMY: If the fallopian tube in the female is blocked, the egg will not be able to reach the uterus.
In both cases fertilisation will not take place.
While surgical methods are safe in the long run, surgery itself can cause infections and other problems if not performed properly.

5**. ABORTION**: Removal of unwanted pregnancies. (Medically guided)/ Medical Termination of Pregnancy. (MTP)

ABORTION, FEMALE FOETICIDE AND ITS SOCIAL IMPACT:

- Abortion may be misused by people who do not want a particular child, as happens in illegal sex-selective abortion of female foetuses.

- For a healthy society, the female-male sex ratio must be maintained. Because of reckless **female foeticides,** child sex ratio is declining at an alarming rate.

PRENATAL SEX DETERMINATION:

- Prenatal sex determination has been prohibited by law. This is due to the misuse of scanning.

QUESTION ANSWERS

MULTIPLE CHOICE QUESTIONS

1) Which of the following methods of contraception protects from acquiring sexually transmitted diseases?

a) Surgery
b) Condoms
c) Copper T
d) Oral pills

2) The embryo in humans get nourishment from mother's blood with the help of special tissue called

a) Placenta
b) Villi
c) Uterus
d) Womb

3) The fertilization of human egg by sperm takes place in

a) Vagina
b) Uterus
c) Oviduct
d) Ovary

4) The process of release of eggs from the ovary is called

a) Menstruation
b) Reproduction
c) Ovulation
d) Insemination

5) Which among the following diseases is not sexually transmitted?

(a) Syphyllis
(b) Hepatitis
(c) HIV-AIDS
(d) Gonorrhea

6) In case the ova does not fertilise which of the following events will take place?
a) Menstruation
b) Pregnancy
c) Implantation
d) ovulation

DESCRIPTIVE QUESTIONS

7) Name the male and female gametes in animals. What is fertilization and where does it take place in human females ?

8) Surgical methods can be used to create a block in the reproductive system for contraceptive purposes. Name such parts where blocks are created in

(a) Males and Females.

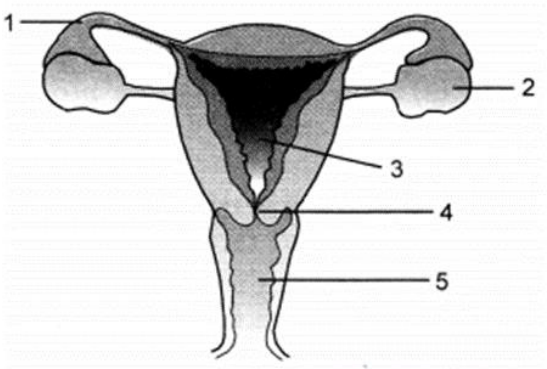
(b) State any two reasons for using contraceptive devices.

9) Prenatal sex determination has been prohibited by law. State two reasons.

10) What is placenta? State its two roles during pregnancy.

11) (a) Name the parts 1 to 5 of human female reproductive system.

(b) Name the part in which fertilization takes place in the system



(b) Fallopian tube.

CASE STUDY BASED QUESTIONS

The growing size of the human population is a cause of concern for all people. The rate of birth and death in a given population will determine its size. Reproduction is the process by which organisms increase their population. The process of sexual maturation for reproduction is gradual and takes place while general body growth is still going on. Some degree of sexual maturation does not necessarily mean that the mind or body is ready for sexual acts or for having and bringing up children. Various contraceptive devices are being used by human beings to control the size of population.

1) What are common signs of sexual maturation in boys
    a) Broadening of shoulders
    b) Development of mammary glands
    c) Broadening of waist
    d) High pitch of voice
2) Common sign of sexual maturation in girls is
    a) Low pitch voice
    b) Appearance of moustaches and beard
    c) Development of mammary glands
    d) Broadening of shoulders
3) Which contraceptive method changes the hormonal balance of the body
    a) Condoms
    b) Diaphragms
    c) Oral pills
    d) Both a) and b)
4) What should be maintained for healthy society
    a) Rate of birth and death rate
    b) Male and female sex ratio
    c) Child sex ratio
    d) None of these

ASSERTION REASON QUESTIONS:

1.Assertion -Ovary releases one every month.
Reason-the lining of the uterus is always thick and spongy.

2.**Assertion-** Surgical methods are most effective methods of contraception.
Reason-Surgical methods block gametes transport and hence prevent fertilization.

ANSWERS :

MCQ

1. B) Condoms
2. A) Placenta
3. C) Oviduct
4. C) Ovulation
5. B) Hepatitis
6. A) Menstruation

DESCRIPTIVE

Ans 7) Male Gamete: Sperm (= spermatozoan) Female Gamete: Ovum.

Fertilization: It is the fusion of two compatible gametes (e.g., sperm and ovum) to form diploid zygote during sexual reproduction.

In human females fertilization occurs in fallopian tube

Ans:8) (a)Vasa deferentia and Fallopian tubes.

(b) -Contraceptive devices are used to prevent pregnancy for

-Limiting size of family by spacing birth of children

-Avoiding unwanted pregnancy.

Ans 9: The test has been banned since due to desire of male child, there has been large scale female foeticide. This has resulted in declining female-male sex ratio.

Ans 10 : Placenta is a spongy vascular structure formed by the joint activity of maternal and foetal tissues in the wall of uterus that connects foetus with uterus.

Roles: Providing nutrition to the foetus. Taking away wastes of the foetus.

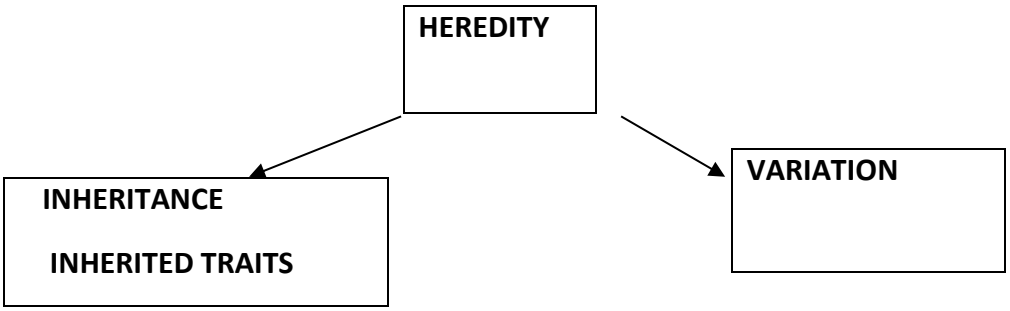
Ans:11(a) 1 - fallopian tube,2— ovary,3 — Uterus, 4 — cervix, 5 — vagina.

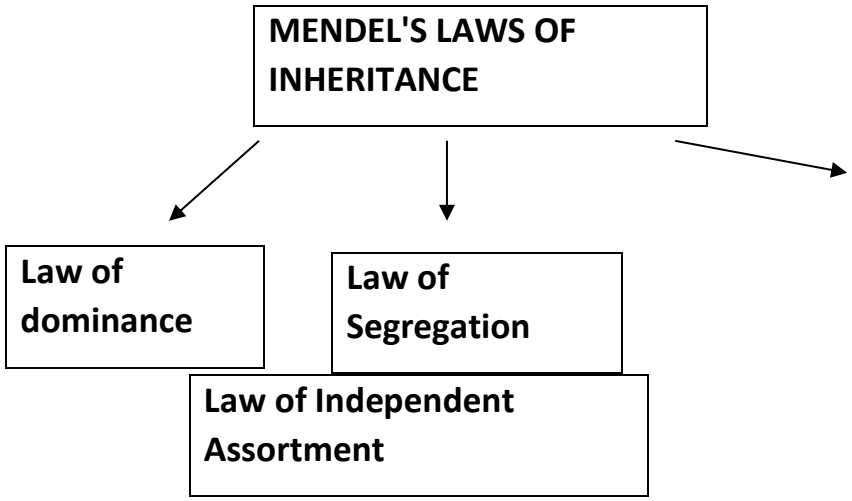
CASE STUDY :

1) A) Broadening of shoulder
2) C) Development of mammary glands
3) C) Oral pills
4) B) Male and female sex ratio

ASSERTION REASON
Answer -c A is true but R is false.
Answer Option A is correct

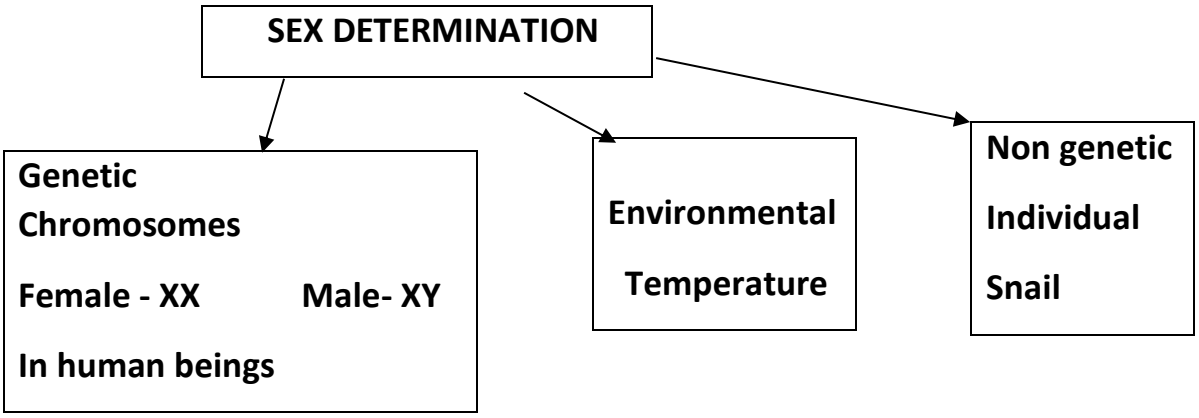
CHAPTER -9 HEREDITY AND EVOLUTION (CONCEPT MAP)





Monohybrid cross - One gene

Dihybrid cross - Two genes



HEREDITY

KEY POINTS

Heredity – Transmission of characters from one generation to another or from parents to offspring.

Variation – The occurrence of small differences or changes among the individuals of a species is called variation.

Sexually reproducing individuals have two copies of genes for the same trait.

Traits - characteristic features of an organism, manifested in a physical form that is visible or in a physiological aspect of the organism.

Dominant traits - The traits that express themselves in an organism in every possible combination and can be seen are called Dominant traits.

Recessive traits - A trait which is not expressed in the presence of a dominant allele is known as recessive.

Gene – It is the basic unit of inheritance. It consists of a sequence of DNA, which is the genetic material. Genes can mutate and can take two or more alternative forms.

Alleles – The alternative forms of genes. They affect the same characteristics or traits in alternate forms. They are located on the same place of the chromosome.

Homozygous – Each organism has two alleles for every gene (Each chromosome has one each). In homozygous, both the alleles are same. For Example, “TT” is the homozygous expression for tallness trait.

Heterozygous – If the two alleles are different from each other, then they are heterozygous in nature. For Example, “Tt” is the heterozygous expression for tallness trait.

Chromosomes – These are thread-like structures made up of nucleic acids (DNA) and proteins. They are mostly found in the nucleus of the cells. They carry the hereditary or genetic information in the form of genes.

Genotype – It is the complete heritable genetic identity of an organism. It is the set of alleles that are carried by the organism. It also includes non-expressed alleles.

Phenotype – It is the description of the actual physical characteristics of an organism or the expressed form of the genotype.

Monohybrid cross - When only one character is considered while crossing two organisms, then such a cross is known as monohybrid cross.

Dihybrid cross - When two characters are considered while crossing two organisms, then such a cross is known as a dihybrid cross.

Laws of Mendel

•Law of Dominance says that a gene has two contrasting alleles and one always expresses itself in the organism.

•Law of Segregation says that traits get segregated completely during the formation of gametes without any mixing of alleles.

•Law of Independent Assortment says that the traits can segregate independently of different characters during gamete formation.

Sex determination

The process of determining the sex of an individual, based on the composition of the genetic material is called sex determination. In different animals, sex of an embryo is determined by different factors.

In humans, sex determination happens on the basis of the presence or absence of Y chromosome. XX is female and XY is male

An ovum always contains X chromosome. An ovum, upon fusion with Y chromosome containing sperm, gives rise to a male child and upon fusion with X containing sperm gives rise to a girl child.

Multiple choice questions

1. ___ is the observable set of characteristics of an organism

    a. Phenotype
    b. Genes
    c. DNA
    d. All of the above

2. Which of the following statements is incorrect?

    a. Gene is a sequence of nucleotides
    b. During the process of gene expression, DNA is first copied into RNA
    c. Genes can acquire mutations in their sequence
    d. Genes cannot acquire mutations in their sequence

3. The process where characteristics are transmitted from parent to offspring is called:
   a. Variation
   b. Heredity
   c. Gene
   d. Allele

4. Which of the following statement is incorrect?

   (a) For every hormone there is a gene.
   (b) For every protein there is a gene.
   (c) For production of every enzyme there is a gene.
   (d) For every molecule of fat there is a gene

5. If a round, green seeded pea plant (RR yy) is crossed with wrinkled, yellow seeded pea plant (rr YY), the seeds produced in F1 generation are
   (a) round and yellow
   (b) round and green
   (c) wrinkled and green
   (d) wrinkled and yellow

6. A zygote which has an X-chromosome inherited from the father will develop into a
   (a) boy
   (b) girl
   (c) X- chromosome does not determine the sex of a child
   (d) either boy or girl

7. Two pea plants one with round green seeds (RRyy) and another with wrinkled yellow (rrYY) seeds produce F_1 progeny that have round, yellow (RrYy) seeds. When F_1 plants are selfed, the F_2 progeny will have new combination of characters. Choose the new combination from the following:
   (i) Round, yellow, (ii) Round, green
   (iii) Wrinkled, yellow (iv) Wrinkled, green
(a) (i) and (ii)
(b) (i) and (iv)
(c) (ii) and (iii)
(d) (i) and (iii)

8. In peas, a pure tall plant (TT) is crossed with a short plant (tt). The ratio of pure tall plants to short plants in F_2 is

   (a) 1 : 3
   (b) 3 : 1

(c) 1 : 1
(d) 2 : 1

9. Independent inheritance of two separate traits, shape and colour of seeds in Mendel's cross on pea plants resulted in a observable ratio of:

(a) 3 : 1
(b) 9 : 3 : 3 : 1
(c) 1 : 1
(d) 9 : 4 : 2 : 1

10. A Mendialian experiment consisted of breeding of tall pea plants bearing violet flowers with short pea plants bearing white flowers. The progeny all bore violet flowers but almost half of it were short. This suggests that the genetic makeup of tall parent can be depicted as:

A) TTWW
B) TTww
C) TtWW
D) TtWw

11. The number of sex chromosomes in zygote of human is_____.

A) 1
B) 2
C) 3
D) 4

12. Which of the following is totally impossible outcome of Mendel's Experiment?

A) 3 tall 1 short
B) 24 tall 8 short
C) 8 tall 0 short
D) 4 tall 1 medium height-

13. Which section of DNA provides information for one protein?

A) Nucleus
B) Trait
C) chromosome
D) gene

14. A character which is expressed in hybrid is _____.

A. Dominant
B. Recessive
C. Co-dominant
D. Epistatic

15. The exchange in genetic material takes place in _____.
A) Vegetative propagation
B) Asexual reproduction
C) sexual reproduction
D) budding

16. The maleness of a child is determined by ___.
A) X chromosome in zygote
B) Y chromosome in zygote
C) The cytoplasm of germ cells which determines the sex
D) Sex is determined by chance

17. If a normal cell of human body contains 46 pairs of chromosomes then the numbers of chromosomes in a sex cell of a human being is most likely to be:
(a) 60
(b) 23
(c) 22
(d) 40

18. What will be the number of chromosomes present in each gamete produced by the plants if the palisade cells of a species of plant contain 28 chromosomes in all?
(a) 56
(b) 28
(c) 14
(d) 4

19. The following results were obtained by a scientist who crossed the F_1 generation of pure-breeding parents for round and wrinkled seeds.

Dominants trait	Recessive trait	No. of F_2 offspring
Round seeds	Wrinkled seeds	7524

From these results, it can be concluded that the actual number of round seeds he obtained was:
(a) 1881
(b) 22572
(c) 2508
(d) 5643.

20. Which of the following determines the sex of a child?
(a) The length of the mother's pregnancy
(b) The length of time between ovulation and copulation
(c) The presence of an X chromosome in an ovum
(d) The presence of a Y chromosome in a sperm

21.Assertion (A) and Reason (R) type questions.
Following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is not the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

I. Assertion(A) : Variations are seen in offspring produced by sexual and asexual reproduction.
Reason (R) : DNA molecule generated by replication is not exactly identical to original DNA.

II. Assertion : When pea plants (pure line) having round yellow seeds are crossed with pure line plants having wrinkled green seeds, then all pea plants obtained in F1, generation bear wrinkled green seeds.
Reason: Round and yellow seeds are dominant to wrinkled and green seeds.

III. Assertion :Selfing of a plant for several generations helps plant breeders to obtain pure breeding varieties.
Reason: Pure breeding plants are heterozygous for many traits.

Very short answer type questions (1 Mark)

1.Name the information source for making proteins in the cells.

2. Differentiate between dominant and recessive traits.

3.Who is known as father of genetics?

4.What is meant by contrasting traits or characters?

Short Answer Type Questions [2 marks]

5.How do Mendel's experiments show that traits may be dominant or recessive?

6. A man with blood group A marries a woman with blood group O and their daughter has blood group O. Is this information enough to tell you which of

the traits − blood group A or O − is dominant? Why or why not?

7. How do Mendel's experiments show that traits are inherited independently?

8. How is the equal genetic contribution of male and female parents ensured in the progeny? Explain

9. What are monohybrid and dihybrid cross? Give one example of each.

10. The chromosome number of the sexually reproducing parents and their offspring is same."" Justify the statement.

11. Genes controls traits ' . Explain this statement with an example.

12. What is DNA copying? State its importance.

13. Differentiate between phenotype and genotype?

Short Answer Type Questions [3 marks]

14. A green stemmed rose plant denoted by GG and a brown stemmed rose plant denoted by gg are allowed to undergo a cross with each other.
(a) List your observations regarding:
(i) Colour of stem in their F1 progeny
(ii) Percentage of brown stemmed plants in F2 progeny if F1 plants are self pollinated.
(iii) Ratio of GG and Gg in the F2 progeny.
(b) Based on the finding of this cross, what conclusion can be drawn?

15. A blue colour flower plant denoted by BB is cross bred with that of white colour flower plant denoted by bb.
(a) State the colour of flower you would expect in their F_1 generation plants.
(b) What must be the percentage of white flower plants in F_2 generation if flowers of F1 plants are self-pollinated?
(c) State the expected ratio of the genotypes BB and Bb in the F_2 progeny.

16. With the help of a flow chart explain in brief how the sex of a newborn is genetically determined in human beings. Which of the two parents, the mother or the father, is responsible for determination of sex of a child?

17. What is variation? How is variation created in a population? What is the importance of variation for survival of a species?

18. Define the following terms.
a. Heredity , b. **Gene** , c. **Alleles**

Long Answer Type Questions [5 Marks]

19.(a) Why did Mendel choose garden pea for his experiments? Write two reasons.

b) 'Different species use different strategies to determine sex of a newborn individual. It can be environmental cues or genetically determined.' Explain the statement by giving example for each strategy.

20. If we cross pure-bred tall (dominant) pea plant with pure-bred dwarf (recessive) pea plant we will get pea plants of F_1 generation. If we now self-cross the pea plant of F_1 generation, then we obtain pea plants of F_2 generation.

(a) What do the plants of F_2 generation look like?

(b) State the ratio of tall plants to dwarf plants in F_2 generation.

(c) State the type of plants not found in F_2 generation but appeared in F_2 generation, mentioning the reason for the same.

(d) State Mendel**'s** laws of **inheritance.**

Case Study questions

21.Read the following and answer any four questions from (i) to (v)

.Pea plants can have smooth seeds or wrinkled seeds. One of the phenotypes is completely dominant over the other. A farmer decides to pollinate one flower of a plant with smooth seeds using pollen from plant with wrinkled seeds. The resulting pea pod has all smooth seeds.

(1) Which of the following conclusions can be drawn?

(i) The allele for smooth seeds is dominated over that of wrinkled seeds.

(ii) The plant with smooth seeds is heterozygous.

(iii) The plant with wrinkled seeds is homozygous.

(a) 1 only

(b) 1 and 2 only

(c) 1 and 3 only

(d) 1, 2 and 3

(ii) Which of the following crosses will give smooth and wrinkled seeds in same proportion?

(a) RR X rr

(b) Rr X rr

(C) RRX Rr

(d) rr X rr

(iii) On crossing of two heterozygous smooth seeded plants (Rr), a total of 1000 plants were obtained in F_1 generation. What will be the respective number of smooth and wrinkled seeds obtained in F_1 generation

(a) 750, 250

(b) 500, 500
(C) 800, 200
(d) 950, 50

(iv)The characters which appear in the first filial generation are called
(a) recessive characters
(b) dominant characters
(c) lethal character
(d) non-mendelian characters.

(v) Which of the following crosses will give 100% smooth seeds ?
(a) RR X rr
(b) Rr X rr
(c) RrX Rr
(d) rr X rr

CASE STUDY

22. Read the passage and answer the given five questions

Pea plant is also tiny, easy to grow, and produces a big number of offspring. Pea plants can have tall plants or dwarf plants. One of the phenotypes is completely dominant over the other. A farmer decides to pollinate one flower of a tall plant with using pollen from plant with dwarf plant. The resulting pea pod has all tall plants.

1. Which of the following conclusions can be drawn?
(1) The allele for tallness is dominated over that of dwarfness.
(2) The plant with tallness is heterozygous.
(3) The plant with dwarfness is homozygous.
A. 1 only
B.1 and 2 only
C. 1 and 3 only
D. 1, 2 and 3.

2. Which of the following crosses will give tall and dwarf plants in same proportion?
A. TT x tt
B. Tt x tt
C. TT x Tt
D.tt x tt

3. Which of the following cross can be used to determine the genotype of a plant with dominant phenotype?
A. TTXTT
B. Tt x Tt
C. Tt x TT
D. Tt x tt

4. State the ratio of tall plant to dwarf plants in F_2 genertion.

A. 2:2,

B.1:3

C.3:1,

D.4:0

5. The characters which does not appear in the first filial generation are called

A. Recessive characters

B. Dominant characters

C. Lethal characters

D. Non-mendelian characters.

ANSWERS –MCQ

MCQ 1. A 2.D 3.B 4.D 5.A 6.B 7.B 8. C 9.B 10.C

11. B 12. D 13.D 14. A 15.C 16. B 17. B 18.C 19.D 20.D

Assertion (A) and Reason (R). 21. I.A, II.D, III.C

Very short answer type questions (1 Mark)

1.Cellular DNA is the information source for making proteins in cells.

2. The character which gets expressed in the presence of its contrasting form is termed as dominant trait.

The trait which remains unexpressed in the presence of its contrasting form is called recessive trait.

3. Gregor Johann Mendel .

4. The characters which always appear in two opposing conditions are called contrasting characters. Tall and dwarf are two contrasting traits for the plant height.

Short Answer Type Questions [2 marks]

5. Mendel conducted a Monohybrid cross(crossed pure tall pea plants with pure dwarf pea plants) he observed only tall pea plants in the F1 generation, but on self crossing of the F1 progeny, both tall and dwarf pea plants were observed in F2 generation in the ratio 3: 1. Appearance of tall character in F1 and F2 generations shows tallness to be a dominant character. But absence of dwarf character in F1 and its reappearance in F2 confirms that dwarfness is recessive character.

6. The give information is not enough to tell us which of the traits – blood

group A or O – is dominant. In blood heredity, blood Type A is always dominant and blood Type O is always recessive.

Here, father's Blood group can be AA (homozygous) or AO (heterozygous) genotypically, where as that of mother can only be OO. For daughter to be born with blood group O, she must receive O type gene one each from father and mother. For this father must have heterozygous AO blood group and mother must have homozygous blood group OO.

7. Mendel performed an experiments in which he took a tall plant with round seeds and a short plant with wrinkled-seeds. In F1, They were all tall and had round seeds. Tallness and round seeds were thus dominant traits. When, he used these F1 progeny to generate F2 progeny by self-pollination, he found that some F2 progeny were tall plants with round seeds, and some were short plants with wrinkled seeds. At the same time there tall plants, but had wrinkled seeds, while others were short, but had round seeds. Thus,Mendel's experiments show that the tall/short trait and the round seed/wrinkled seed trait are independently inherited.
8. During sexual reproduction, a female gamete or egg cell fuses with a male gamete or sperm cell which are haploid to form zygote. Zygote is diploid which contains 23 chromosomes from mother and 23 from father. In this way, an equal genetic contribution of male and female parents is ensured in the progeny.
9. Monohybrid cross- This is the simplest cross in which only one character's inheritance is investigated. A cross is created by crossing two plants with one contrasting characteristic, such as tall or dwarf.

Dihybrid cross- A dihybrid cross is a cross between two plants with two sets of opposing characters. Round and green seed, for example, crossed with yellow and wrinkled seed.

10. In sexually reproducing organisms, male and female gametes /reproductive cells with only half the number of chromosomes (as in the parent cell) are produced. during fertilization, when male and female gametes fuse to give to a zygote, original number of chromosomes are restored.
11. Genes controls traits by synthesizing the specific enzyme. Plant height depends on the amount of a particular plant hormone. The amount of plant hormone made will depends on enzyme. If enzyme work efficiently the plant will be tall. if the gene for that enzyme has an alteration that makes enzyme less efficient, the amount of hormone will be less and plant will be short.
12. DNA copying is the process of producing two identical replicas from one original DNA molecule during cell division.

DNA is necessary to make all the RNA and proteins needed for cells to carry out necessary reactions and cellular processes in order to survive.

13. **Genotype** – It is the complete heritable genetic identity of an organism. It is the set of alleles that are carried by the organism. It also includes non-expressed alleles.

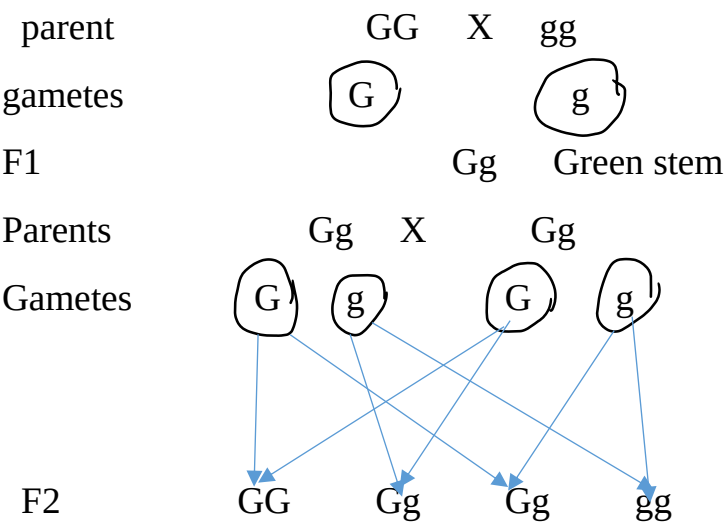
Phenotype – It is the description of the actual physical characteristics of an organism or the expressed form of the genotype.

Short Answer Type Questions [3 Marks]

14. Ans. (a) (i) Colour of the stem in F1 progeny: All green

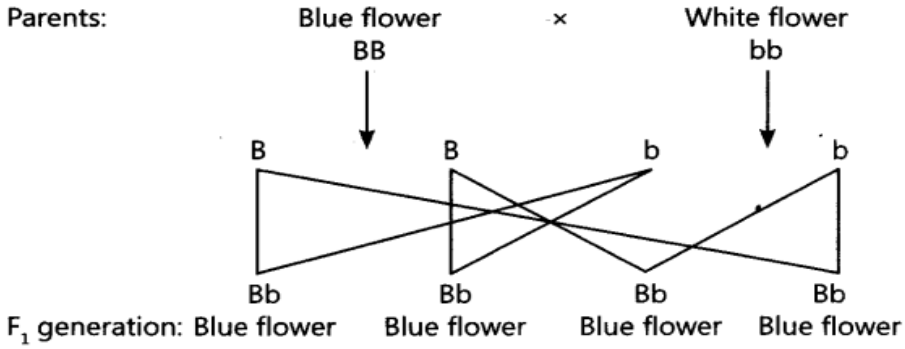
(ii) Percentage of brown stem: 25 %

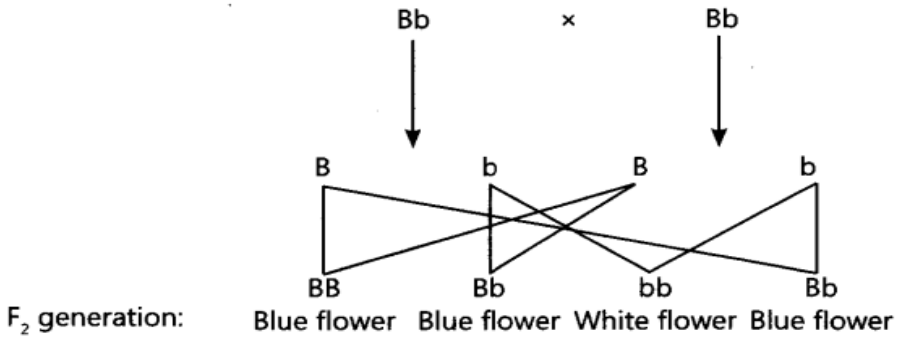
((iii) GG: Gg is 1: 2



(b) Based on the above cross, it can be concluded that green colour is dominant and get expressed in F1 generation. The brown stem, which does not get express itself in the F1 generation, is the recessive character.

15.

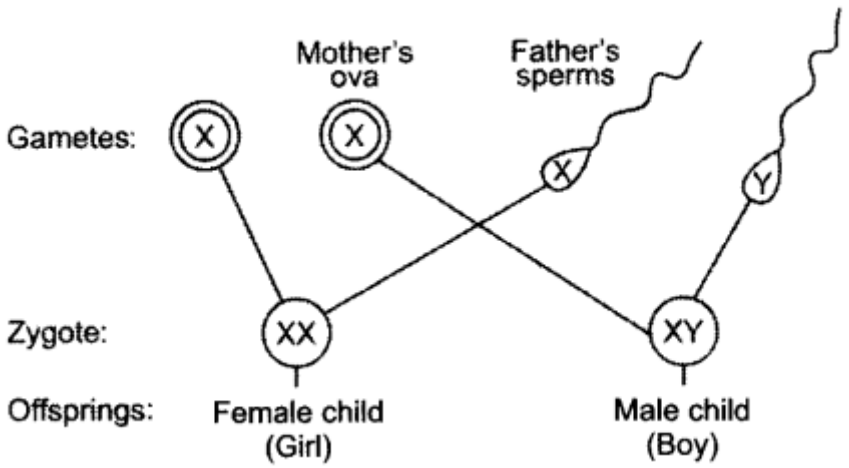




(*a*) The colour of all the flowers in F_1 generation will be blue.
(*b*) Percentage of white flower plants in F_2 generation will be 25.
(*c*) The ratio of genotype BB and Bb in F_2 progeny will be 1 : 2.

16. In human beings, the sex of the individual is genetically determined. Sex chromosome of male is XY and of female is XX. Sex of a child depends on what happens at fertilisation.

The woman produces eggs having X chromosome while the man produces 50% sperms having X chromosome and 50% sperms having Y chromosome. Man therefore,actually determines the sex of the new born baby.



17.The differences in the traits shown by the individuals of a species and also by the offsprings (siblings) of the same parents are referred to as variation. New variation may arise during the process of DNA copying that already has variations accumulated from previous generations.
Species having suitable variations have more chance of survival if there is change in environmental conditions.

18 **.Heredity** – Transmission of characters from one generation to another or from parents to offspring.

Gene – It is the basic unit of inheritance. It consists of a sequence of DNA, which is the genetic material. Genes can mutate and can take two or more alternative forms.

Alleles – The alternative forms of genes. They affect the same characteristics or traits in alternate forms. They are located on the same place of the chromosome.

Long answer type questions

19. Ans. (a) Reasons:

(i) Pea plant is small and easy to grow.

(ii) A large number of true breeding varieties of pea plant are available.

(iii) Both self and cross-pollination can be made possible. Because this plant has a short life cycle, the results may be gathered and evaluated more quickly.

(iv)The garden pea possesses a number of features that are diametrically opposed to one another.

b) Environmental Cue: (i) In some animals, the temperature at which fertilised

eggs are kept determines whether the developing animal in egg is male or female.

(ii) In some animals like snail, individual can change sex.

Genetical Cue: A child who inherits an X-chromosome from her father will be a girl and one who inherits a Y- chromosome from the father will be a boy.

20. a)All plants of F_1 generation will be tall plants.

(b) 3:1

(c) Dwarf trait is recessive trait which was not expressed in the F_1 generation,

the recessive trait gets expressed in the F_2 generation after self pollination.

d. Laws of Mendel

- Law of Dominance says that a gene has two contrasting alleles and one always expresses itself in the organism.
- Law of Segregation says that traits get segregated completely during the formation of gametes without any mixing of alleles.
- Law of Independent Assortment says that the traits can segregate independently of different characters during gamete formation.

21.**Case study questions**

1.(c) 1 and 3 only

2.(b) Rr x rr

3.(a) 750, 250

4.(b) dominant characters

5.(a) RR x rr

22.1.D 1,2&3

2. B .Tt x tt

3.D.Ttxtt

4.C.3:1

5.A. Recessive characters.

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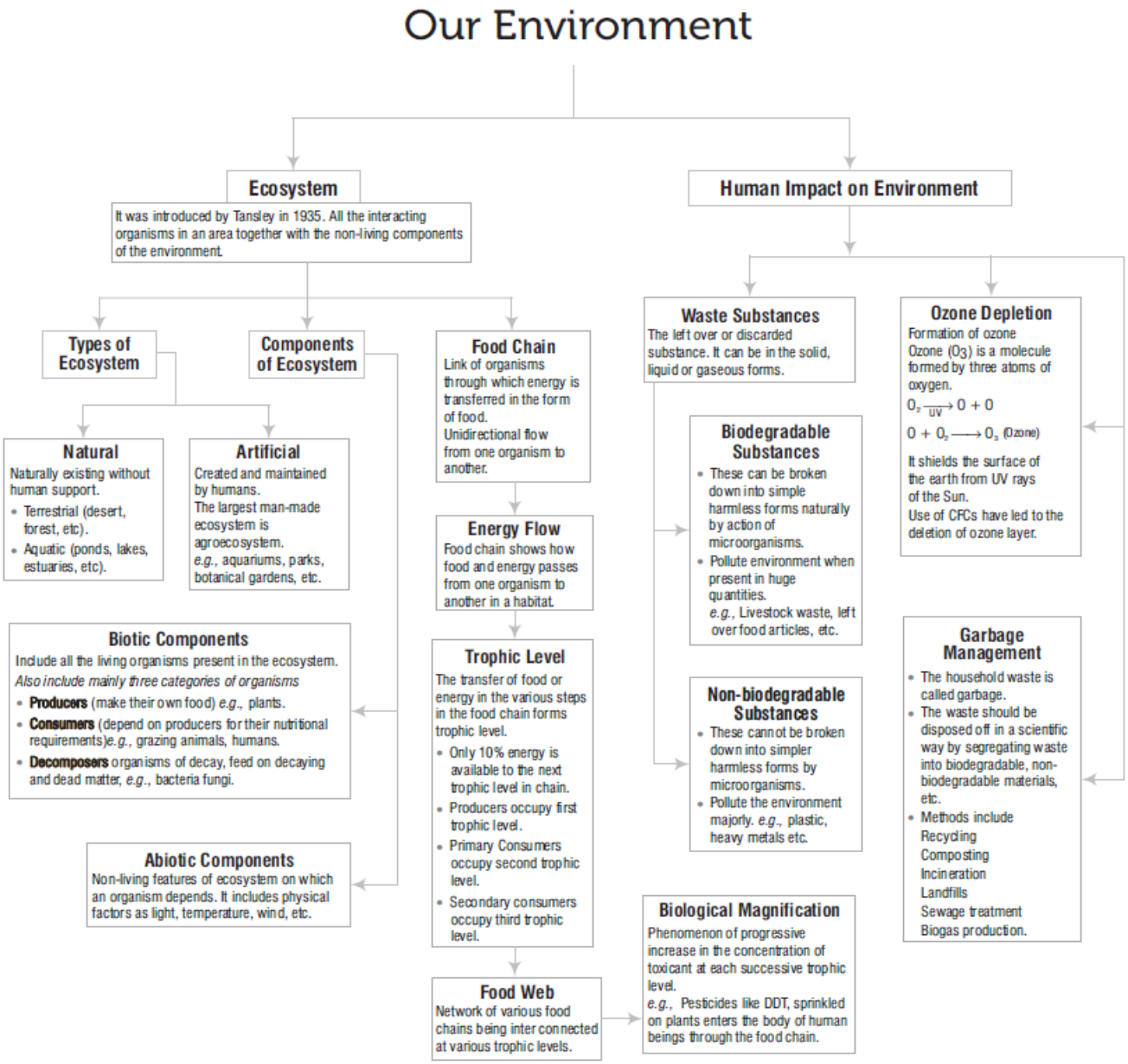
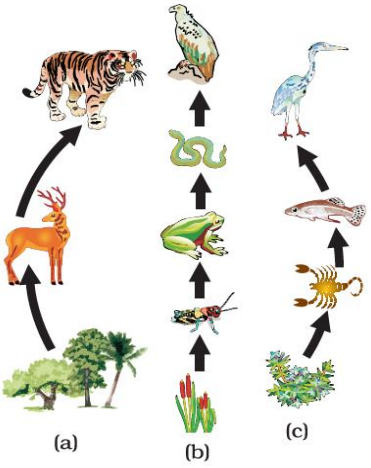
CHAPTER 15 OUR ENVIRONMENT

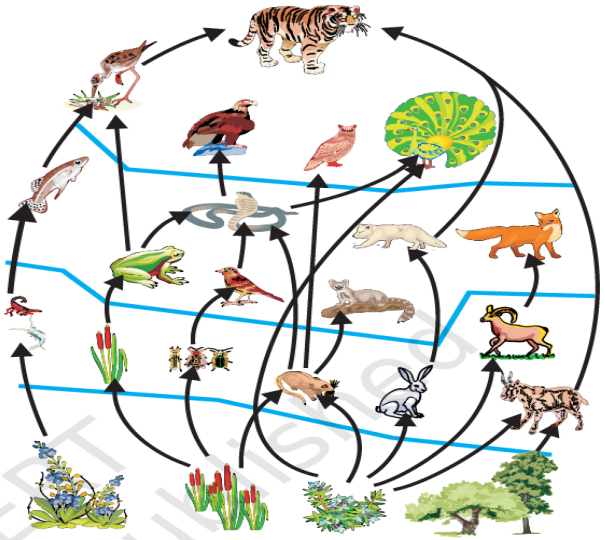
MIND MAP



IMPORTANT DIAGRAM



Food chain in nature (a) in forest, (b) in grassland and (c) in a pond



Food web, consisting of many food chains

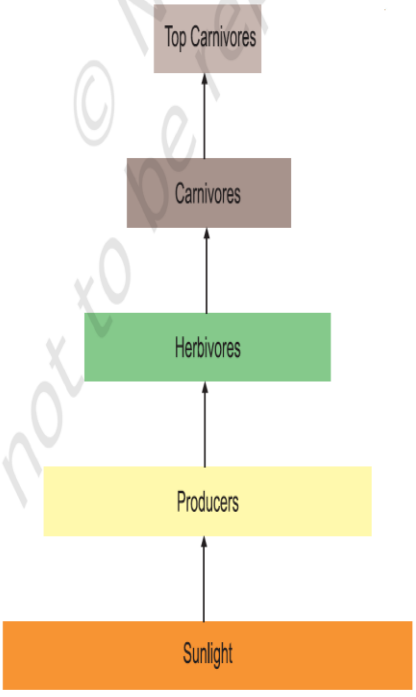
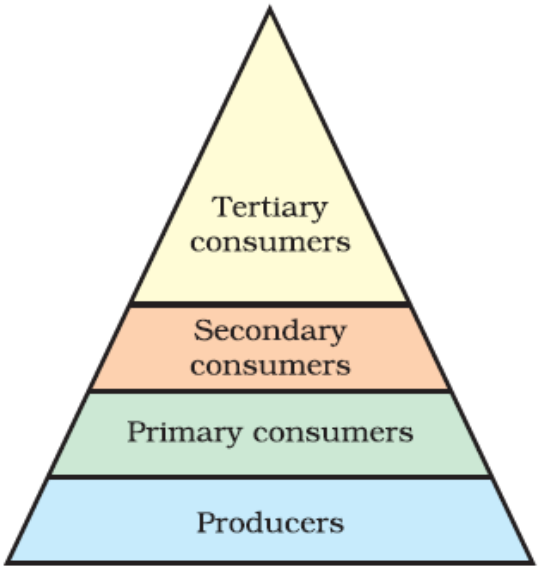


Diagram showing flow of energy in an ecosystem



Trophic levels

FOCAL POINTS

Environment

Environment means anything that surrounds us. It can be living (biotic) or non-living (abiotic) things. It includes physical, chemical and other natural factors. In the environment there are different interactions between animals, plants, soil, water, and other living and non-living things.

Ecosystem

All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem. On the basis of nature, ecosystems may be classified as

- Natural ecosystem: - They are naturally formed ecosystems like forests, deserts, grasslands, mountains, ponds, lakes, rivers, oceans etc.

- Artificial ecosystem: -They are manmade ecosystems like gardens, parks, crop fields, aquarium, zoo etc.

Components of an ecosystem:

Biotic components comprise of living organisms like plants, animals and microorganisms. They consist of producers, consumers and decomposers.

- Producers are autotrophy, Phytoplankton, Algae, Green plants which produce food by photosynthesis.
- Consumers are organisms which depend on producers directly or indirectly for food.
- Herbivores which get their food directly from plants (e.g.: Rabbit)
- Carnivores are animals that feed on other animals (e.g. :Lion)
- Omnivores are animals that feed on plants and other animals.(e.g. Cockroach)
- Decomposers are microorganisms like Bacteria or Fungi which decompose dead organic matter. They convert complex organic substances into simple inorganic substances in the soil which are absorbed by plants.

Abiotic components comprise of non-living physical factors like air, water, soil, minerals, sunlight, temperature, wind etc.

Foodchain:

A food chain is the flow of food energy from producers to consumers of different trophic levels by eating and being eaten. In a food chain an organism gets food from one group of organisms.

Food chain E.g.:-

Grass ----------→ Deer ----------→Tiger

(Producer) (Primary consumer) (Secondary consumer)

Phytoplankton-----→small fish-------→L a r g e f i s h - - - -→Crane

(Producer) (Primary Consumer) (Secondary Consumer) (Tertiary consumer)

Grass-----→ grass hopper----------→ Frog ----------→Snake ----------→Hawk

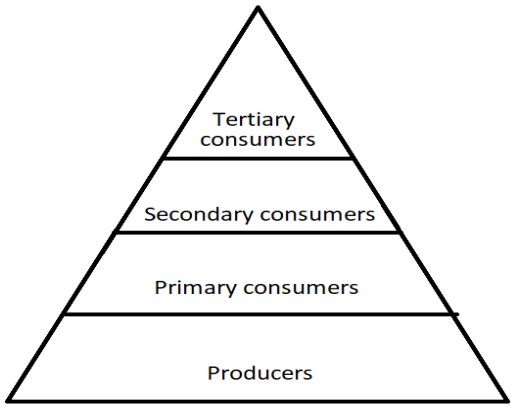
(Producer) (Primary Consumer) (Secondary Consumer) (Tertiary Consumer) (Quaternary Consumer)

Food web

- Food web is a group of several interconnected food chains.
- It shows the interrelationship between organisms based on food.
- In a food web an organism gets food from more than one group of organisms.

Trophic Levels

- Based on the source of nutrition or food, organisms occupy a specific place in food chain is called trophic level.
- Since the transfer of food energy decreases as we move from producers to consumers at different trophic levels, the number of trophic levels in a food chain are limited and they do not exceed four or five.

Fourth trophic level-tertiary consumers	
Third trophic level- secondary consumers	
Second trophic level-primary consumers	
First trophic level- producers	TROPHIC LEVELS

<u>Energy flow in trophic levels</u>:

- Producers absorb about 1% of solar energy (light energy) falling on them and stores it as food energy (chemical energy) during photosynthesis.
- During the transfer of food energy from one trophic level to the next, 90% of the energy is lost to the environment and only 10% is transferred to the next trophic level. So, there is a decrease in the amount of food energy transferred at every trophic level by 10%.This is known as the 10% law.
- Flow of energy is unidirectional.

Grass----→ grass hopper---------→Frog ----------→Snake ----------→Hawk

(6000 KJ) (600 KJ) (60 KJ) (6 KJ) (0.6 KJ)

<u>Biological magnification (Biomagnification)</u> :

- The increased concentration of toxicants at successive trophic levelsis called Biological magnification.
- Chemicals like insecticides and pesticides which are used to protect crops from insects and pests are absorbed by plants and enter the food chain. All these chemicals are non-biodegradable. So, it cannot be metabolized by green plants.

So, they get accumulated progressively at every trophic level and their concentration increases at higher trophic levels.

Human activities affecting the environment:

Depletion of ozone layer

Ozone molecule contains three oxygen atoms (O3). At higher levels in the atmosphere (stratosphere) the UV radiation splits some oxygen molecules (O2) into free oxygen atoms which combine with oxygen molecules (O2) to form ozone.

UV radiation

$O_2 \xrightarrow{\text{UV radiation}} O + O$

$O_2 + O \longrightarrow O_3$ (ozone)

The ozone layer present in the higher layer of the atmosphere protects the earth from the harmful UV radiation from the sun.

Reason for ozone layer depletion:

The ozone layer is being damaged by the use of chemicals like chlorofluoro carbons (CFCs) used in refrigerators and fire extinguishers.

$O_3 \xrightarrow{Cl} O_2 + O$

The chlorine atoms found in CFC acts as a catalyst in the conversion of ozone to oxygen molecule and nascent oxygen.

Effects

- UV radiation causes skin cancer in humans.
- Damage of eyes causing eye disease called cataract.

Prevention

In 1987, the United Nations Environment Programme (UNEP) succeeded in forging an agreement to freeze CFC production at 1986 levels.

Steps adopted to minimize the CFC production are -

- Reduce the use of CFC in refrigerators and air coolants.
- Use alternatives to CFC which are less harmful.

Managing the garbage

- Garbage can be biodegradable and non-biodegradable. Garbage causes pollution of air, water and soil. So, it should be disposed properly.
- Biodegradable Garbage are materials which can be easily decomposed by microbes. E.g. Plant refuse, Animal refuse
- Non biodegradable Garbage are materials which cannot be decomposed by microbes E.g. Plastics, DDT (and certain pesticides)
- Some methods of Garbage disposals are: - Landfills, Recycling, Production of biogas and manure, Preparation of compost, Incineration, Sewage treatment.

I. MULTILE CHOICE QUESTIONS

1. In a given food chain if the amount of energy at the fourth trophic level is 6 kJ, what will be the energy available at the producer level?

(a) 6000 kJ (b) 20 kJ (c) 60 kJ (d) 600 kJ

2. Which of the following is biodegradable waste ?

(a) DDT (b) Aluminium can (c) Plastic bag (d) Cow dung

3. Which of the following is the best way for disposal of vegetable and fruit peels?

(a) Landfill (b) Recycling (c) Composting (d) Burning

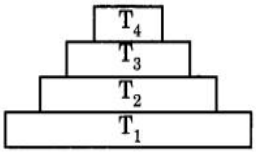
4. Accumulation of non-biodegradable pesticides in the food chain in increasing amount at each higher trophic level is known as:

(a) Eutrophication (b) Pollution
(c) Biomagnifications (d) Accumulation

5. In an ecosystem, the 10% of energy available for transfer from one trophic level to the next is in the form of :

(a) heat energy (b) light energy
(c) chemical energy (d) mechanical energy

6. In the given Figure the various trophic levels are shown in a pyramid. At which trophic level is maximum energy available?



(a) T_4 (b) T_2 (c) T_1 (d) T_3

7. Which of the statements is incorrect?
(a) All green plants and blue green algae are producers
(b) Green plants get their food from organic compounds
(c) Producers prepare their own food from inorganic compounds
(d) Plants convert solar energy into chemical energy

8. What will happen if Deer is missing in the food chain given below?
Grass → Deer → Tiger
(a) The population of tiger increases
(b) The population of grass decreases
(c) Tiger will start eating grass
(d) The population of tiger decreases and the population of grass increases

9. When is the World Environment Day celebrated?
(a) 16 June (b) 5 December (c) 5 June (d) 5 July

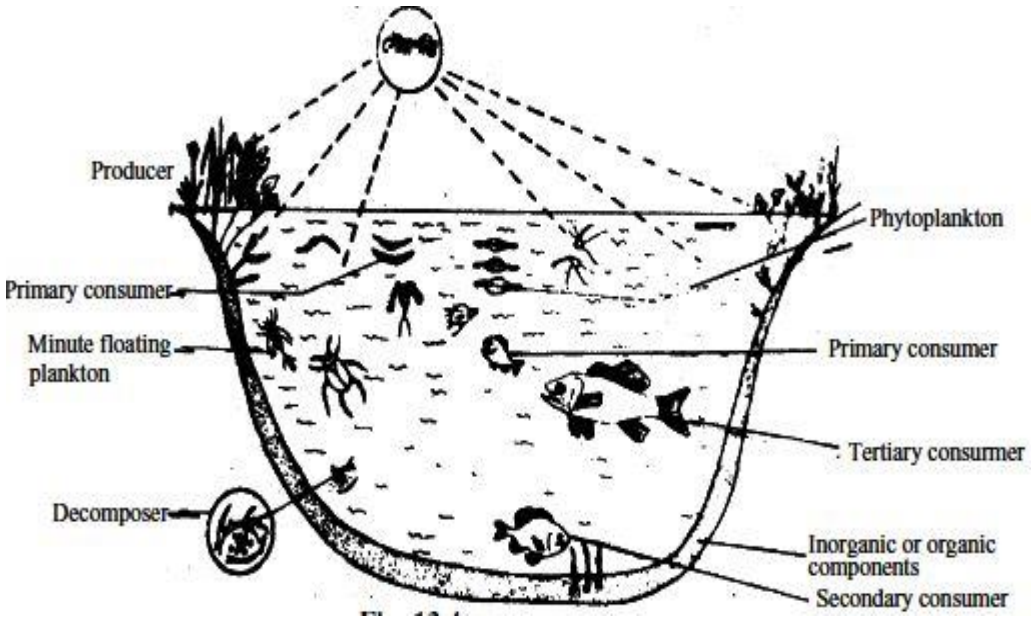
10. Which of these is a greenhouse gas?
(a) Hydrogen Sulphide (b) Methane
(c) Ozone (d) Carbon monoxide

11. The transfer of Energy in a food chain is always:
(a) Unidirectional (b) Methane
(c) Bi-directional (d) Random

12. **If a grasshopper is eaten by frog, then the energy transfer will be from:**
(a) producers to decomposers
(b) producer to primary consumer
(c) primary consumer to secondary consumer
(d) secondary consumer to primary consumer

13. **The % of solar radiation absorbed by all green plants for photosynthesis is about ————.**
(a) 1% (b) 5% (c) 8% (d) 10%

14. Study the image given below and answer the following questions.



A. Which among the following are the Primary Producers?

(a) Algae
(b) Phytoplankton
(c) Algae and phytoplankton
(d) Green plants

B. Which group of organisms may have higher Bio-magnification?

(a)Producers
(b) Primary consumers
(c) Secondary Consumer
(d) Tertiary consumers

C. Which is the Primary source of energy in an ecosystem?

(a) Soil
(b) Water
(c) Sun
(d) Carbon dioxide

D. The image given above is an example of

(a) Aquatic ecosystem

(a) Terrestrial ecosystem
(b) Land ecosystem
(c) Natural aquatic ecosystem

15. In 1987 the ---------- Succeeded in forging an agreement to freeze CFC Production

(a) UNESCO
(b) UNEP
(c) UNCTED
(d) UNICEF

16. O2---------UV---------→O+O

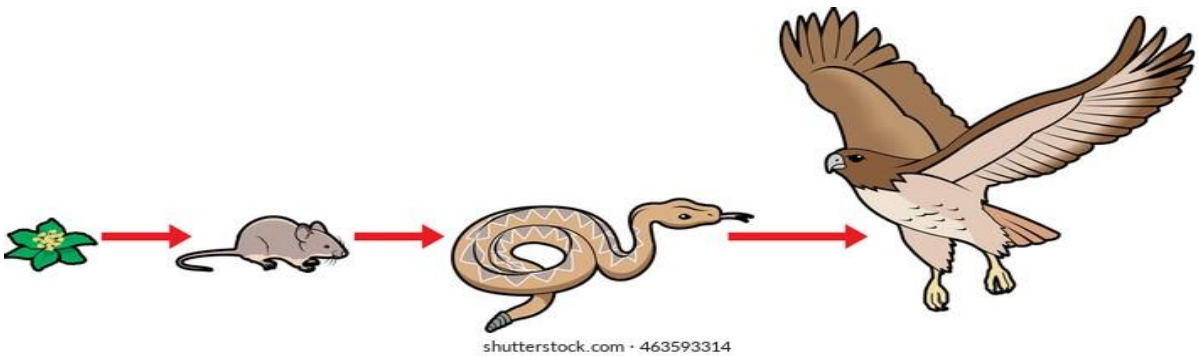
O+O2---------→O3 (Ozone) The role of UV rays in this reaction is ----------

(a) To Split Oxygen molecule
(b) To unite oxygen molecule
(c) To Destroy Ozone
(d) None

17. O3---------???---------→ O2 + (O+O) which substance catalyzes the reaction?

(a) Chlorine
(b) Sulphurdioxide
(c) Hydrogen sulphide
(d) Neon

18. Study the image and answer the questions given below.



(10000 KJ) **(1000 KJ)** --------- **????**

A. Find out the energy available to the bird :

(a) 100KJ

(b) 10 KJ
(c) 1KJ
(d) . 5KJ

B. Which trophic level may have higher Biological Magnification :
(a) Grass
(b) Snake
(c) Bird
(d) Rabbit

C. What may happen if all the Rabbits disappear from the ecosystem :
(a) Bird population declines
(b) Snake population declines
(c) Bird and snake population declines
(d) Bird and snake population declines and grass grow abundant

D. Which of the following chemicals cause Biological Magnification :
(a) DDT
(b) BHC
(c) All non biodegradable pesticides and chemicals
(d) Plastics

19. **Which group of waste materials can be classified as non-biodegradable ?**

(a) Plant waste, used tea bags
(b) Polyethene bags, plastic toys
(c) Used tea bags, paper straw
(d) Old clothes, broken footwear

20. **Environment includes:**

(a) Land, air, water
(b) Light, temperature, rainfall
(c) Plants, animals, microbes
(d) All of these

II. ASSERTION REASON TYPE OF QUESTIONS

(a) If both Assertion and reason are true and Reason is the correct explanation of assertion

(b) If both Assertion and Reason are true but Reason is not a correct explanation of the Assertion

(c) If Assertion is true but the Reason is false

(d) If both Assertion and Reason are false

1. **Assertion:** Polythene bags and plastic containers are non-biodegradable substances.

Reason: They can be broken down by microorganisms in natural simple harmless substances

2. Assertion - Each step or level of the food chain forms a trophic level

Reason - Autotrophs or producers are the first trophic level in the ecosystem

3. Assertion - Green plants harvest the solar energy directly and convert light energy into chemical energy

Reason - Food transfer in the ecosystem takes place through food chain and food web

4. Assertion - The length and complexity of food chain vary greatly in an ecosystem

Reason - There is a reduction of energy when it transfers from one trophic level to other by eating and being eaten

5. Assertion - There is generally greater number of individuals at the lower trophic levels of an ecosystem

Reason - Green plants are the producers in an ecosystem

6. Assertion - Ozone is formed by three atoms of oxygen

Reason - UV rays are needed to form ozone molecule

7. Assertion – Substances that are broken down by biological process are said to be Biodegradable

Reason- Some Pesticides and chemicals are Non- biodegradable

8. Assertion - More and more things we use becoming disposable, changes in packaging have resulted in much of our waste becoming Non-biodegradable

Reason - Biodegradable materials are environment friendly and easily degraded by the microbes in nature

9. Assertion-Enzymes are very essential for digestion of food materials in our body. Specific enzymes are needed for the breakdown of a particular substance

Reason - We will not get energy if we try to eat coal

10. Assertion - Water, soil, temperature, light, minerals are the abiotic factors in the ecosystem

Reason - Biotic factors interact with abiotic factors in an ecosystem to sustain

11. Assertion - Ozone layer is seen at the Stratosphere of atmosphere, which is harmful to plants and animals.

Reason - The Ozone layer that is found in the troposphere of atmosphere is good to the plants and animals

12. Assertion - A sparrow when feeds on seeds, it is a primary consumer, but when it feeds on an insect, it belongs to secondary consumer.

Reason - The ecological pyramids (trophic levels) are not always reliable

13. Assertion - Only the green plants can prepare their own food by means of photosynthesis

Reason - Some Bacteria derive their nutrition by autotrophic means

14. Assertion - Forests, Grass lands, Rivers, Meadows, Estuaries are natural ecosystems

Reason - Artificial ecosystems are manmade ecosystems

15. Assertion - In Sea waters the number of Primary Producers is more than that of Primary consumers

Reason - In Sea water the Primary consumers are more than that of Primary Producers

III. CASE STUDY QUESTIONS

POLLUTION OF RIVER GANGA

The belief the Ganga River is "holy" has not, however, prevented over-use, abuse and pollution of the river. All the towns along its length contribute to the pollution load. It has been assessed that more than 80 per cent of the total pollution load (in terms of organic pollution expressed as biochemical oxygen demand (BOD)) arises from domestic sources, i.e., from the settlements along the river course. Due to over-abstraction of water for irrigation in the upper regions of the river, the dry weather flow has been reduced to a trickle.

Rampant deforestation in the last few decades, resulting in topsoil erosion in the catchment area, has increased silt deposits which, in turn, raise the river bed and lead to devastating floods in the rainy season and stagnant flow in the dry season. Along the main river course there are 25 towns with a population of more than 100,000 and about another 23 towns with populations above 50,000. In addition, there are 50 smaller towns with populations above 20,000. There are also about 100 identified major industries located directly on the river, of which 68 are considered as grossly polluting. Fifty-five of these industrial units have complied with the regulations and installed effluent treatment plants (ETPs) and legal proceedings are in progress for the remaining units. The natural assimilative capacity of the river is severely stressed. The principal sources of pollution of the Ganga River can be characterized as follows:

• Domestic and industrial wastes. It has been estimated that about 1.4 × 106 m3 d-1 of domestic wastewater and 0.26 × 106 m3 d-1 of industrial sewage are going into the river.

• Solid garbage thrown directly into the river.

• Non-point sources of pollution from agricultural run-off containing residues of harmful pesticides and fertilizers.

• Animal carcasses and half-burned and unburned human corpses thrown into the river. • Defecation on the banks by the low-income people.

• Mass bathing and ritualistic practices.

1. Accumulation of toxic substances at higher trophic levels of an ecosystem through the food chain in water bodies affects which of the following organisms more?
   (a) Phytoplankton
   (b) Zooplankton

(c) Small fishes
(d) Large fishes

2. When toxic chemicals and nutrients get deposited in the water bodies, which of the following gases get depleted in the water bodies?
   (a) Oxygen
   (b) Carbon dioxide
   (c) Both oxygen and carbon dioxide
   (d) Nitrogen
3. Which of the following activities may pollute the river water more?
   (a) Bathing using detergent and soap
   (b) Discharging animals excreta
   (c) Deposit flowers and leaves as the part of puja
   (d) Bathing without soap and detergent
   (e)

4. Which of the following organisms grow abundant in water when the water get mixed with nutrients like sulphates, phosphates etc.?

(a) Algae
(b) Zooplankton
(c) Small fishes
(d) Large fishes

5 .Green Algae and Diatoms are the major producers of Aquatic ecosystem .Which of the following will be more in the aquatic ecosystem:

(a) Small fishes
(b) Large fishes
(c) Algae and phytoplankton
(d) Tadpole

6. Phyto plankton (60000kj) ----------→ Zooplankton (6000kj)---→Small fishes (600kj)---→Large fish(----------?????-----). Find out the energy available to large fish.

(a) 60Kj
(b) 6kj
(c) 0.6 Kj
(d) 61Kj

7. The source of Primary energy source to the aquatic organisms is ----------

(a) Algae
(b) Zooplankton
(c) Sun
(d) Moon

8. The harmful metals that get mixed with the water bodies from the industrial units' are :

(a) Iron and copper
(b) Mercury and lead
(c) Sodium and potassium
(d) Magnesium and cobalt

9. The Ganga Action Plan is to ----------

(a) Make Ganga water free from garbage
(b) Minimise the use of soap and detergents in water bodies like Ganga
(c) Make awareness among the people to save Ganga
(d) All the above

10. This will be the best method to protect our River water bodies-

(a) Grow trees along the bank of Rivers
(b) Grow small fishes in River water
(c) Permitted level of sand mining
(d) Making Flats or Malls near the River

IV. Descriptive questions

Short Questions (2M)

1. What is natural and artificial ecosystem? Give one example each
2. Define ecosystem and name its components.
3. What is the full form of CFCs and UNEP?
4. What is the ultimate source of energy in an ecosystem? Which process helps to trap this energy in producers?

5. Define trophic level in a food chain? The first trophic level in a food chain is always a green plant. Why?
6. Food web increases the stability of an ecosystem. Justify.
7. What is food chain? Construct an aquatic food chain showing four trophic levels.
8. List two causes of depletion of ozone layer. Mention any two harmful effects of depletion of this layer.
9. What are decomposers? Write any two consequences of decomposers are removed from the ecosystem?
10. Pesticides like DDT which are sprayed to kill pests on crops are found to be present in the soil, ground water, water bodies etc. Explain. How do they reach these places?
11. List two environment friendly practices or habits which need to be followed by every member of a family or community. Explain how these practices will support the "save the environment" mission.
12. What are the by-products of fertilizer industries? How do they affect the environment?
13. Make a diagrammatic representation showing various trophic levels.

V. Short Questions (3M)

14. Differentiate between biodegradable and non-biodegradable substances with the help of one example each. List two changes in habit that people must adapt to dispose non-biodegradable waste for saving the environment.
15. How is ozone formed in the higher level of the atmosphere? "Damage to ozone layer is a cause of concern". Justify this statement.

16. Explain phenomenon of “biological magnification”. How does it affect organisms belonging to different trophic levels particularly the tertiary consumers?

VI. Long answer Questions (5M)

17. Explain some harmful effects of agricultural practices on the environment.
18. In a food chain, if 10000 Joules of energy is available to the producer, how much energy will be available to the secondary consumer to transfer it to the tertiary consumer?
19. Suggest any four activities in daily life which are eco-friendly.
20. “Energy flow in a food chain is unidirectional”. Justify this statement. Explain how the pesticides enter a food chain and subsequently get into our body.

SOLUTIONS

I. MCQ - ANSWER KEY

1	A	11	A	18-A	B
2	D	12	C	18-B	B
3	C	13	A	18-C	D
4	C	14-A	C	18-D	C
5	C	14-B	D	19	B
6	C	14-C	C	20	D
7	B	14-D	D		

8	D	15	B		
9	C	16	A		
10	B	17	A		

II. ASSERTION AND REASON- ANSWER KEY

1	B	6	A	11	D
2	A	7	A	12	A
3	A	8	A	13	B
4	A	9	A	14	A
5	B	10	A	15	B

III. CASE SUDY QUESTIONS - ANSWER KEY

1	D	6	A
2	C	7	C
3	A	8	B
4	A	9	D
5	A	10	A

IV. DESCRIPTIVE QUESTIONS – ANSWER KEY

1) Natural ecosystem: Self-sustaining ecosystem formed by the interaction of living and non living things in an area. Eg: Forest or pond

   Artificial ecosystem: An ecosystem which is formed or modified by human intervention. Crop field or aquarium.

2) The living and non-living components of an area interact with each other to form an ecosystem. Components of ecosystem are: Biotic (living) and abiotic (non-living)
3) CFC=Chlorofluorocarbons

   UNEP = United Nations Environment Programme

4) Sun is the ultimate source of energy in an ecosystem. Photosynthesis helps to trap this energy in producers.

5) Each step or level of the food chain forms a trophic level. The autotrophs or the producers are the first trophic level. They fix up the solar energy and make it available for the heterotrophs or consumers. The first tropic level in a food chain is always a green plant because only plants can utilize the radiant energy of the sun and transform it to chemical form during photosynthesis.

6) Food web shows food relationship in an ecological community. It consists of many food chains. Thus, if any one organism becomes endangered or extinct, the one dependent in it has an alternative option available to him for survival. In this way food web increases stability in the ecosystem.

7) Food chain is formed by a series of organisms feeding on one another.

Phytoplankton → Zooplankton → Small fish → Bird.

8) Two causes of depletion of ozone layer are as follows:
   a. Use of CFC's
   b. Use of Halogens

   Harmful effects of ozone depletion:
   a. Due to depletion of ozone UV radiation reaches the earth. This UV radiation causes skin cancer, damage to eyes and immune system.
   b. Ozone depletion may also lead to variation in global rainfall, ecological disturbances and wildling of global food supplies.

9) Decomposers are organisms that live on dead and decaying matter. They convert complex organic material into simple materials and mix with soil. Eg: fungi, bacteria

Some of the consequences if decomposers are removed from soil are

a. Dead organisms will pile up.
b. There will be no replenishment of soil.

10) **Soil:** Pesticides are used to protect plants from insects. They consequently get settled into soil particles, when used on plants.

Groundwater: Through irrigation in the fields, these pesticides present in soil pass into lower layers of soil and reach ground water.

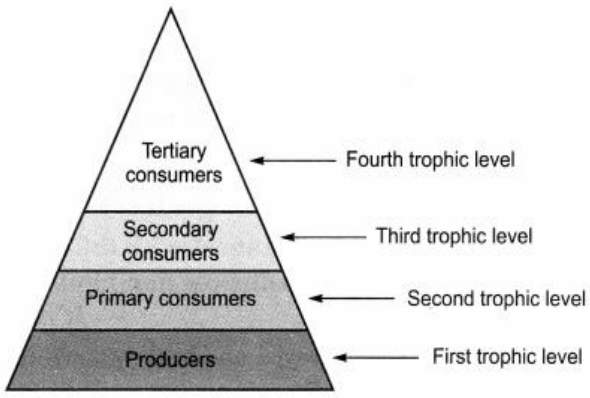
11) The below practices will support "Save the environment mission"

a. Use of paper bags or jute bags instead of plastic bags
b. Segregate biodegradable and non-biodegradable wastes in separate dustbins.
c. Use fuels like CNG, unleaded petrol or other ecofriendly fuels in vehicles.

Due to uses of environment friendly practices or habits we can save our environment

12) The harmful by-products of fertiliser industries are the harmful gases like sulphur dioxide and Nitrogen oxides. They cause air pollution and combine with the water vapour in the atmosphere to cause harmful acid rain

13)



14) A. Biodegradable substances: Substances that can be slowly destroyed and broken down into very small parts by natural processes i.e., by bacteria, fungi, etc. For example, organic wastes like vegetables and fruit peels.

B. Non-biodegradable substances: Substances that cannot be broken down or decomposed into the soil by natural agents are called as non-biodegradable.For example, plastic.

a. Segregating and treating the non-biodegradable waste before putting in dustbins.
b. Recycle the plastics or glass present in non-biodegradable wastes.
c. Motivate people to use paper or jute bags instead of plastic bags.

15) Ozone is formed due to action of UV rays on oxygen molecules to form free oxygen atom which subsequently combines with another molecule of oxygen to form ozone. The reaction is:

$$O_2 \xrightarrow{UV} O + O$$

$O + O_2 \rightarrow O_3$ (Ozone)

Ozone depletion is a cause of concern because it protects us from the harmful

ultraviolet radiations of the Sun by absorbing them. The UV rays can cause skin cancer, ageing, cataract, etc. to human beings if they are not absorbed by ozone due to ozone depletion.

16) The levels of harmful toxicants/pesticides like DDT get increased at successive trophic levels as they are neither metabolized nor excreted by the organism. They get accumulated in organism's body with their higher concentrations at higher trophic levels. This is called as biological magnification

Since, the tertiary consumers are at the top of the food chain, so a higher amount of these toxicants is present in them compared to the lower trophic levels.

17) Harmful effects of agricultural practices on the environment are

a. Change in the chemistry of soil and killing of useful microbes due to excessive use of fertilizers.
b. Biological magnification occurs due to excessive use of chemical pesticides.
c. Water table gets lowered due to the excess use of ground water.
d. Soil fertility is lost due to extensive cropping.
e. The natural ecosystems are harmed due to ploughing during agriculture.

18) Energy which will be available to the secondary consumer to transfer it to the tertiary consumer are

a. Energy available to producers = 10,000 Joules. Energy transfer to producer = 1% of 10,000 Joules = 100 Joules.

b. According to Ten per cent law, Energy transfer to primary consumer = 10100 × 100 = 10 Joules.

c. Energy transfer to secondary consumer = 10100 × 10 = 1 Joule.

d. Energy transfer to tertiary consumer = 10100 × 1 = 0.1 Joule

19) The eco-friendly activities in life are

a. Planting of trees

b. Segregating biodegradable and non-biodegradable wastes

c. Using cloth bags, jute bags or paper bags instead of plastic bags

d. Creating awareness on environment protection through initiatives and campaigns

e. Using of manures and organic agricultural methods Using less of chemical fertilizers and pesticides

f. Controlling pollution by using fuels like CNG.

20) Because the energy moves progressively through the various trophic levels and is no longer available to the previous trophic level. The energy captured by autotrophs does not revert to the solar input.

a. Pesticides, used for crop protection when washed down into the soil/ water body, are absorbed by the plant along with water and minerals

b. Plants are consumed by animals and these chemicals get into animal body
c. Being non-biodegradable, these chemicals get accumulated progressively in the food chain and into our body
d. As we go into higher levels of food chain amount of harmful substances will increase in the body of organisms as a result of biomagnification.

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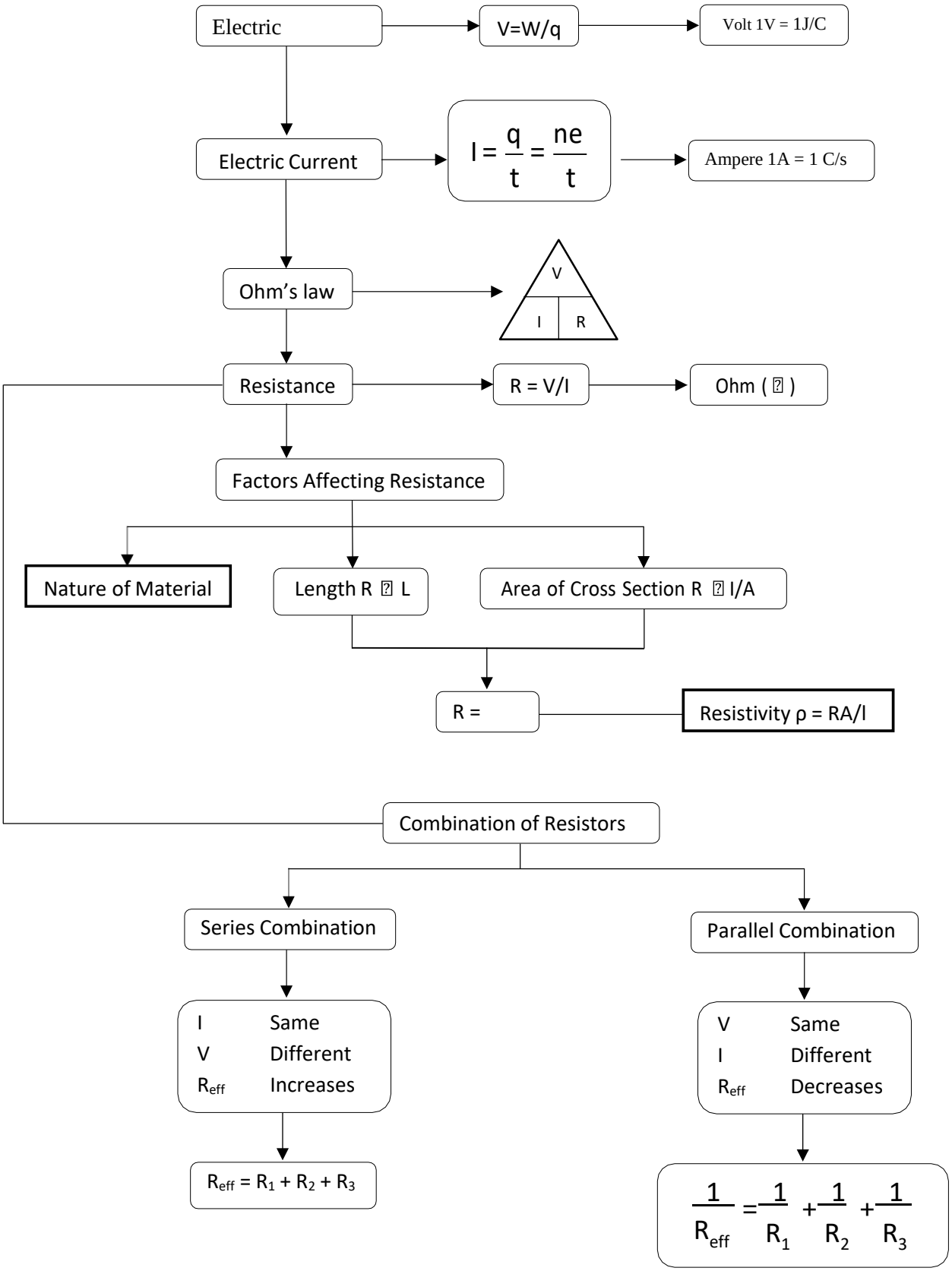
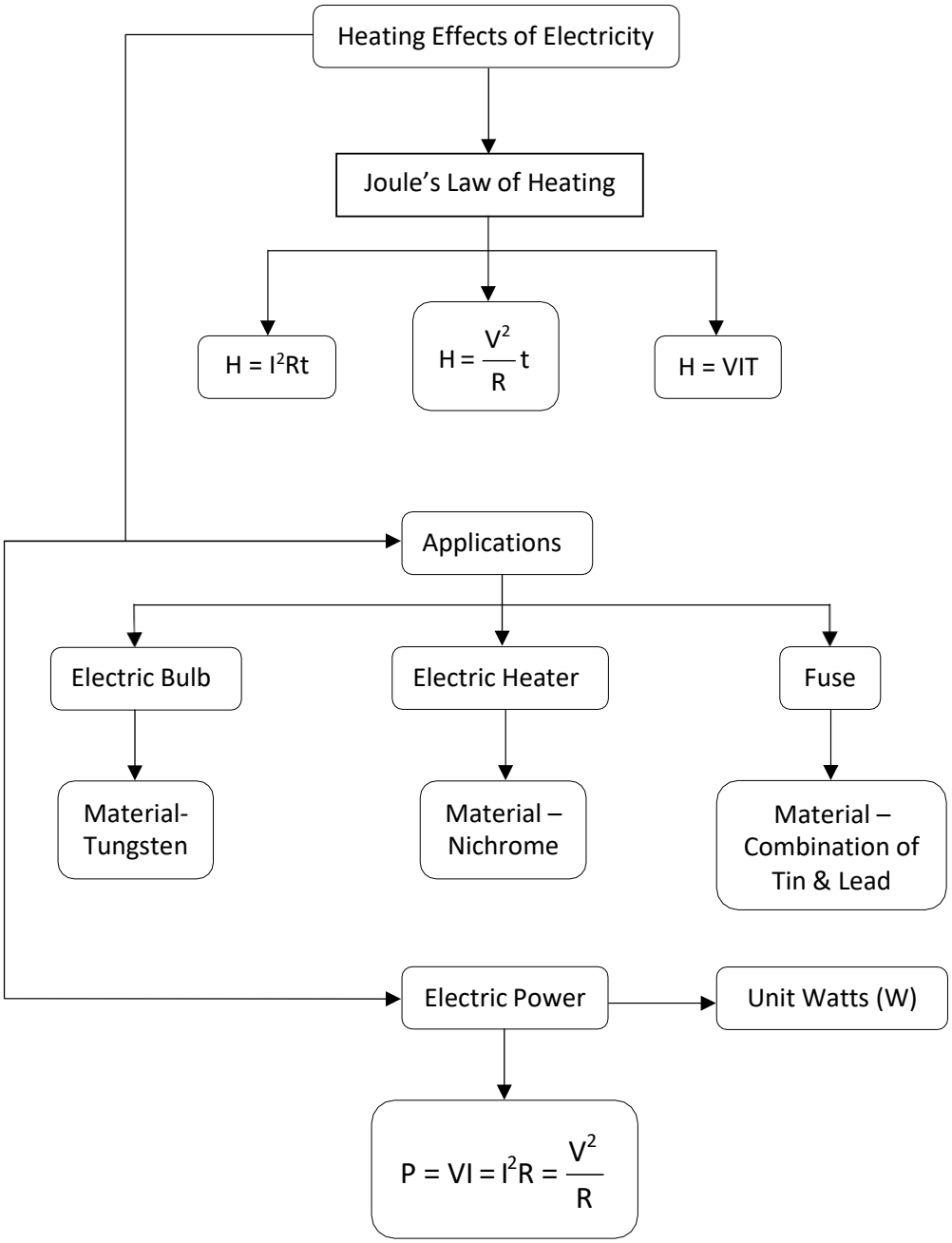
ELECTRICITY
CHAPTER MAPPING




Heating Effects of Electricity
Joule's Law of Heating
H = I²Rt
H = V²/R t
H = VIT
Applications
Electric Bulb
Electric Heater
Fuse
Material- Tungsten
Material – Nichrome
Material – Combination of Tin & Lead
Electric Power
Unit Watts (W)
P = VI = I²R = V²/R

NOTES

- **Electric current :** The rate of flow of electric charges in unit time is called current.

The strength of electric current, I = q/t= ne/t. Unit is Ampere.

Charge flows through the conductor only when the potential at two ends of the conductor are different. Thus positive charge flows from the higher potential to the lower potential and negative from lower to higher. The direction of current is taken as the direction of flow of positive charge.

- **Electric Potential Difference** :We define the electric potential difference between two points in an electric circuit carrying some current as the work done to move a unit charge from one point to the other.

Potential difference (V) between two points = Work done (W)/Charge (Q)

$V = W/Q$

The SI unit of electric potential difference is volt (V)

1 Volt = 1 Joule / Coulomb

Note: The potential difference is measured by means of an instrument called the voltmeter. The voltmeter is always connected in parallel across the points between which the potential difference is to be measured.

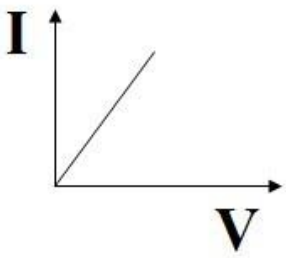
- **Ohm's Law :** Ohm's law states that at constant temperature the current passing through the conductor is directly proportional to the potential difference between the ends of the conductor. i.e. $V \alpha I$

$V = IR$

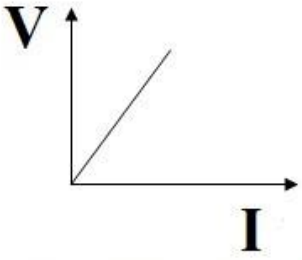
$R = V/I$

Where R is a constant known as the resistance of the conductor. Resistance is something which opposes the flow of electric charges. The unit resistance is Ohm (Ω)

Graph



Slope of this graph gives 1/R. i.e. as slope increases R decreases



Slope of this graph gives R. i.e. as slope increases R also increases

- **Factors affecting resistance of conductor**
  - (i) Nature of the conductor.
  - (ii) Length of the conductor :Resistance of the conductor is directly proportional to the length of the conductor. ($R \alpha l$)
  - (iii) Area of cross-section: Resistance of a conductor is inversely proportional to the area of cross-section. ($R \alpha 1/A$).

  Therefore $R \alpha l/A$

  $R = \rho l/A$. ρ- Resistivity

  $\rho = RA/l$

  When A=1sq.unit and l=1 unit, $\rho = R$. Resistivity of a material is defined as the resistance of that material in unit length and unit area of cross-section.

  Note: Resistivity of a given material does not changes with length or area of cross section. (i.e. there will not any change in resistivity when the area or length of the conductor increases or decreases.)

- **Combination of resistors**

- **Series combination:** If resistors are connected in end to end connection then such combination is known as series combination.

  In series combination (i) effective resistance increases.

  (ii) current (I) flows through all resistors are equal.

  (iii) Potential difference across each resistor may different.

  i.e. $V = V_1 + V_2$

  $I R_{eff.} = I R_1 + I R_2$

  $R_{eff.} = R_1 + R_2$

fig.

If 'n' equal resistors of resistance 'R' are connected in series then the effective resistance is 'nR'.

- **Parallel combination:** in parallel combination of resistors

  Effective resistance decreases.

  Current (I) flows through each resistors may different.

  Potential difference for ever y resistance is same.

  $I = I_1 + I_2$

  $(V/ R_{eff}) = (V/ R_1 + V/R_2)$

  $(1/ R_{eff}) = (1/ R_1 + 1/R_2)$

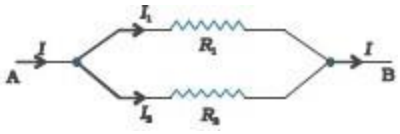


Fig.

If 'n' equal resistors of resistance 'R' are connected in parallel, then the effective resistance is R/n.

- **Joule's law of heating effect**

  This law implies that heat produced in a resistor is

  (i) directly proportional to the square of current for a given resistance,

  (ii) directly proportional to resistance for a given current, and

  (iii) directly proportional to the time for which the current flows through the resistor

- **Electric Power**

  The energy dissipated per unit time is called the Power dissipated.

  Power $P = V\ I = I^2R = V^2/R$

  Its unit is Watt (W). 1 W = 1 J/ s.Hence Ws is a unit of energy. The commercial unit of electrical energy is kWh.

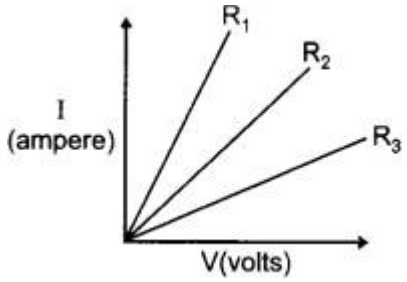
- **Practical Applications of Heating Effect of Electric Current**

  - Electric Bulb : It produces light when it becomes too hot. Therefore a material which can produce high heat with out burning is required to make the filament of a bulb. Tungsten is used for making bulb because it has high resistivity and high melting point.
  - Fuse: It has to be work in a manner that it should burn when high current is passing through it. Therefore a material which can produce high heat but should melt at high temperature. An alloy of tin and lead is used for making fuse wire because it has high resistivity and low melting point.
  - Electric Heater : Its produces heat when current is passing through it. The commonly used material for making heater is Nichrome wire. It has high resistivity and high melting point.

ELECTRICITY

MULTIPLE-CHOICE QUESTIONS

1. When electric current is passed, electrons move from:
   (a) high potential to low potential.
   (b) low potential to high potential.
   (c) in the direction of the current.
   (d) against the direction of the current.
   ANS -b
2. Electrical resistivity of any given metallic wire depends upon
   (a) its thickness
   (b) its shape
   (c) nature of the material
   (d) its length
   ANS -c
3. What is the commercial unit of electrical energy?
   (a) Joules
   (b) Kilojoules
   (c) Kilowatt-hour
   (d) Watt-hour
   ANS -c
4. The heating element of an electric iron is made up of:
(a) copper
(b) nichrome
(c) aluminium
(d) iron
   ANS -b
5. A student carries out an experiment and plots the V-I graph of three samples of nichrome wire with resistances R_1 R_2 and R_3 respectively. Which of the following is true?



(a) $R_1 = R_2 = R_3$
(b) $R_1 > R_2 > R_3$
(c) $R_3 > R_2 > R_1$
(d) $R_2 > R_3 > R_1$

   ANS -d
6. In an electrical circuit two resistors of 2 Ω and 4 Ω respectively are connected in series to a 6 V battery. The heat dissipated by the 4 Ω resistor in 5 s will be
(a) 5 J
(b) 10 J
(c) 20 J
(d) 30 J
ANS -c
7. Coulomb is the SI unit of:

(a)charge
(b) current
(c) potential difference
(d) resistance
ANS-a

8. Work of 14 J is done to move 2 C charge between two points on a conducting wire. What is the potential difference between the two points?

(a) 28 V

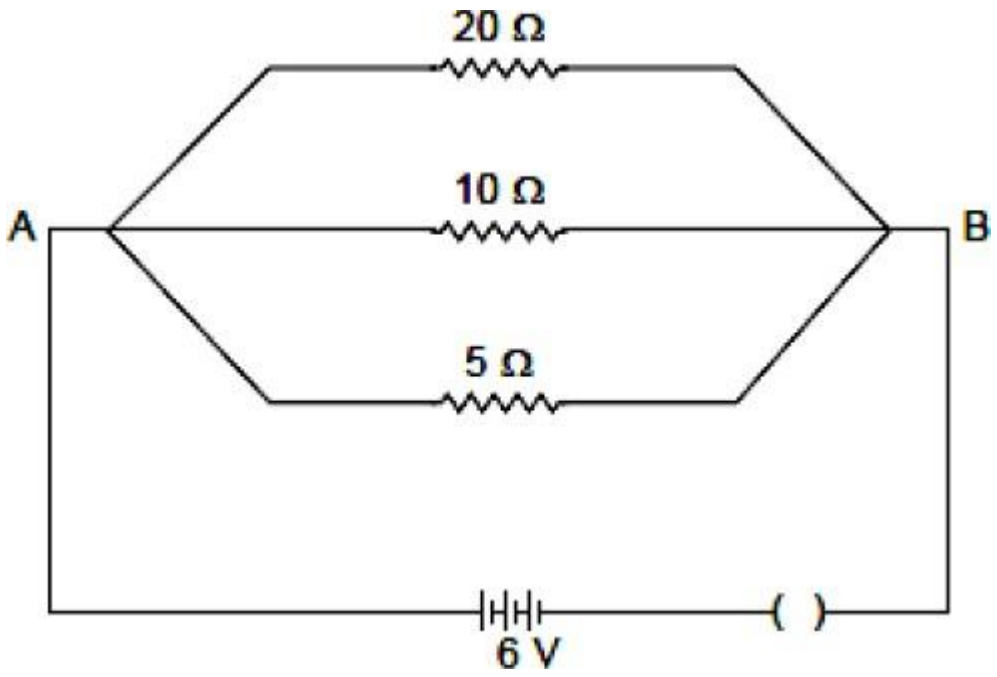
(b) 14 V

(c) 7 V

(d) 3.5 V

ANS -c

9. Calculate the current flow through the 10 Ω resistor in the following circuit.



(a) 1.2 A

(b) 0.6 A

(c) 0.2 A

(d) 2.0 A

ANS - d

10. If R1 and R2 be the resistance of the filament of 40 W and 60 W, respectively operating 220 V, then

(a) R1 < R2

(b) R2 < R1

(c) R1 = R2

(d) R1 ≥ R2

ANS- b

11. Two resistors connected in series give an equivalent resistance of 10 Ω. When connected in parallel, give 2.4 Ω. Then the individual resistance is

(a) each of 5 Ω

(b) 6 Ω and 4 Ω

(c) 7 Ω and 4 Ω

(d) 8 Ω and 2 Ω

ANS-b

12. The resistance of a wire of length 300 m and cross-section area, 1.0 mm^2 made of material of resistivity 1.0 x 10^{-7} Ω is:
(a). 2 Ω
(b). 3 Ω
(c). 20 Ω
(d). 30 Ω

ANS d

13. Which of the given statements is true regarding ammeter and voltmeter?
(a). Ammeter is connected in series with the required device, Voltmeter in parallel
(b). Both ammeter and voltmeter are connected in series with required device
(c). The voltmeter is connected in series with the device, Ammeter in parallel
(d). They can be connected in any way

ANS -a

14. The obstruction offered by material of conductor to the passage of electric current is known as :
(a). Resistance
(b). Conductance
(c). Inductance
(d). None of these

ANS - a

15. The unit of potential difference is :
(a). Volt
(b) Ohm
(c) Ampere
(d) Faraday

ANS -a

16. The instrument used for measuring electric current is **:**
(a) Ammeter
(b) Galvanometer
(c) Voltmeter
(d) Potentiometer

ANS- a

17. While a cell is being charged,_____energy is converted into_____energy.

a. mechanical, electrical
b. electrical, chemical

c. heat, electrical
d. chemical, heat

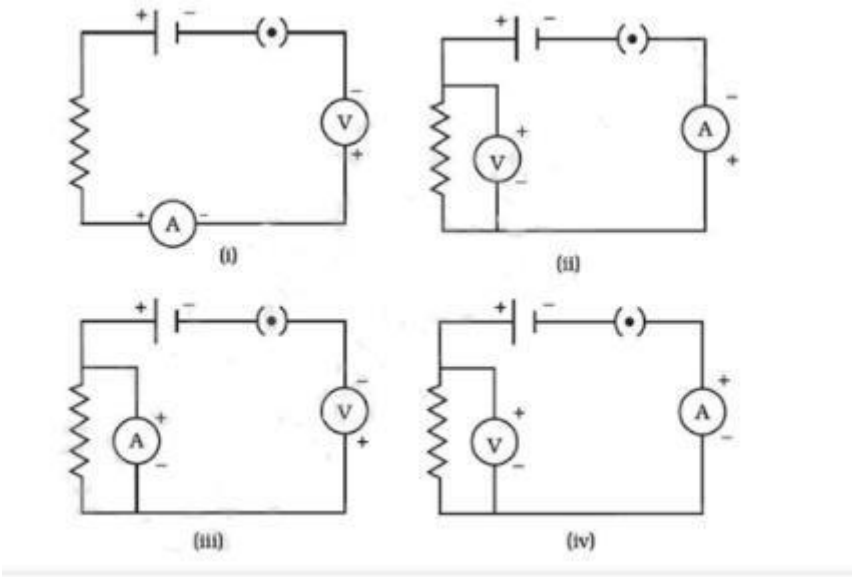
ANS -b

18. Copper is not preferred to make fuse wire because it_____.

a. is a good conductor of electricity
b. has a low melting point
c. has a high melting point
d. is not easily available

ANS -b

19. Identify the correct circuit diagram:



(a) i
(b) ii
(c) iii
(d) iv
ANS-d

20. The unit of resistivity is :

(a) V A
(b) V A
(c) V m /A
(d) VA/m

ANS-c

ASSERTION-REASON TYPE QUESTIONS

Following questions consist of two statements – Assertion (A) and Reason (R). Answer these questions selecting the appropriate option given below:

(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

1. Assertion (A) : Longer wires have greater resistance and the smaller wires have lesser resistance.
   Reason (R) : Resistance is inversely proportional to the length of the wire.-
   ANS - c
2. Assertion (A) : Tungsten metal is used for making filaments of incandescent lamps.
   Reason (R) : The melting point of tungsten is very low.
   ANS -c
3. Assertion (A) : Alloys are commonly used in electrical heating devices, like electrical iron, toasters etc.
   Reason (R) : Alloys do not oxidise (burn) readily at high temperatures.
   ANS -a
4. Assertion (A) : Bending a wire does not affect electrical resistance.
   Reason (R) : Resistance of a wire is proportional to resistivity of material.
   ANS - b

CASE STUDY BASED QUESTIONS

1. Electrical resistivities of some substances, at 20°C are given below in the table. Study the table and answer the given questions.

Silver	$1.60 \times 10^{-8}\ \Omega m$
Copper	$1.62 \times 10^{-8}\ \Omega m$
Tungsten	$5.2 \times 10^{-8}\ \Omega m$
Mercury	$94 \times 10^{-8}\ \Omega m$
Iron	$10 \times 10^{-8}\ \Omega m$
Nichrome	$100 \times 10^{-6}\ \Omega m$

1. Which is a better conductor of electric current ?

(A) Silver (B) Copper (C) Tungsten (D) Mercury

Ans. Option (A) is correct.

Explanation: Silver is a better conductor because it has lower resistivity.

2. Which element will be used for electrical transmission lines ?

(A) Iron (B) Copper (C) Tungsten (D) mercury U

Ans. Option (B) is correct.

Explanation: Copper, because it is economical, less oxidative than other metals and has low resistivity.

3. Nichrome is used in the heating elements of electric heating device because:

(A) It has high resistivity

(B) It does not oxidise readily at high temperature

(C) Both of the above

(D) None of the above U

Ans. Option (C) is correct.

Explanation: Nichrome, as it has very high resistivity / as it is an alloy, it does not oxidize readily at high temperature.

4. Series arrangement is not used for domestic circuits because:

(A) Current drawn is less

(B) Current drawn is more

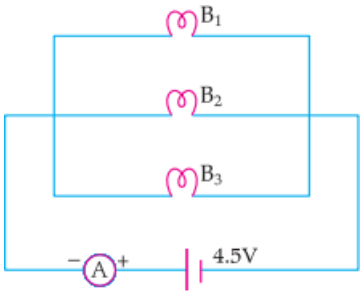
(C) Neither of the above

(D) Both of the above U

Ans. Option (A) is correct.

Explanation: In series arrangement, same current will flow through all the appliances which is not required and the equivalent resistance becomes higher, hence the current drawn becomes less.

2. In the given circuit, three identical bulbs B1, B2 and B3 are connected in parallel with a battery of 4.5 V. Study the diagram and answer the questions given below :



1. What will happen to the other two bulbs if the bulb B3 gets fused ?

(A) They will also stop glowing.

(B) Other bulbs will glow with same brightness.

(C) They will glow with low brightness.

(D) They glow with more brightness.

Ans. Option (B) is correct. Explanation: Other bulbs will glow with same brightness because glowing of bulbs depend upon power and potential difference, and resistance remain same for other bulbs

2.If the wattage of each bulb is 1.5 W, how much readings will the ammeter A show when all the three bulbs glow simultaneously?

(A) 1.0 A (B) 2 A (C) 1.5 A (D) None of the above

Ans. Option (A) is correct. Explanation: When the bulbs are in parallel, wattage will be added (4.5 W) and the ammeter reading would be,

I = P/V = 4 5 /4 = 1 A

3. Find the total resistance of the circuit.

(A) 1.0 Ω (B) 4.5 Ω (C) 1.5 Ω (D) 2.0 Ω

Ans. Option (B) is correct.

Explanation: Ammeter reading = 1.0 A, V = 4.5 V, R = V/I = 4.5/1 = 4.5 Ω

4. How many resistors of 88 Ω are connected in parallel

to carry 10 A current on a220 V line ?

(A) 2 resistors (B) 1 resistors (C) 3 resistors (D) 4 resistors

Ans. Option (D) is correct.

Explanation: Ohm's law, $V = IR_p$, $220 = 10 \times R_p$, $R_p = 220/10 = 22\ \Omega$

For parallel connection $1/R_p = 1/R_1 + 1/R_2 + 1/R_3 + \text{-----} + 1/R_n$

Here $R_1 = R_2 = R_3 \text{----------} = R_n$

ie, $1/R_p = n/R$, $R_p = R/n$, $22 = 88/n$, n=4 resistors

TWO MARKS QUESTIONS

1.Calculate the number of electrons that would flow per second through the cross- section of a wire when 1 A current flows in it.

Ans :

Given: I = 1A , t = 1 s

Q = It , Q =1Ax 1s = 1C

But Q = ne or n = Q/e = 1 /1.6x10^{-19} = 6.25 x 10^{8} electrons

2. Define the following terms:
(a) one ampere (b) 1 volt.
Answer:
Ampere: The SI unit of electric current is ampere (A). One ampere is the electric current when one coulomb of charge flows through a conductor in one second.

Volt: The SI unit of potential difference is volt (V). One volt is the potential difference between two points in an electric circuit when one joule of work is done to move a charge of one coulomb from one point to the other.

3. Keeping the potential difference constant, the resistance of a circuit is doubled. By how much does the current change?
Answer:
V = IR
V/R= I
Since the resistance and the current are inversely proportional, the current will become half.

4.How much work is done in moving a charge of magnitude 3 C across two points having a potential difference of 12 V?
Answer:
Given : Q = 3 C, V = 12 V
To find: W

V = W/Q
W = VQ = 12 × 3 = 36 J

5. Define electric power. Write an expression relating electric power, potential difference and resistance.

Ans. Electric power : It is the amount of electric energy consumed in a circuit per unit time.

Expression :

$P = V^2 /R$ Where, P = Electric Power, V = Potential difference, R = Resistance

6.Give reason for the following:

a. Tungsten used almost exclusively for filament of electric lamp.

b. Why do we use copper and aluminium wires for transmission of electric current?

Ans :

a. Tungsten is used in making the filament of electric lamp because it has high resistivity and high melting point.

b. The copper and aluminium have low resistivity and high conductivity.

7.List in a tabular form two differences between a voltmeter and an ammeter.

	Voltmeter	Ammeter
1	It is used to measure P.D. across two points in an electric circuit.	It is used to measure electric current in an electric circuit.
2	Its resistance is very high.	Its resistance is very low.
3	An voltmeter is connected inparallel in an electric circuit.	An ammeter is connected in series in an electric circuit.

8.Write the factors on which heat produced in a resistor depends

Ans: heat produced in a resistor is directly proportional to

- Square of current (I^2)
- Resistance of the resistor (R) and
- Time for which the current flows through the resistor.(t)

$H = I^2Rt$ joules
By Ohm's law, we get $H = VIt$ joules $= V^2t/R$ joules

9. Distinguish between resistances in series and resistances in parallel.
Answer:
Resistances in series:

1. If a number of resistances are connected in such a way that the same current flows through each resistance, then the arrangement is called resistances in series.
2. The current across each resistance is same.
3. The equivalent resistance in series combination is greater than the individual resistances.
4. This combination decreases the current in the circuit.

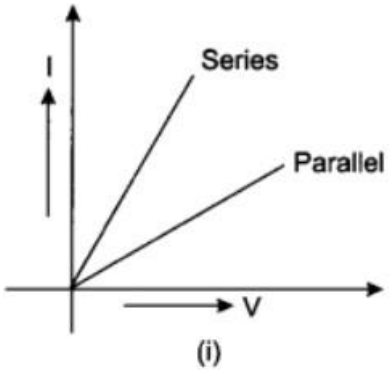
Resistances in parallel:

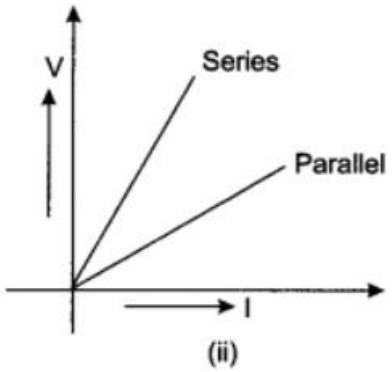
1. If a number of resistances are connected between two common points in such a way that the potential differences across each of them is the same, then the arrangement is called resistances in parallel.
2. The voltage across each resistance is same.
3. The equivalent resistance in parallel combination is smaller than each of the individual resistances.
4. This combination increases the current in the circuit.

10. What is the better way of connecting lights and other electrical appliances in domestic wiring? Why?
Answer:
The better way of connecting lights and other electrical appliances in domestic wiring is parallel connection because of the following advantages:

- In parallel circuit, if one appliance stops working due to some defect, then all other appliances keep working normally.
- In parallel circuit, each electrical appliance has its own switch due to which it can be turned on or off, without affecting other appliances.
- In parallel circuit, each electrical appliance gets the same voltage (220 V) as that of the power supply line.
- In parallel circuit, the overall resistance of the domestic circuit is reduced due to which the current from the power supply is high.

11. Two students perform experiments on series and parallel combinations of two given resistors R_1 and R_2 and plot the following V-I graphs.





Which of the graphs is (are) correctly labelled in terms of the words 'Series and parallel'? justify your answer.

In case of series combination, the effective resistance = $R_1 + R_2$ is more, hence slope of V – I graph will be more. It is otherwise in case of I – V graph. So, series and parallel are correctly marked in graph (ii).

12. A bulb is rated at 5.0 V, 100 mA. Calculate its (a) power and (b) resistance.

Ans :

Rating of bulb, V = 5 0. Volt, I = 100 mA = 100 $x10^{-3}$A = 0.1A

a. Power of bulb = V x l, P = 5 .0 x 0 .1 = 0.5W
b. V = IR, R =V/l = 5/.1 =50 Ω

THREE MARKS QUESTIONS

13.(a) List the factors on which the resistance of a conductor in the shape of a wire depends.

(b) Why are metals good conductors of electricity whereas glass is a bad conductor of electricity? Give reason.

(c) Why are alloys commonly used in electrical heating devices? Give reason.

Ans

a. Factors on which resistance of a wire depends:

i. Resistance is directly proportional to length (l)

ii. Resistance is inversely proportional to area of cross-section(A).

$R \alpha l$, $R \alpha 1/A$

$R \alpha l/A$

or $R = \rho l/A$, here ρ is the resistivity of the material at a particular temperature

(ie, resistivity depends on material and temperature)

b. Metals are good conductors due to having large number of free electrons and their low resistivity. Glass is a bad conductor because it has no free electrons and its resistivity is higher.

c. Alloys are commonly used in electrical heating devices due to their high resistivity and high melting point .

14.A nichrome wire has a resistance of 10 Ω. Find the resistance of another nichrome wire, whose length is three times and area of cross-section four times the first wire.

Ans: we have resistance $R = \rho l/A$

For first wire length $L_1 = l$, Area of cross section $A_1 = A$

So for first wire resistance $R_1 = \rho l/A = 10\ \Omega$

For second wire length $L_2 = 3l$, Area of cross section $A_2 = 4A$

So for second wire resistance $R_2 = \rho\ 3l/4A$

$$R_1/\ R_2 = \frac{\rho\ l/A}{\rho\ 3l/4A} = \frac{4}{3}$$

$$\text{Or } R_2 = \frac{3}{4} R_1 = \frac{3}{4} \times 10 = \frac{15}{2}\ \Omega$$

15. State the formula co-relating the electric current flowing in a conductor and the voltage applied across it. Also, show this relationship by drawing a graph. What would be the resistance of a conductor, if the current flowing through it is 0.35 ampere when the potential difference across it is 1.4 volt?

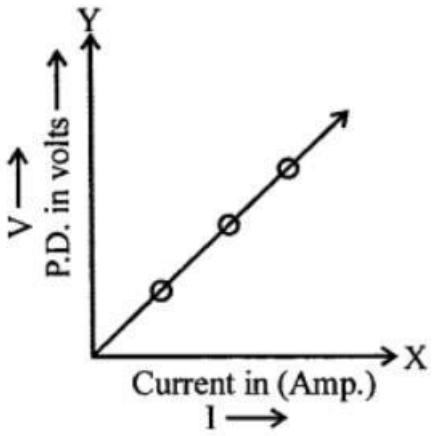
Ans:

potential difference V = IR where I is electric current and R, resistance of conductor

ie, V α I

If we plot a graph b/w V and I , it is a straight line.

Graph b/w V and I :



Given current I = 0.35 A , potential difference V = 1.4 V

Resistance R = = $\frac{V}{I}$ = = $\frac{1.4}{.35}$ = 4Ω

16. Calculate the total cost of running the following electrical devices in the month of September, if the rate of 1 unit of electricity is Rs. 6.00. (i) Electric heater of 1000 W for 5 hours daily. (ii) Electric refrigerator of 400 W for 10 hours daily

Ans. P_1 = 1000 W = 1kW, t_1= 5h,

P_2 = 400 W = 400 /1000 kW = 0.4KW , t_2 = 10h

No. of days, n = 30

$E_1 = P_1 \times t_1 \times n$ = 1 kW × 5h × 30 = 150 kWh

$E_2 = P_2 \times t_2 \times n$ = 0.4kW x 10h x 30 = 120kWh

∴ Total energy = (150 + 120) kWh = 270 kWh

Total cost = 270 x 6 = Rs. 1620/-

17.(i) Consider a conductor of resistance 'R', length 'L', thickness 'd' and resistivity 'ρ'. Now this conductor is cut into four equal parts. What will be the new resistivity of each of these parts? Why?

(ii) Find the resistance if all of these parts are connected in:

(a) Parallel (b) Series

(iii) Out of the combinations of resistors mentioned above in the previous part, for a given voltage which combination will consume more power and why?

Ans. (i) Resistivity will not change as it depends on the material of the conductor.

(ii) The length of each part become L/4 , ρ is constant and R = ρL/A

Resistance of each part = R_{part} = $\frac{\rho L/4}{A} = \frac{R}{4}\ \Omega$

(a) In parallel the $\frac{1}{Rp} = \frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} + \frac{1}{R4}$

Here R1 = R2= R3 =R4 = $R_{part} = \frac{R}{4}\ \Omega$

ie, $\frac{1}{Rp} = \frac{4}{R} + \frac{4}{R} + \frac{4}{R} + \frac{4}{R} = \frac{16}{R}\ \Omega$

(b) In series the Rs = $\frac{R}{4} + \frac{R}{4} + \frac{R}{4} + \frac{R}{4}$ = R Ω

(ii) $P = V^2/R$

Ans :

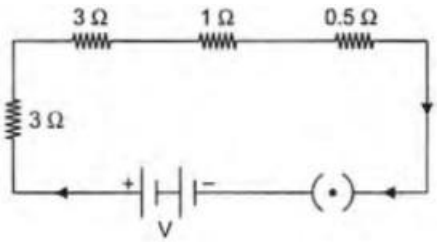
In the given circuit 2 Ω ,2 Ω , resistances are in parallel.

Let their equivalent resistance be R_1, then R_1 = 1 Ω (by using the formula for parallel combination)

Similarly 1 Ω ,1 Ω , resistances also are in parallel.

Let their equivalent resistance be R_2, then R_2 = 0.5 Ω (by using the formula for parallel combination)

The circuit can be reduced as,



Now all resistances are in series combination., then the resistance of the circuit

R = 3 Ω + 3 Ω + 1 Ω +0.5Ω = 7.5 Ω

18. Two bulbs A and B are rated as 90W–120V and 60W–120V respectively. They are connected in parallel across a 120V source. Find the current in each bulb. Which bulb will consume more energy?

First Bulb: 90 W–120 V

Resistance of first bulb $R_1 = V^2/P_1 = \frac{120\ X\ 120}{90}$ = 160 Ω

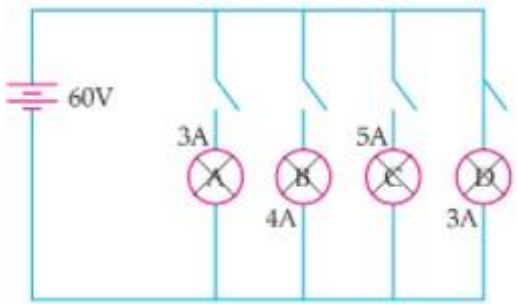
Current in first bulb $I_1 = V/R_1$ = 120 /160 = .75 A

Resistance of second bulb $R_2 = V^2/P_2 = \frac{120\ X\ 120}{60}$ = 240 Ω

Current in second bulb $I_2 = V/R_2 = 120/240 = .50$ A

Power of first bulb is more than second bulb, so first bulb will consume more energy.

19. In the given circuit, A, B, C and D are four lamps connected with a battery of 60 V.



Analyse the circuit to answer the following questions.

(i) What kind of combination are the lamps arranged in (series or parallel)?

(ii) Explain with reference to your above answer, what are the advantages (any two) of this combination of lamps?

(iii) Explain with proper calculations which lamp glows the brightest?

(iv) Find out the total resistance of the circuit R

Ans. (i) The lamps are in parallel.

(ii) Advantages: If one lamp is faulty, it will not affect the working of the other lamps. They will also be using the full potential of the battery as they are connected in parallel.

(ii) The lamp with the highest power will glow the brightest.

P=VI In this case, all the bulbs have the same voltage. But lamp C has the highest current.

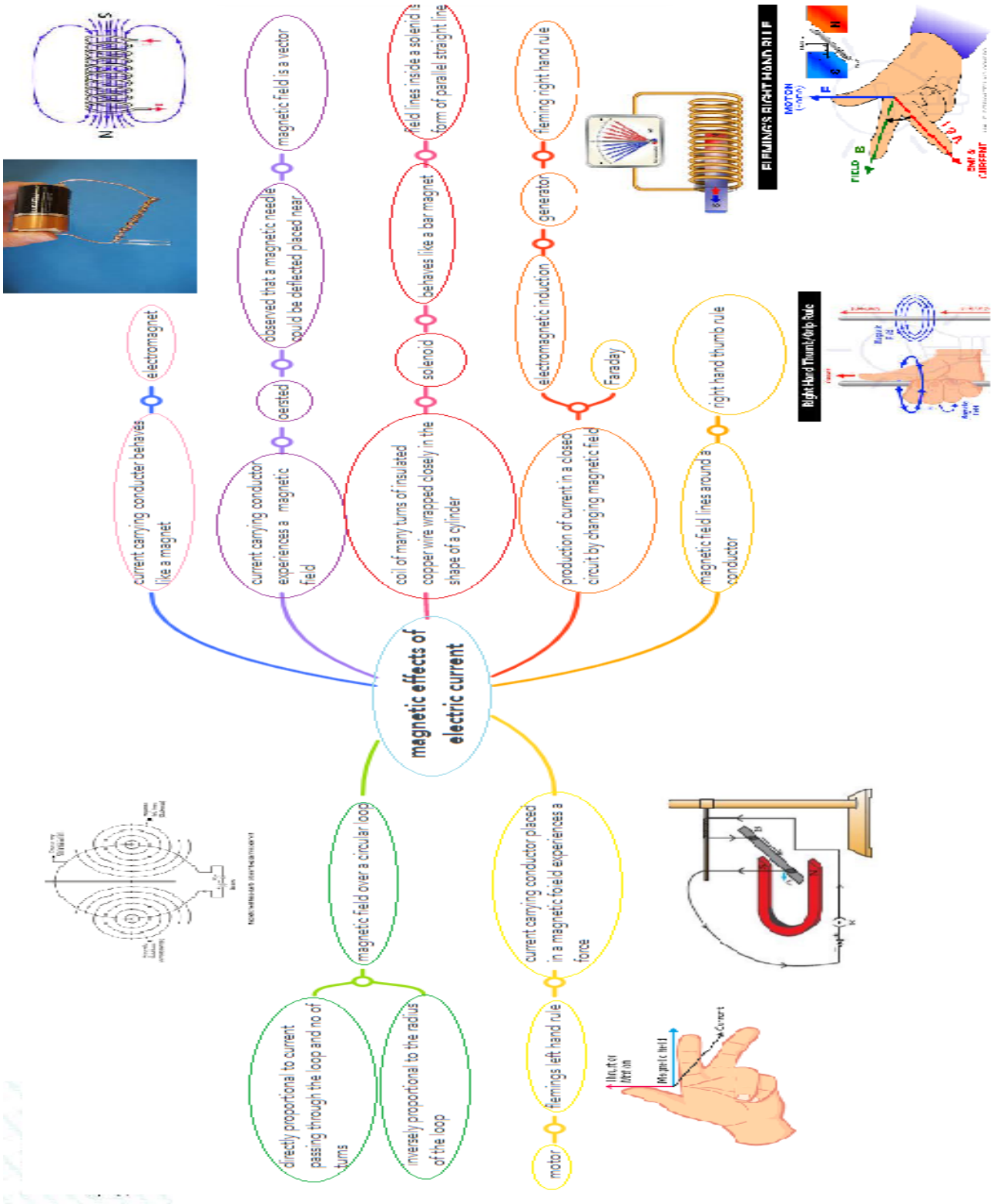
Hence, for Lamp C, power P = 5 × 60 Watt = 300 W. (the maximum).

(iii) The total current in the circuit = 3+4+5+3 A = 15A

Voltage = 60V

R = V/I = 60/15 = 4 Ω

CHAPTER 13.
MAGNETIC EFFECTS OF ELECTRIC CURRENT
KEY CONCEPTS & GIST OF THE LESSON



Magnet:

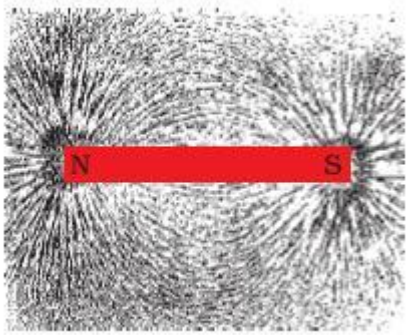
(i) Is an object that attracts objects made of iron, cobalt & nickel.(man made)
(ii) Natural magnets are also available. (not man made)
(iii) Comes to rest in North-South direction, when suspended freely.
(iv) Has two poles, north and south.

Magnets are used:

(i) In radio & stereo speakers,
(ii) In refrigerator doors,
(iii) On audio & video cassettes players,
(iv) On hard discs & floppies of computers &
(v) In children's toys and magnetic compass.

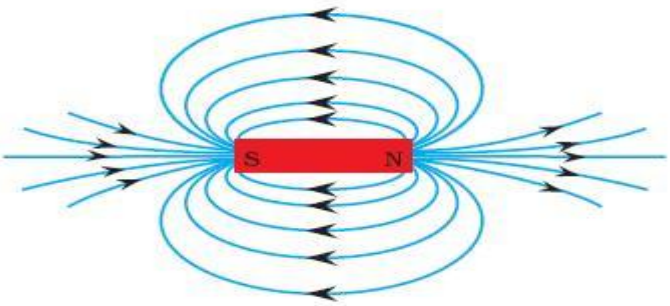
Magnetic field: The region of space around a magnet where a magnetic force is experienced is called a magnetic field. The strength of magnetic force is also called the magnetic field. Its symbol is B..It is a quantity that has both direction & magnitude. Its unit is Tesla(T). Direction is from north pole to south pole.

Magnetic field lines: Magnetic field is represented by field lines. They are lines drawn in a Magnetic field along which a North magnetic pole moves. Magnetic field lines are called as Magnetic lines of force.

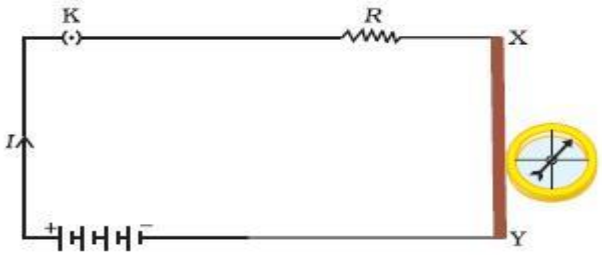


Properties of Magnetic field lines:

1. Magnetic field lines emerge from north pole and merge at the south pole .Inside the magnet, the direction of field lines is from its south pole to its north pole. Thus the magnetic field lines are closed curves.
2. The relative strength of the magnetic field is shown by the degree of closeness of the field lines. The field is stronger, that is, the force acting on the pole of another magnet placed is greater where the field lines are crowded .
3. No two field-lines are found to cross each other. If they did, it would mean that at the point of intersection, the compass needle would point towards two directions, which is not possible.



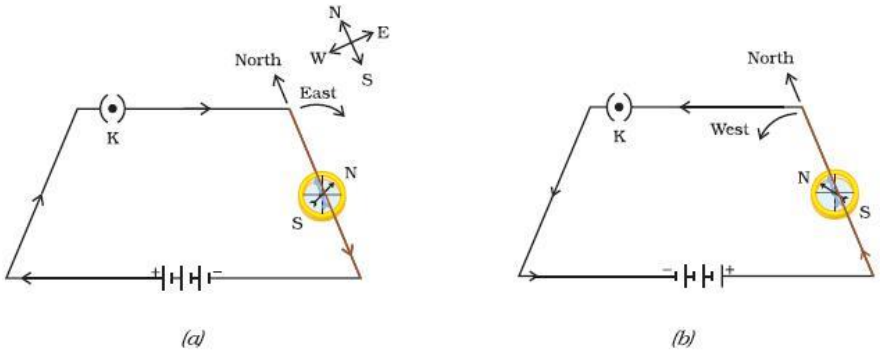
MAGNETIC EFFECTS OF CURRENT



Hans Christian Oersted, accidentally discovered that a compass needle got deflected when an electric current passed through a metallic wire is placed nearby.

SNOW RULE : When current is flowing from south to north magnetic needle gets deflected towards west .

and when current is flowing from north to south magnetic needle gets deflected towards east. (as in figure below)



MAGNETIC FIELD DUE TO A STRAIGHT CURRENT-CARRYING CONDUCTOR

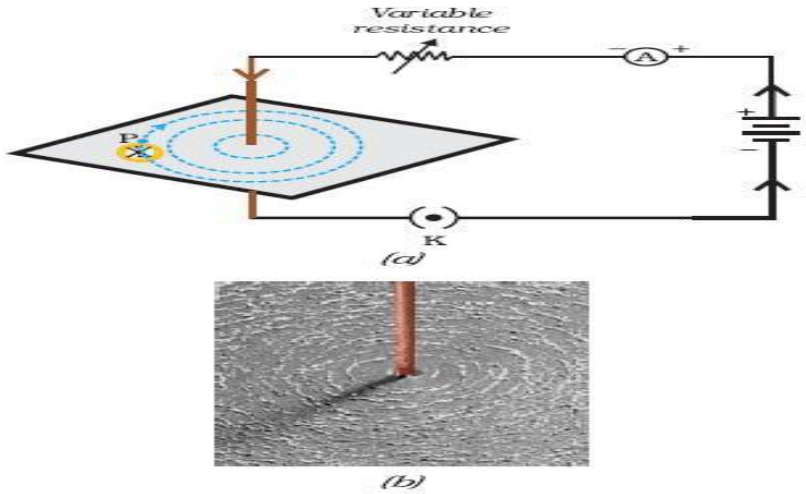
The magnetic field lines due to a straight current carrying conductor are concentric circles whose centres lie on the wire.

Factors on which the magnitude of magnetic field due to straight current carrying conductor depends

The magnitude of magnetic field produced is

a) **Directly proportional to the current passing in the wire**.If the magnitude of the magnetic field produced at a given point increases as the current through the wire increases.

b)**Inversely proportional to the distance of that point from the wire**. The magnetic field produced by a given current in the conductor decreases as the distance from it increases. From Fig. 13.6, it can be noticed that the concentric circles representing the magnetic field around a current-carrying straight wire become larger and larger as we move away from it.



Right hand thumb rule:

If a current carrying straight conductor is held in your right hand such that the thumb points towards the direction of current, then the wrapped fingers show the direction of magnetic field lines.

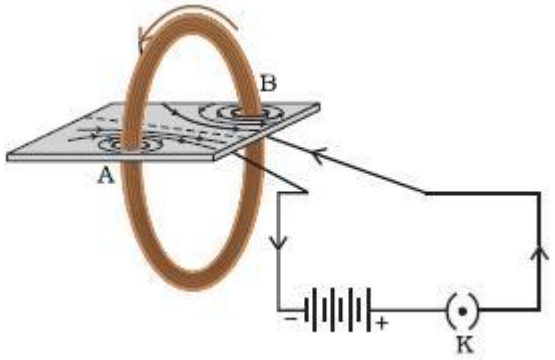
Magnetic field lines due to a current through a circular loop .

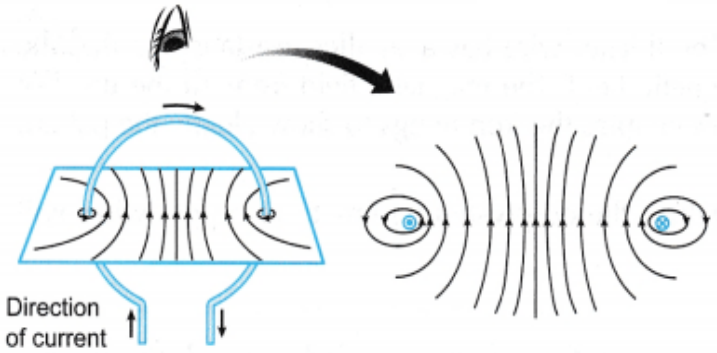
The strength of the magnetic field at the centre of the loop(coil)depends on:

(i) **The radius of the coil**- The strength of the magnetic field is inversely proportional to the radius of the coil. If the radius increases, the magnetic strength at the centre decreases.

(ii) **The number of turns in the coil**: As the number of turns in the coil increase, the magnetic strength at the centre increases, because the current in each circular turn is having the same direction, thus the field due to each turn adds up.

(iii) **The strength of the current flowing in the coil**: as the strength of the current increases, the strength of the magnetic fields also increases.





Solenoid:

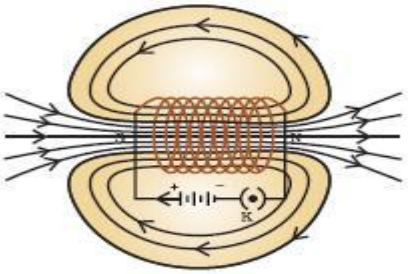
A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid.

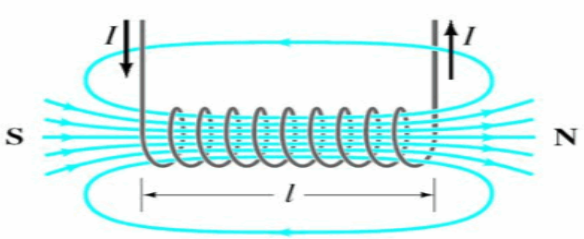
In fact, one end of the solenoid behaves as a magnetic north pole, while the other behaves as the south pole.

The field lines inside the solenoid are in the form of parallel straight lines. This indicates that the magnetic field is the same at all points inside the solenoid. That is, the field is uniform inside the solenoid.

The strength of the magnetic field inside a solenoid depends on

1. The number of turns in the solenoid : Larger the number of turns in the solenoid greater the magnetism
2. The strength of current in the solenoid :Larger the magnitude of current passed through the solenoid greater the strength of magnetic field.
3. The nature of core material used in making solenoid: The use of soft iron core inside the solenoid produces stronger magnetic field.





Electromagnet:
A device consisting of a coil of insulated wire wrapped around an iron core that becomes magnetized when an electric current flows through the wire.

Permanent (Bar) Magnet	Electromagnet
They are permanently magnetized.	These are temporarily magnetized.
These are usually made of hard materials.	They are usually made of soft materials.
The strength of the magnetic field line is constant i.e. it cannot be varied.	The strength of the magnetic field lines can be varied according to our need.
The poles of a Permanent magnet cannot be changed.	The poles of an electromagnet can be altered.
Example of a permanent magnet is a Bar Magnet	Example of a temporary magnet is solenoid wounded across a nail and connected to a battery.

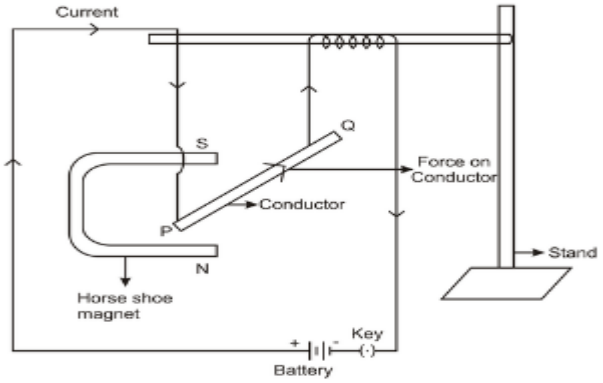
Uses of electromagnets :In magnetic locks, relays, magnetic levitation, electric bells, loudspeakers etc.

Factors affecting strength of electromagnet:
1.The number of turns in the coil: As the number of turns increases strength of electromagnet increases.
2.The current flowing in the coil : Strength of electromagnet increases when current increases.
3.The length of air gap between the poles.If we reduce the length of air gap then strength of electromagnet increases.

FORCE ON A CURRENT-CARRYING CONDUCTOR IN A MAGNETIC FIELD

- A current carrying conductor placed in a magnetic field experiences a force.
- If the direction of the field and that of current are mutually perpendicular to each other, then the force acting on the conductor will be perpendicular to both and that can be determined using the Fleming's left-hand rule.

- When current establishes in the conductor, it gets displaced which verifies the existence of a force on the conductor.



Aim:

To show that a current carrying wire experiences a force when placed in a magnetic field.

- **Experimental Setup:**
- 1. A conductor PQ is suspended horizontally from a stand.
- 2. A horse shoe magnet is placed in such a way that rod lies between that two poles a magnet.
- 3. Conductor is connected with the battery and the key.
- **Observations:**
- 1. On closing the key, the conductor gets displaced towards right.
- 2. On reversing the direction of current, the conductor gets displaced towards left.
- 3. On changing the polarity of horse shoe magnet, the direction of force acting on the current carrying conductor gets reversed.
- 4. When current carrying conductor is placed perpendicular to the direction of magnetic field, the maximum displacement occurs indicating the maximum force on the conductor.
- 5. On placing the conductor parallel to the direction of magnetic field no displacement is noticed.
- **Conclusion:**
- The displacement of the conductor shows that it experiences some force when it carries some current and is placed in a magnetic field.

Cause of Force on the current carrying conductor

Force on the current carrying conductor is due to the interaction between magnetic field due to current and external magnetic field.

I**ts magnitude increase when**

1.Strength of current increases

2.External magnetic field strength increases.

3.Length of conductor increases

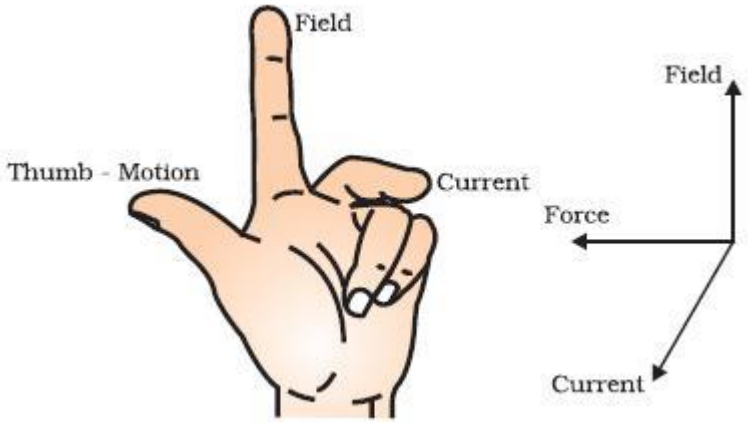
Maximum and minimum force

Force is maximum when the conductor is perpendicular to the magnetic field and minimum (zero) when conductor is parallel to the magnetic field.

The direction of force is given by **Fleming's left hand rule**

Fleming's Left hand rule:

Stretch the thumb, forefinger and middle finger of left hand such that they are mutually perpendicular. Forefinger points in the direction of magnetic field and middle finger in the direction of current, then the thumb gives the direction of force acting on the conductor.



Electric motor:

An electric motor is a rotating device that converts electrical energy to mechanical energy.

Principle: The **principle** of the **electric motor** is based on the fact that a current carrying conductor produces a magnetic field around it. A current carrying conductor placed perpendicular to an external magnetic field experiences a force.

Electric motor is used as an important component in electric fans, refrigerators, mixers, washing machines, computers, MP3 players etc.

Construction:

Parts of a Electric Motor

1.Insulated Copper wire: A rectangular coil of wire ABCD. The coil is placed between the two poles of a magnetic field such that the arm AB and CD are perpendicular to the direction of the magnetic field. The ends of the coil are connected to the two halves P and Q of a split ring

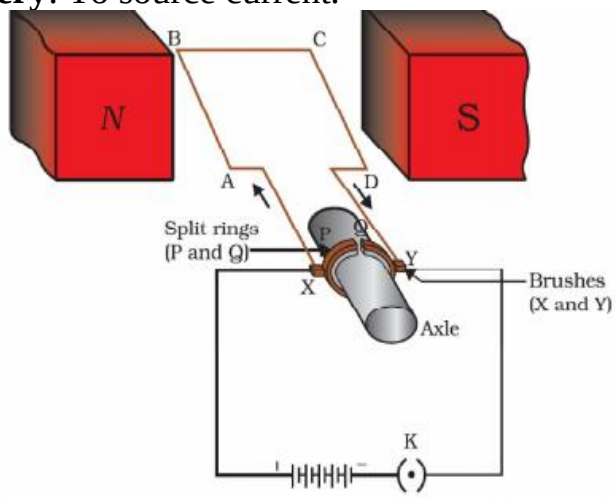
2.Magnet Poles: A magnet as placed above ie North Pole and South Pole. This creates a magnetic field .

3.Split Rings: Two disjoint C-shaped rings P and Q. It acts as a commutator (which can reverse the direction of current)

4.Axle: The split rings are placed on the axle which can rotate freely.

5.Brushes: The outside of the split rings are connected to conducting brushes X and Y.

6.Source Battery: To source current.



Working

- When the current begins to flow, current flows through **brush X, then A to B, B to C, C to D and then to brush Y and into the battery.**
- Now applying **Fleming's Left Hand Rule** to wire AB, Current is along **AB**, Magnetic Field is as shown (North- South), the motion of the wire is **downwards**.
- Now applying **Fleming's Left Hand Rule to wire CD**, Current is along **CD**, Magnetic Field is as shown (North- South), the motion of the wire is **upwards**.
- The rectangular coil begins to move in the **anti-clockwise direction**
- Note that during anti-clockwise motion, the split rings and axle also move, whereas the brushes don't move.
- After half a rotation, **Wire CD and Split ring Q moves to the left. Wire AB and Split ring P moves to right.** Brushes X and Y do not move.
- Now applying **Fleming's Left Hand Rule** to wire CD, Current is along **DC**.(Battery - Split ring Q – DC) Magnetic Field is as shown (North- South), the motion of the wire is **downwards**.
- Now applying **Fleming's Left Hand Rule** to wire AB, Current is along **BA**. (Battery - Split ring Q - DC -- CB - BA -- Split ring P), Magnetic Field is as shown (North- South), the motion of the wire is **upwards**.
- So, again the coil rotates in the **anti-clockwise direction.**
- The reversal of current in the coil results in the continuous rotation of the coil. **The reversal of current is achieved by the commutator rings**

Applications

- Electric Fans,Refrigerators ,Mixers,Washing machines

Note:Commutator

A device that reverses the direction of flow of current through a circuit is called a commutator. In electric motors, the split ring acts as a **commutator.**

Ways to increase power of electric motor:

The commercial motors use

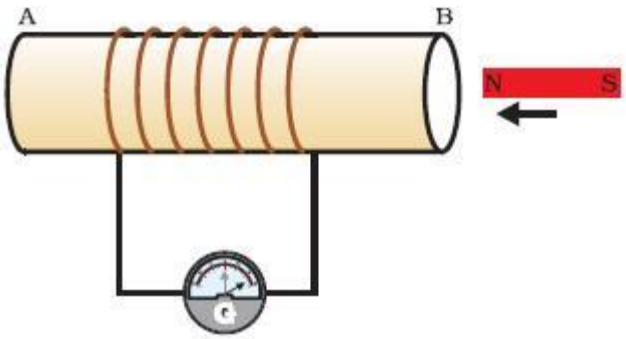
(i) an electromagnet in place of permanent magnet.

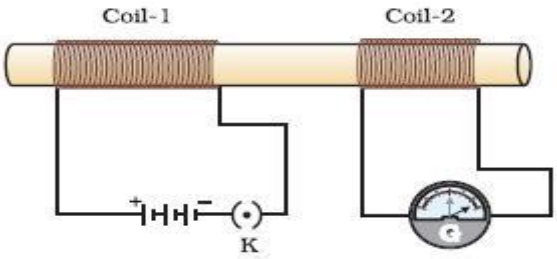
(ii) large number of turns of the conducting wire in the current carrying coil

(iii) a soft iron core on which the coil is wound. The soft iron core, on which the coil is wound, plus the coils, is called an **armature.** This enhances the power of the motor.

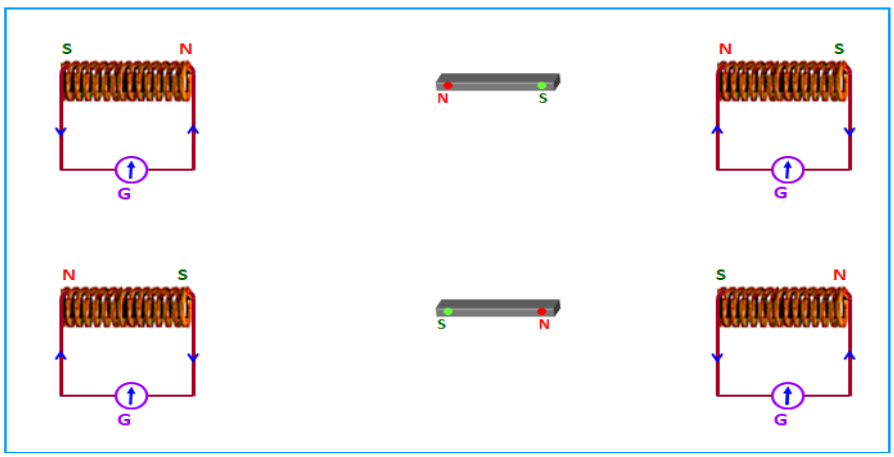
Electromagnetic induction:

Phenomenon of generation of electricity as a result of changing magnetic field in a conductor is called Electromagnetic induction.





Faraday's Experiment - 1:

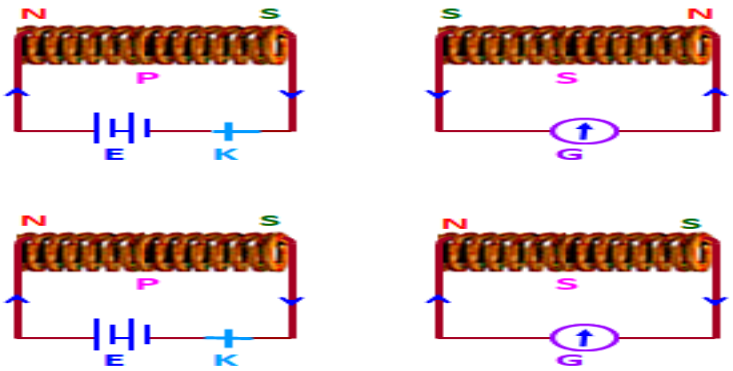


Observations:

i) the relative motion between the coil and the magnet
ii) the induced polarities of magnetism in the coil
iii) the direction of current through the galvanometer and hence the deflection in the galvanometer
iv) that the induced current (e.m.f) is available only as long as there is relative motion between the coil and the magnet

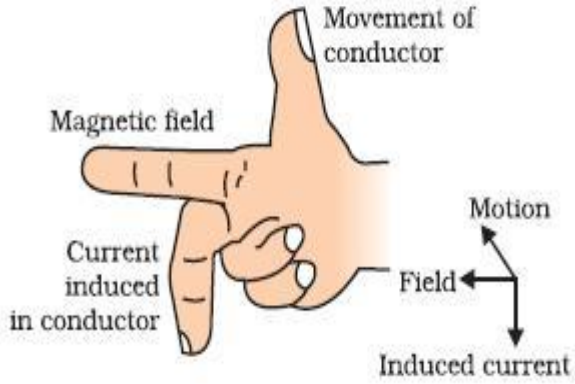
Note: i) coil can be moved by fixing the magnet
ii) both the coil and magnet can be moved (towards each other or away from each other) i.e. there must be a relative velocity between them.
iii) magnetic flux linked with the coil changes relative to the positions of the coil and the magnet
iv) current and hence the deflection is large if the relative velocity between the coil and the magnet and hence the rate of change of flux across the coil is more .

Faraday 2nd experiment



- When the primary circuit is closed current grows from zero to maximum value.
- During this period changing, current induces changing magnetic flux across the primary coil.
- This changing magnetic flux is linked across the secondary coil and induces current in the secondary coil.
- Induced current and hence deflection in galvanometer lasts only as long as the current in the primary coil and hence the magnetic flux in the secondary coil change.

Fleming's Right hand rule: gives the direction of induced current. Stretch the thumb, forefinger and middle finger of right hand such that they are mutually perpendicular. Forefinger points in the direction of magnetic field , the thumb gives the direction of motion of the conductor then the middle finger will give the direction of induced current .



Same poles repel and opposite poles attract each other in a magnet.

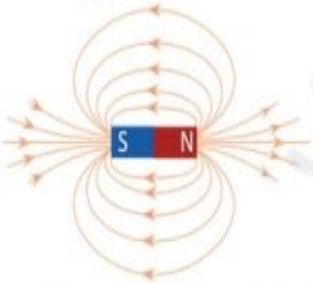
Magnetic Field

Compass needle align itself in the direction of magnetic field.

Magnetic Field

North Pole of a compass needle points in the direction of magnetic field.
Magnetic field is a quantity that has both magnitude and direction.

Magnetic Field Lines



- Magnetic field lines outside the magnet emerge from north pole and merge at south pole.
- Inside the magnet, field lines are from south pole to north pole
- Magnetic field lines are closed curves.
- Magnetic field is stronger where the field lines are crowded.
- No two field lines are found to cross (intersect) each other.

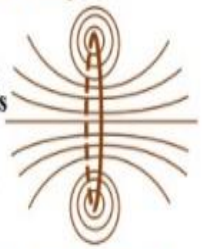
Magnetic Field due to a Current through a Straight Conductor

- Magnetic field lines around a straight current carrying conductor forms concentric circles centered on the wire.
- As current increases deflection of compass needle increases.
- As compass needle is moved away from the wire, deflection in compass needle decreases.
- As current is reversed in direction, compass needle deflects in opposite direction.

Right Hand Thumb rule states that if we hold the current carrying conductor in our right hand such that the thumb points towards the direction of current then the wrapped fingers will give the direction of the magnetic field.

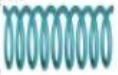
Magnetic Field due to a Current through a Circular Loop

If there is circular coil having n turns, the field produced is n times as large as that produced by a single turn.

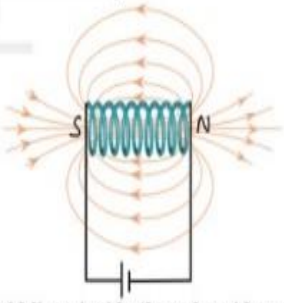


Magnetic Field due to a Current in Solenoid

A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid.



Magnetic field of a solenoid is similar to that of the bar magnet.



The field lines inside the solenoid are in the form of parallel straight lines.
The field is uniform inside the solenoid.

MCQ

1. **Choose the incorrect statement from the following regarding magnetic lines of field**

(A)The direction of magnetic field at a point is taken to be the direction in which the north pole of a magnetic compass needle points.

(B) Magnetic field lines are closed curves.
(C) If magnetic field lines are parallel and equidistant, they represent zero field strength.
(D) Relative strength of magnetic field is shown by the degree of closeness of the field lines.

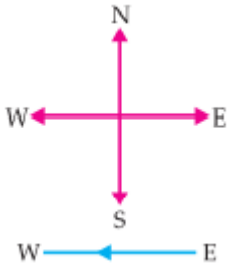
Ans. Option (C) is correct. Explanation: Magnetic field lines appear parallel when they are far from the magnet. But this does not mean that field strength is zero. No field line would be present where field strength becomes zero.

2. **Which of the following correctly describes the magnetic field near a long straight current carrying wire?**

(A) The field consists of straight lines perpendicular to the wire.
(B) The field consists of straight lines parallel to the wire.
(C) The field consists of radial lines originating from the wire.
(D) The field consists of concentric circles centered on the wire.

Ans. Option (D) is correct. Explanation: On applying right-hand thumb rule, we find the direction of magnetic field. The field is in the form of concentric circles centered on the wire carrying current.

3. **A constant current flowing in a horizontal wire in the plane of the paper from East to West is shown in Figure. The direction of magnetic field at a point will be from North to South :**



(A) Directly above the wire.
(B) Directly below the wire.
(C) At a point located in the plane of the paper, on the north side of the wire.
(D) At a point located in the plane of the paper, on the south side of the wire.

Ans. Option (B) is correct.
Explanation: Line WE shows a straight conductor through which current is moving from E to W. When seen from east, the magnetic field lines appear in clockwise direction, i.e., S to N above the wire and N to S below the wire. This is in accordance with right hand thumb rule.

4. For a current in a long straight solenoid N- and S-poles are created at the two ends. Among the following statements, the incorrect statement is :

(A)The field lines inside the solenoid are in the form of straight lines which indicates that the magnetic field is the same at all points inside the solenoid.

(B) The strong magnetic field produced inside the solenoid can be used to magnetise a piece of magnetic material like soft iron, when placed inside the coil.

(C) The pattern of the magnetic field associated with the solenoid is different from the pattern of the magnetic field around a bar magnet.

(D) The N and S-poles exchange position when the direction of current through the solenoid is reversed.

Ans. Option (C) is correct

Explanation: A solenoid behaves like a bar magnet. Hence, the pattern of the magnetic field associated with the solenoid is same as the pattern of the magnetic field around a bar magnet.

5. The strength of magnetic field inside a long current carrying straight solenoid is :

(A) More at the ends than at the centre
(B) Minimum in the middle
(C) Same at all points
(D) Found to increase from one end to the other

Ans. Option (C) is correct.
Explanation: Magnetic field lines are straight and parallel inside the solenoid. This indicates a same magnetic field. Hence, inside the solenoid, the magnetic field is same throughout.

6. Which of the following property of a proton can change while it moves freely in a magnetic field? (There may be more than one correct answer.)

(A) Mass
(B) Speed
(C) Velocity
(D) Momentum
Ans. Option (C) and (D) is correct.

Explanation: When a proton enters a magnetic field, it starts moving on a circular path. Because of its movement along a circular path it attains angular momentum. We know that momentum is a product of mass and velocity. Therefore velocity and mass of a proton change when it enters a magnetic field.

7. A positively-charged particle (alpha – particle) projected towards west is deflected towards north by a magnetic field. The direction of magnetic field is

(A) Towards south.
(B) Towards east.
(C) Downward.
(D) Upward.
Ans. Option (D) is correct.
Explanation: In accordance with Fleming's Left-Hand Rule, the direction of magnetic field is vertically upward.

8. The phenomenon of electromagnetic induction is :

(A) The process of charging a body.
(B) The process of generating magnetic field due to a current passing through a coil.

(C) Producing induced current in a coil due to relative motion between a magnet and the coil.
(D) The process of rotating a coil of an electric motor.

Ans. Option (C) is correct.

Explanation: In electromagnetic induction phenomenon, an induced current begins to flow in a coil whenever there is a change in magnetic field in and around a coil.

9. A rectangular coil of copper wires is rotated in a magnetic field. The direction of the induced current changes once in each:

(A) Two revolutions.
(B) One revolution.
(C) Half revolution
(D) One-fourth revolution.

Ans. Option (C) is correct.
Explanation: When a rectangular coil of copper wire is rotated in a magnetic field, the direction of the induced current changes once in each half revolution.

10. What is SI unit of magnetic field strength:

(A) Pascal (B) Nm^2 (C) Tesla (D) No unit

Ans.

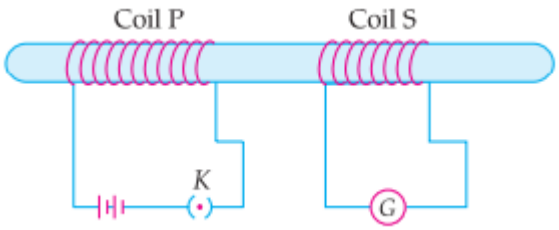
Option (C) is correct. Explanation: Tesla is the SI unit of magnetic field.

11. What does the crowding of iron filings at the end of the magnet indicate?

(A) Magnetic field is strongest near the poles of the magnet.
(B) Magnetic field is weakest near the poles of the magnet.
(C) There is no significant magnetic field at the poles of the magnet.
(D) The significance of polarity

Ans. Option (A) is correct. Explanation: Crowding of iron filings at the ends of the magnet indicates that the magnetic field is strongest near the poles of the magnet.

12. A momentary deflection is shown by the galvanometer, when



(A) Key K is open
B) Key K is closed
(C) In both the situations
(D) In neither of the case.

Ans. Option (C) is correct.
Explanation: Momentary deflection is seen in both the cases. When the key K is closed, magnetic field around the coil S increase momentarily. This induces current in the coils and deflection is shown by the galvanometer. And when it is opened, a momentary deflection is seen in opposite direction as induced current flow in the opposite direction because of decrease in magnetic field in coil S.

13. What should be the core of an electromagnet?

a. soft iron
b. hard iron
c. rusted iron
d. none of above

Ans. Option (a) is correct.

14. No force acts on a current carrying conductor when it is placed-

a. perpendicular to the magnetic field
b. parallel to the magnetic field
c. far away from the magnetic field
d. inside a magnetic field

Ans. Option (b) is correct.

15. A plotting compass is placed near the south pole of a bar magnet. The pointer of plotting compass will:

(a) point away from the south pole

(b) point parallel to the south pole

(c) point towards the south pole

(d) point at right angles to the south pole

Correct Answer: Option (c)

16.Two magnetic field lines:

a) Intersect at neutral point

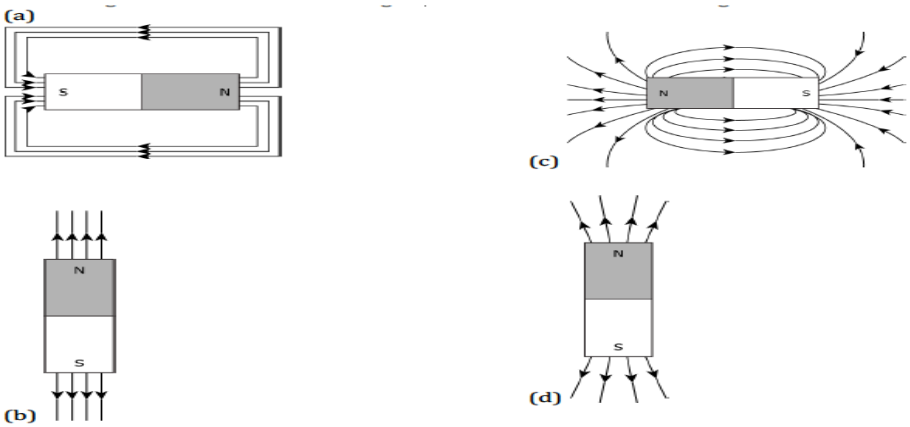
b) Never intersect each other

c) Intersect near north-pole or south pole

d) Intersect at the midpoint of the magnet

Correct Answer: Option (b)

17. **A student learns that magnetic field strength around a bar magnet is different at every point. Which diagram shows the correct magnetic field lines around a bar magnet?**



Correct Answer: Option (c)

18. E**lectric motor is a device which converts**

(a) mechanical energy to electrical energy
(b) electrical energy to mechanical energy
(c) chemical energy to mechanical energy
(d) mechanical energy to light energy.

Correct Answer: Option (b)

19. Which option explains Fleming's left-hand rule to understand the working of a motor?

(a) When a current carrying conductor is moved with a force, it creates the magnetic field.
(b) When a conductor is moved inside a magnetic field, current is produced in the conductor.
(c) When the magnetic field is moved relative to the conductor, current is produced in the conductor.
(d) When a current carrying conductor is placed in a magnetic field, it experiences a force by magnetic field.

Correct Answer: Option (d)

20. A student inserts a bar magnet in the coil. The student observes deflection in the galvanometer connected to the coil. What will happen if the magnet is continuously getting in and out of the coil?

(a) the current induced in the coil will increase

(b) the current will change its direction continuously

(c) the magnetic field will create a motion in the coil

(d) the magnetic field of the bar magnet would keep decreasing

Correct Answer: Option (b)

ASSERTION –REASON TYPE QUESTIONS

Each of these questions contain two statements, Assertion (A) and Reason (R). Each of these questions also has four alternative choices, only one of which is the correct answer. You have to select one of the codes (a), (b), (c) and (d) given below.

(a) Assertion is correct, reason is correct; reason is a correct explanation for assertion.
(b) Assertion is correct, reason is correct; reason is not a correct explanation for assertion
(c) Assertion is correct, reason is incorrect
(d) Assertion is incorrect, reason is correct.

1. **Assertion:** A current carrying conductor experience a force in the magnetic field

Reason: The force acting on a current carrying conductor in a magnetic field is due to interaction between magnetic fields produced by the conductor and external magnetic field.

Ans : A

2. **Assertion:** In Fleming's left hand rule, the direction of magnetic field, magnetic force and current are mutually perpendicular.

Reason: Fleming's left hand rule is applied to measure the induced current.

Ans : C

3. **Assertion:** Magnetic Field due to a current carrying coil at its centre becomes double if current in the coil is doubled.

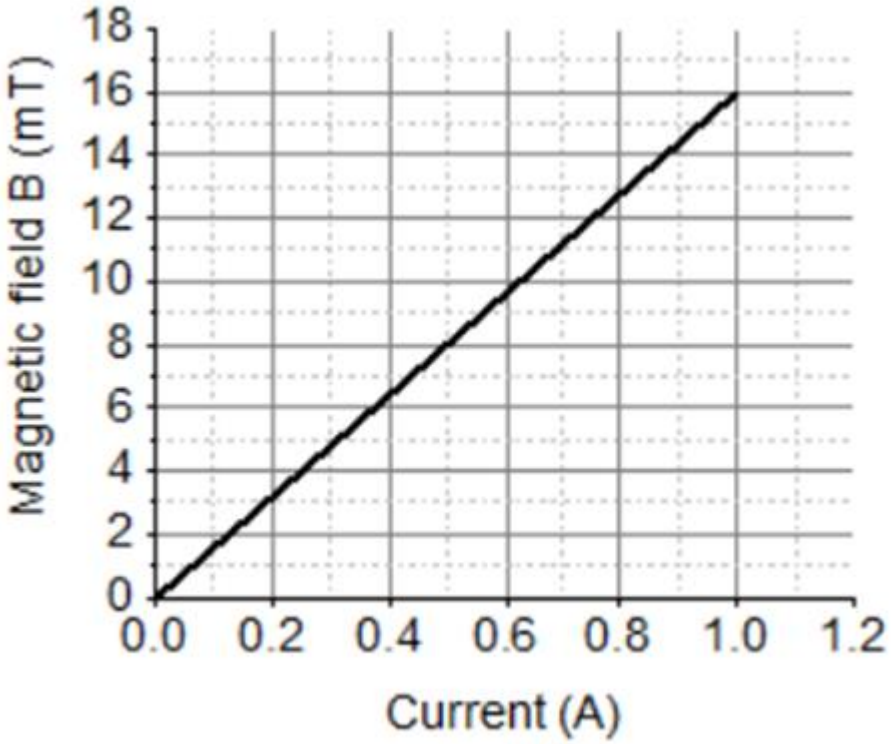
Reason: Magnetic Field due to a current carrying coil at its centre is directly

proportional to the current.

Ans : A

CASE BASED QUESTIONS

1.A solenoid is a long helical coil of wire through which a current is run in order to create a magnetic field. The magnetic field of the solenoid is the superposition of the fields due to the current through each coil. It is nearly uniform inside the solenoid and close to zero outside and is similar to the field of a bar magnet having a north pole at one end and a south pole at the other depending upon the direction of current flow. The magnetic field produced in the solenoid is dependent on a few factors such as, the current in the coil, number of turns per unit length etc. The following graph is obtained by a researcher while doing an experiment to see the variation of the magnetic field with respect to the current in the solenoid. The unit of magnetic field as given in the graph attached is in milli-Tesla (mT) and the current is given in Ampere.



(i) What type of energy conversion is observed in a linear solenoid?

a. Mechanical to Magnetic
b. Electrical to Magnetic
c. Electrical to Mechanical
d. Magnetic to Mechanical

Ans:b

(ii) What will happen if a soft iron bar is placed inside the solenoid?

a. The bar will be electrocuted resulting in short-circuit.
b. The bar will be magnetised as long as there is current in the circuit.
c. The bar will be magnetised permanently.
d. The bar will not be affected by any means.

Ans:b

iii)The magnetic field lines produced inside the solenoid are similar to that of …

a. a bar magnet
b. a straight current carrying conductor
c. a circular current carrying loop
d. electromagnet of any shape

Ans: a

iv) After analysing the graph a student writes the following statements.

I. The magnetic field produced by the solenoid is inversely proportional to the current.
II. The magnetic field produced by the solenoid is directly proportional to the current.
III. The magnetic field produced by the solenoid is directly proportional to square of the current.
IV. The magnetic field produced by the solenoid is independent of the current.

Choose from the following which of the following would be the correct statement(s).

a. Only IV

b. I and III and IV

c. I and II

d. Only II

Ans:d

v) **From the graph deduce which of the following statements is correct.**

a. For a current of 0.8A the magnetic field is 13 mT
b. For larger currents, the magnetic field increases non-linearly.

c. For a current of 0.8A the magnetic field is 1.3 mT
d. There is not enough information to find the magnetic field corresponding to 0.8A current.

Ans: a

2. An electric motor is an electrical machine that converts electrical energy into mechanical energy. Most electric motors operate through the interaction between the motor's magnetic field and electric current in a wire winding to generate force in the form of torque applied on the motor's shaft.

(**1) Electric motor is used in**

(a) electric fans (b) refrigerators (c) mixers (d) all of the above

(2) In Electric motor magnetic field is produced by

(a) Permanent magnet (b) Electro magnet

(c) both (a) and (b)

(d) none of the above.

(3) Direction of magnetic force on a current carrying conductor placed in magnetic field is given by

(a) Fleming's left hand rule (b) Fleming's right hand rule

(c) Right hand palm rule (d) none of the above

(4) Moving part of an electric motor is called

(a)brushes (b) shaft (c) split ring (d) slip ring

(5) The commercial motors use

(a) an electromagnet in place of permanent magnet

(b) large number of turns of the conducting wire in the current carrying coil

(c) a soft iron core on which the coil is wound.

(d) All of the above

Ans ; (a), (c), (a), (b) and (d)

Descriptive type questions

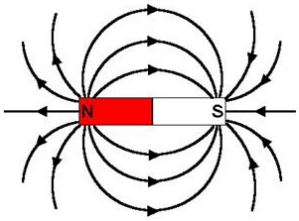
1.What do you understand by magnetic effect of current?

Answer: When electric current flows through a conductor it produces a magnetic field around it and behaves like a magnet. This is called the magnetic effect of electric current.

2.Why does a compass needle get deflected when brought near a bar magnet ?

Answer: The magnetic field of the magnet exerts force on both the poles of the compass needle. The forces experienced by the two poles are equal and opposite. These two forces form a couple which deflects the compass needle.

3.Draw magnetic field lines around a bar magnet.



4.List the properties of magnetic lines of force.

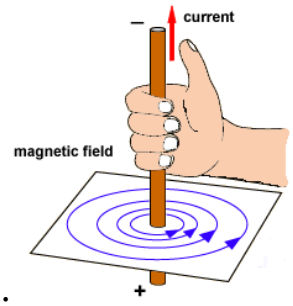
Properties of magnetic lines of force:
By rule the field lines start from the north pole and end at the south pole,
Inside the magnet, the direction of field lines is from south pole to north pole.
The magnetic field lines are closed curves.
The magnetic field is stronger, where the field lines are crowded.
No two field-lines intersect each other.

5.Why don't two magnetic lines of force intersect each other ?

Answer:The resultant force on a north pole of the compass needle at any point can be only in one direction. But if the two magnetic field lines intersect one another, then the resultant force on the north pole placed at the point of intersection will be along two directions, which is not possible.

6. Explain Right Hand Thumb Rule

Answer: Imagine you are holding a current-carrying straight conductor in right hand such that the thumb points towards the direction of current the fingers will wrap around the conductor in the direction of the field lines of the magnetic field.This is known as the right-hand thumb rule



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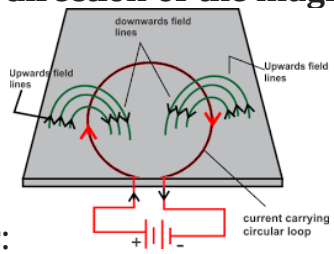
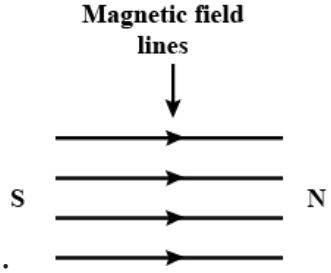
7.Consider a circular loop of wire lying on the plane of the table. Let the current pass through the loop clockwise. Apply the right hand rule to find out the direction of the magnetic field inside and outside the loop.



Answer:
By applying right hand thumb rule, we find that all the sections produce magnetic field downwards at all points inside the loop while at the outside points, the field is directed upwards. Therefore, the magnetic field acts normally into the plane of the paper at the points inside the loop and normally out of the plane of paper at points outside the loop.

8. The magnetic field in a given region is uniform. Draw a diagram to represent it.

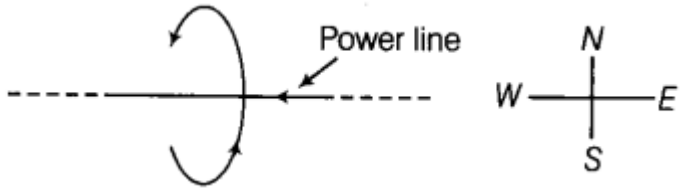
Answer: A uniform magnetic field in a region is represented by drawing parallel straight lines, all pointing in the same direction.For example, the uniform magnetic field which exists inside a current-carrying solenoid can be represented by parallel straight lines pointing from its S-pole to N-pole



.

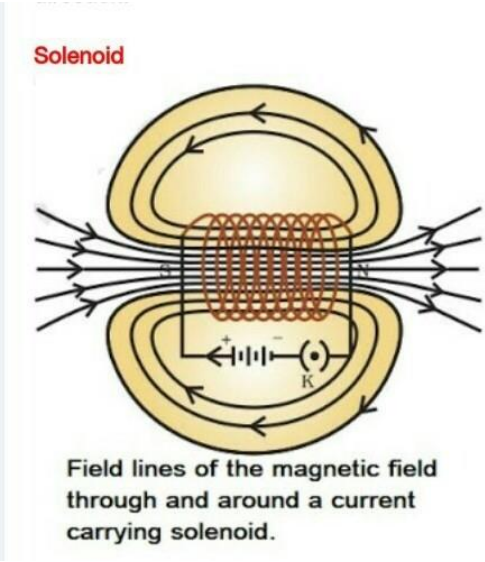
9. A current through a horizontal power line flows in east to west direction. What is the direction of magnetic field at a point directly below it and at a point directly above it?

Answer:The current is in the east-west direction. Applying the right-hand thumb rule, we get that the magnetic field (at any point below or above the wire) turns clockwise in a plane perpendicular to the wire, when viewed from the east end, and anti-clockwise, when viewed from the west end.



10.What is a Solenoid? Draw magnetic field lines for a current carrying solenoid.

Answer:A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid.The magnetic field lines around a current-carrying solenoid is similar to a bar magnet.One end of the solenoid acts as North Pole, while the other behaves as the South Pole. The field lines inside the solenoid are parallel straight lines, that is, the field is uniform inside the solenoid.

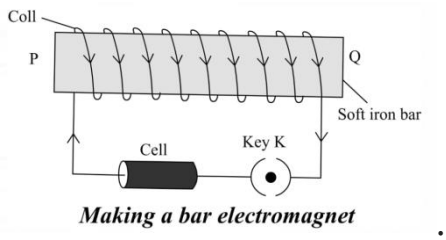


Field lines of the magnetic field through and around a current carrying solenoid.

11.What is an electromagnet?What are the factors that decide the strength of the electromagnet?

Answer: The strong magnetic field produced inside a solenoid can be used to magnetize a piece of magnetic material, like soft iron, when placed inside the coil The magnet so formed is called an electromagnet.The strength of the electromagnet depends on:

i) Amount of current flowing through it
ii) No of turns in the coil (solenoid)
iii) Nature of the core.



Making a bar electromagnet

12.State Fleming's left hand rule.

Answer: Fleming's left hand rule : Stretch the first finger, the middle finger and the thumb of your left hand mutually perpendicular to each other in such a way that the first finger represents the direction of the magnetic field, the middle finger represents the direction of the current in the conductor, then the thumb

will represent the direction of Force(motion of the conductor).

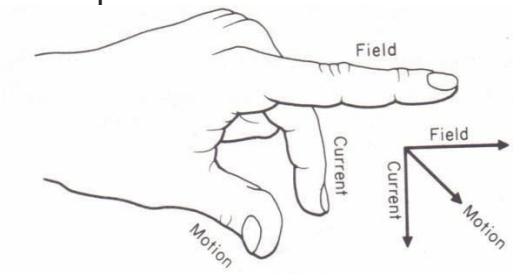


Fig. 38.3. Fleming's left-hand rule (motor rule)

13.What is the principle of an electric motor?

Answer: A motor works on the principle of magnetic effect of current. When a rectangular coil is placed in a magnetic field and current is passed through it, a force acts on the coil which rotates it continuously.
When the coil rotates, the shaft attached to it also rotates. In this way the electrical energy supplied to the motor is converted into the mechanical energy of rotation.

14.What is the role of the split ring in an electric motor?

Answer: The split ring reverses the direction of current in the armature coil after every half rotation, i.e., it acts as a commutator. The reversed current reverses the direction of the forces acting on the two arms of the armature after every half rotation. This allows the armature coil to rotate continuously in the same direction.

15.Explain electromagnetic induction.
Answer: A changing magnetic field in a conductor induces a current in another conductor, this is called electromagnetic induction.

- We can induce current in a coil either by moving it in a magnetic field or by changing the magnetic field around it.
- The induced current is found to be the highest when the direction of motion of the coil is at right angles to the magnetic field.

16.State the principle of an electric generator.

Answer: The electric generator works on the principle that when a straight conductor is moved in a magnetic field, then current is induced in the conductor.In an electric generator, a rectangular coil is made to rotate rapidly in the magnetic field between the poles of a horse-shoe type magnet. When the coil

rotates, it cuts the magnetic field lines due to which a current is produced in the coil.

17.Name some sources of direct current.
Answer: Some of the sources of direct current are dry cells, button cells, lead accumulators.

18.Which sources produce alternating current?

Answer: Alternating current is produced by AC generators of nuclear power plants, thermal power plants, hydroelectric power stations, etc.

19.Name two safety measures commonly used in electric circuits and appliances.

Answer:(i) Earthing and (ii) Electric fuse.

20.An electric oven of 2 kW power rating is operated in a domestic electric circuit (220 V) that has a current rating of 5 A. What result do you expect ? Explain.

Answer: The electric oven draws a current given by
I=P/V 2000/220=9.09A The electric oven draws current much more than the current rating of 5 A. That is the circuit is overloaded. Due to excessive current, the fuse wire will blow and the circuit will break.

21.When is the force experienced by a current-carrying conductor placed in a magnetic field largest?

Answer: When the conductor carries current in a direction perpendicular to the direction of the magnetic field, the force experienced by the conductor is largest.

22.**Imagine that you are sitting in a chamber with your back to one wall. An electron beam, moving horizontally from back wall towards the front wall, is deflected by a strong magnetic field to your right side. What is the direction of magnetic field ?**

Answer: Here the electron beam is moving from our back wall to the front wall, so the direction of current will be in the opposite direction, from front wall

towards back wall or towards us. The direction of deflection (or force) is towards our right side.We now know two things :direction of current is from front towards us, and direction of force is towards our right side.

Let us now hold the forefinger, middle finger and thumb of our left hand at right angles to one another. We now adjust the hand in such a way that our center finger points towards us (in the direction of current) and our thumb points towards the right side (in the direction of force). Now, if we look at our forefinger, it will be pointing vertically downwards. Since the direction of the forefinger gives the direction of the magnetic field, therefore, the magnetic field is in the vertically downward direction.

23.Draw a labeled diagram of an electric motor. Explain its principle and working. What is the function of a split ring in an electric motor?

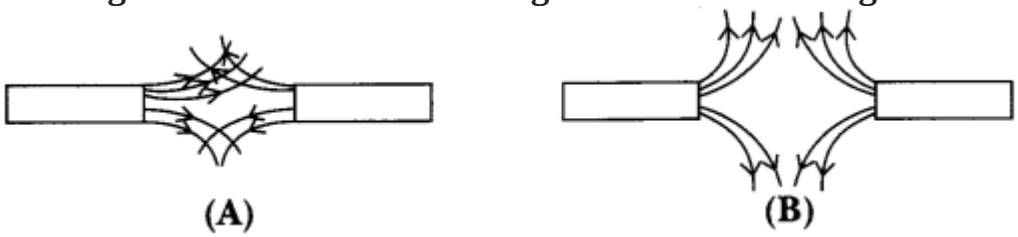
Electric Motor : The device used to convert electrical energy to mechanical energy is called Electric Motor. It is used in fans, machines, etc.
Principle : Electric motor works on the principle of force experienced by a current carrying conductor in a magnetic field. The two forces in the opposite sides are equal and opposite. The direction of motion is given by Flemmings left hand rule. Motion.
Working of an electric motor : When current starts to flow, the coil ABCD is in horizontal position. The direction of current through the armature coil has the direction from A to B in the arm AB and from C to D in the arm CD. The direction of force exerted on the coil can be found through Fleming's left hand law.
According to this law, it is found that the force exerted on the part AB, pushes the coil downwards. While the force exerted on the part CD pushes it upwards. In this way, these two forces being equal and opposite form a couple that rotates the coil in anticlockwise direction.
When the coil is in vertical position, the brushes X and Y would touch the centre of the commutator and the current in the coil is stopped. Though currentis is stopped but the coil comes back in horizontal state due to momentum.

After half rotation, the polarity of the commutator also changes, because now Q makes contact with brush X and P with brush Y. Therefore, now the force exerts downwards on the arm AB and upwards on the arm CD and thus again a couple of forces is formed that rotates the coil in clockwise direction. This process is repeated again and again and the coil rotates til! the current flows across it.
Function of split ring : Split ring in a motor acts as a commutator, i.e., it reverses the flow of current in the circuit due to which the direction of the forces acting on the arms also reverses.

24.Name some devices in which electric motors are used.

Answer: Electric motors are used in the appliances like electric fans, washing machine, mixers, grinders, blenders, computers, MP3 players, etc.

25. Magnetic field lines of two magnets are shown in fig. A and fig. B.



Select the figure that represents the correct pattern of field lines. Give reasons for your answer. Also name the poles of the magnets facing each other.

Answer. Figure B represents the correct pattern of field lines.

In figure A, field lines cross each other which is not possible because if they cross each other, at the point of intersection, there would be two directions of field lines.

In figure B, field lines are emerging in nature, so poles of magnet facing each other are north poles while opposite faces will have south polarity

Blue print - Sample paper class X

		SECTION A SA I	SECTION B SA II	SECTION C *CASE BASED	TOTAL
SL NO	CHAPTERS	2 MARKS EACH	3 MARKS EACH	4 MARKS EACH	
1	ELECTRICITY		3(2)	*4(1)	10(3)
2	MAGNETIC EFFECTS OF CURRENT	2(1)			2(1)
3	REPRODUCTION	2(2)			4(2)
4	HEREDITY	2(1)	3(1)	*4(1)	9(3)
5	PERIODIC CLASSIFICATION OF ELEMENTS	2(2)	3(1)		7(3)
6	CARBON AND ITS COMPOUNDS		3(1)		3(1)
7	OUR ENVIRONMENT	2(1)	3(1)		5(2)
	TOTAL	**14(7)**	**18(6)**	**8(2)**	**40(15)**

The question paper has **three sections** and **15 questions**. All questions are compulsory. However Internal choices have been provided in **3 questions of Section-A** and **2 questions of Section –B.** A student has to attempt only one of the alternatives in such questions

* Section C has 02 case-based questions. Each case is followed by 03 sub-questions (a, b and c). Parts a and b are compulsory (1mark each). However, an internal choice has been provided in part c. (2 marks)

SAMPLE QUESTION PAPER

CLASS X

Science (086)

Term 2 (2021-22)

Max. Marks:40 **Time allowed: 2 hours**

General Instructions:

i) All questions are compulsory.

ii) The question paper has three sections and 15 questions. All questions are compulsory.

iii) Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case-based questions of 4 marks each.

iv) Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions.

SECTION A

1.Study the table given below carefully and answer the questions.

GROUP	1	2	3 -12	13	14	15	16	17	18
2^{nd} pd.	A					C		D	E
3^{rd} pd.	E				B				

(a) Which element is a nonmetal with valency 1?

(b) Which element makes only covalent bond?

(c) Which element has the largest atomic radius?

(d) Write the electronic configuration of the element C

2. How does binary fission differ from multiple fission? Give one difference between the binary fission in amoeba and leishmania?

3.. Woman had undergone surgical method for preventing unwanted pregnancies. Does this protect her from getting sexually transmitted diseases? Write any other 2 contraceptive methods.

4.Write any two limitations of Mendeleev's periodic table and how these defects are rectified in Modern periodic table?

5. Explain the mechanism by which the chromosome number is maintained constant in human beings?

OR

With the help of suitable example, explain characters may be inherited, but may not be expressed always.

6. A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is

(a) pushed into the coil?

(b) withdrawn from inside the coil?

Give reason also.

OR

Name any 2 factors on which the strength of the magnetic field produced by a solenoid depends? How does it depend on these factors?

7. Explain with the help of an example, why the number of trophic levels in a food chain is limited?

OR

A food chain consists of fish, larvae, phytoplankton and birds. The level of pesticides in water in which these organisms live is high.

(a) Which organism will have the maximum amount of pesticides accumulated through the food chain and what is this process known as?

(b) Write the food chain comprising all the organisms mentioned above.

SECTION -B

8. Calcium is an element with atomic number 20. Answer the following stating reasons.

(a) Is calcium a metal or non-metal?

(b) Will its atomic radius be larger or smaller than that of potassium with atomic number 19?

(c) Write the formula of its oxide.

9. What is homologous series? List its any two characteristics. Write the name and formulae of the next higher homologue of HCOOH.

(OR)

What are structural isomers? Write down the possible isomers of butane.

10. Name the plant Mendel used for his experiments. What type of progeny was obtained by Mendel in F1 and F2 generations when he crossed the tall and short plants? Write the ratio he obtained in F2 generation plants.

11. (a) An electric bulb is rated at 200 V and 100 W. What is its resistance?

(b) Calculate the energy consumed by 3 such bulbs if they glow for 10 hours for the month of November.

(c) Calculate the total cost if the rate is Rs 6.50 per unit.

12. Show how would you join three resistors, each of resistance 9 Ω so that the equivalent resistance of the combination is: (i) 13.5 Ω (ii) 6 Ω? Represent the above combinations in a circuit diagram.

OR

The values of current (I) flowing through a given resistor of resistance (R) for the corresponding values of potential difference (V) across the resistor are as given below.

V(volts)	0.5	1.0	1.5	2.0	2.5	3.0	4.0

I(amperes)	0.1	0.2	0.3	0.4	0.5	0.6	0.8

(a) Plot a graph between current(I) and potential difference (V).
(b) Determine the resistance of the resistor.

13. List two main causes of the pollution of water of the river Ganga. State how pollution of the river water proves harmful for the health of people? What steps can be taken to solve this issue?

SECTION-C

This section has 2 case-based questions (14 and 15). Each case is followed by 3 sub-questions (a, b and c. Parts a and b are compulsory. However, an internal choice has been provided in part c.

14. Inheritance from one generation to the next provides a common body design with subtle changes. While some of these differences will be unique, others will be inherited from their respective parents who were different from each other. Selection of variants by environmental factors forms the basis for evolutionary processes.

(a) If a trait A exists in 10% of a population of an asexually reproducing species and a trait B exists in 60% of the same population, which trait is likely to have arisen earlier? (1mark)

(b) How does creation of variations in a species promote survival? (1 mark)

(c) Newly formed DNA copies may not be identical at times. Give reason (2mark)

(OR)

Which of the processes, sexual or asexual reproduction brings about maximum variation in the off springs? Why?

15. A fuse is a safety device having a short length of a thin, tin-plated copper wire having low melting point. The thickness and the length of the fuse wire depends on

the maximum current allowed through the circuit. The fuse for protecting our domestic wiring is fitted just above our main switch on the switch board.

Sangeeta of class X used a fuse rated as 6 A in a circuit in which an electric heater of 2.5 kW was connected with the main supply of 220 V. But the heater isn't working.

(a) Why Sangeeta's heater is not operating? Give reason. (1 mark)

(b) Will the heater work, if the given fuse is replaced by another fuse rated 16A?

(1 mark)

(c) Calculate how much current will flow in the circuit with the fuse rated 16 A? (2 mark).

Or

Write, how the fuse is connected in the circuit and why?

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SAMPLE QUESTION PAPER

CLASS X

Science (086)

Term 2 (2021-22)

Marking Scheme

1. (a) D (b) B (c) E (d) 2,5

2. Binary fission- parent organism splits to form two new organism.

Multiple fission - parent organism splits to form many new organisms.

In amoeba fission can take place in any plane whereas in Leishmania splitting of parent cell take place in a definite plane with respect to flagellum at its end.

3.No,it will not

Can use any other barrier methods such as condoms and diaphragm.

Can adopt chemical methods like the use of oral pills and vaginal pills by the females. (or any 2 suitable methods)

4. Two limitations of Mendaleev's periodic table

(1) No fixed position was given to hydrogen in the Mendaleev's periodic table.But the atomic number of Hydrogen is 1 and hence it is placed in the first position in group 1 of the Modern periodic table.

(2) No separate Position for isotopes was given in Mendaleev's periodic table.

As the isotopes of an element have same atomic number there is no need of separate place in the Modern periodic table.

(any 2 anomalies in the Mendaleev's periodic table and how it is rectified in Modern periodic table).

5. In human beings there are 22pairs of chromosomes along with sex chromosomes. Chromosome number becomes half during gamete formation . When the gametes fuse the original number of chromosomes is restored in the zygote.

OR

In Mendel's experiment when pure tall pea plants were crossed with dwarf pea plants only tall plants were obtained in the F1 generation.

On selfing the pea plants of F1 generation both tall and dwarf pea plants were obtained in F2 generation.

Reappearance of dwarf pea plants in the F2 generation proves that the trait 'dwarfness' was inherited but not expressed in F1 generation.

6. (a) When bar magnet is pushed into the coil galvanometer shows a momentary deflection due to the flow of an induced current in the coil.

(b) When bar magnet is withdrawn from inside the coil galvanometer shows a momentary deflection in the opposite direction due to the flow of an induced current in the coil.

OR

The 2 factors on which the strength of the magnetic field produced by a solenoid depends are

(1) directly proportional to the current flowing through the solenoid.

(2) directly proportional to the number of turns of the solenoid.

7. The number of trophic levels in a food chain is limited because after that the energy available for the next organism will be insufficient to sustain the life of that organism.

		10%		10%		10%	
Eg.	Grass	→	Mice	→	Snakes	→	Peacock
	100J		10J		1J		0.1 J

OR

(a) Bird will have the maximum amount of pesticides accumulated through the food chain.

This process known as Biological magnification

(b) Phytoplankton → larvae → fish → birds

SECTION -B

8. (a) Metal

(b) Its atomic radius is smaller than potassium.

(c) CaO

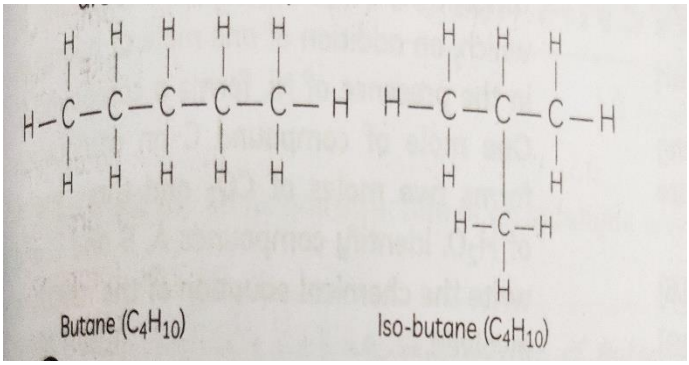
9. A homologous series is a group of organic compounds having similar structure and similar chemical properties in which the successive compounds differ by -CH_2

Characteristics: All members can be represented by same general formula/ Two adjacent homologue differ by-CH_2 or 14 u/ all members have similar chemical properties.

CH3COOH- Ethanoic acid (Acetic acid)

(OR)

10. Compounds having same molecular formula but different structures are called as structural isomers.



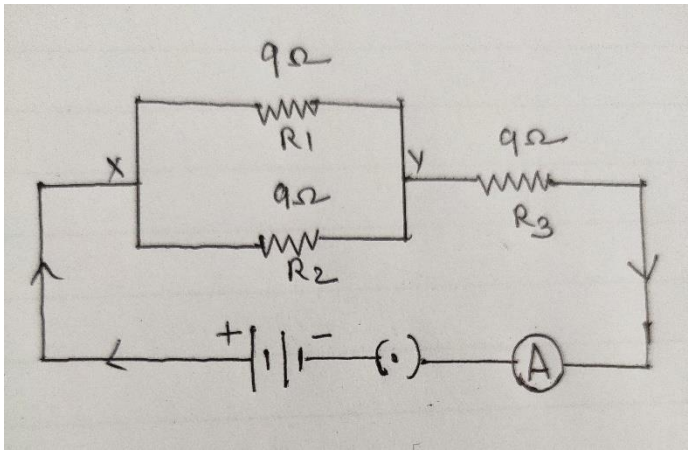
11. (a) V=220V , P=100W, R=? $P=V^2/R$ $R=V^2/P$ =200x200/100 =400Ω

(b) P=100W = 0.1 KW No 0f bulbs= 3 Time= 10 hours No of days =30

=0.1x3x10x30 = 90KWh.

(c) Rate per unit= 6.50 90 x 6.50 = Rs 585.00

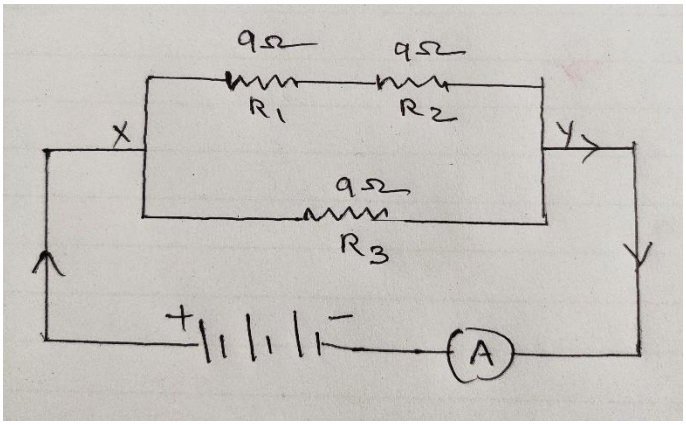
12. (i) 13.5 Ω



$1/R_p = 1/R_1 + 1/R_2 \quad = 1/9 + 1/9 \quad R_p = 9/2 \quad = 4.5\ \Omega$

$R = R_p + R_3 \quad = 4.6 + 9 = 13.5\ \Omega$

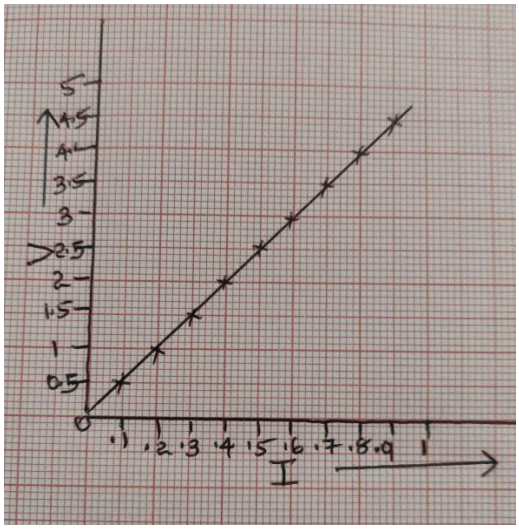
(ii) 6 Ω



$R_s = R_1 + R_2 \quad = 9 + 9 = 18\ \Omega$

$1/R = 1/R_s + 1/R_3 \quad = 1/18 + 1/9 \quad = 3/18 \quad R = 18/3 = 6\ \Omega$

(OR)



R=V/I 1/0.2 = 5 **Ω**

13. **Causes**: (i) Disposal of industrial effluents (ii). Human activities like bathing, washing. (iii) disposal of dead bodies/ashes. (iv) disposal of untreated sewage.

Effects on Human Health: (i) spread of water borne diseases. (ii) Consumption of contaminated fishes lead to health issues. (iii) accumulation of chemicals by biomagnification.

Prevention: (i) strict laws by government (ii) Fine /punishment to offenders

(iii) Awareness programs through media.

CASE STUDY

14. (a) Trait B

(b) Depending on the nature of variations each individual would have different advantages of survival.

(c) The replication of DNA is done by biochemical reactions. When replication takes place there may be slight errors in copying. So, the copies may not be identical. These errors in replication leads to variations in asexual reproduction.

(OR)

Sexual reproduction would bring in maximum variation due to separation and recombination of genes from two different parents.

15.

(1) The heater was not operating as fuse wire melted on switching.

(2) Yes

(3) I = P/V

= 2500/220

= 11.36 A

OR

The fuse is connected in series with the circuit because then only on melting of fuse wire the whole circuit will be affected and the flow of current will be stopped.

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SAMPLE QUESTION PAPER
CLASS X
Science (086)
Term 2 (2021-22)

Max. Marks:40 **Time allowed: 2 hours**

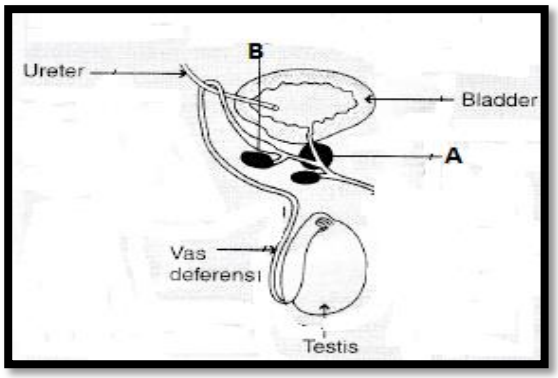
General Instructions:

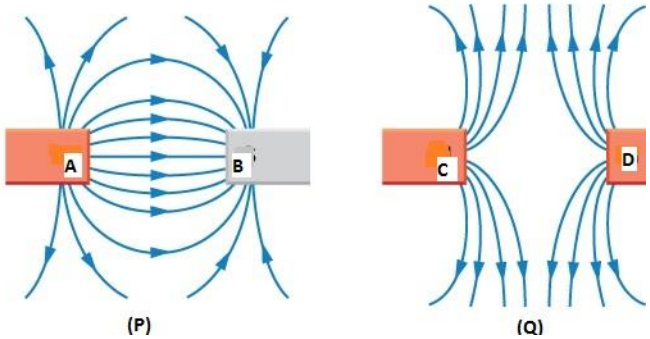
i) All questions are compulsory.

ii) The question paper has **three sections** and **15 questions**. All questions are compulsory.

iii) Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case based questions of 4 marks each.

iv) Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions

	SECTION-A	
1.	1)An element 'Z' has four shells and same number of electrons in the first and fourth shell as well as second and third shell. a)Identify its group and period. b)Write the electronic configuration of the element. c)What type bond will it form with the element 'X'(2,8,6)	2
2.	In any homologous series there is a gradation in physical properties but the chemical properties remain similar. Justify the given statement with valid reasons.	2
3	 a)Identify the glands A and B in the figure given above. b)Write two functions of the secretions of these glands.	2
4.	Rahul noticed that buds in the notches along the leaf margin of a plant fall on the soil and develop, into new plants. a)Identify the plant and the specific mode of asexual reproduction.	2

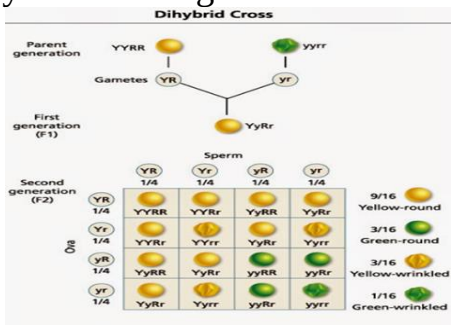
	b)List two advantages of this mode of propagation in plants	
5	In the given Mendelian di hybrid cross 4 types of combinations were seen in the F_2 generation. Identify and classify these types as parental types and new combinations.  ORd When two purebred rabbits, a male with black fur and a female with tan fur are crossed , all of the F_1 generation had tan fur. Identify the dominant and recessive trait .Justify your answer giving reason for this identification.	2
6	How would the strength of magnetic field in a current carrying loop be affected if a)the radius of the loop is reduced to half of its original radius? b)strength of current through the loop is doubled? OR  P and Q shows the magnetic field lines of force between the poles of the magnet. Identify the poles A,B,C and D	2
7	Food web increases the stability of an ecosystem. Justify OR State and explain any two possible consequences of elimination of decomposers from the earth.	2
	SECTION-B	
8	i. How and why does the atomic size of the elements vary as we move a) from left to right in a period and b) down a group? ii. How does the tendency of the elements to lose electrons change in the modern periodic table a) in a group and b) in a period?	

9	Define the term isomers. Draw the structures of two isomers of butane. Explain why we cannot have isomers of first three members of alkane series	
10	Explain with suitable example how Mendel proved that traits are inherited independently	
11	Show how would you join three resistors, each of resistance 9 ohm so that the equivalent resistance of the combination is (i) 13.5 ohm (ii) 6 ohm	
12	Calculate the total cost of running the following electrical devices in the month of September, if the rate of 1 unit of electricity is Rs. 6.00 (i) Electric heater of 1000W for 5 hours daily (ii) Electric refrigerator of 400W for 10 hours daily	
13	(i)Write down the importance of ozone layer and mention how its formed. (ii)Explain the causes of depletion of ozone layer	
SECTION-C **This section has 02 case-based questions (14 and 15). Each case is followed by 03 sub-questions (a, b and c). Parts a and b are compulsory. However, an internal choice has been provided in part c.**		
14	Whether an animal will become a male, a female, or a hermaphrodite is determined very early in development. Scientists have worked for hundreds of years to understand the sex-determination system. Environmental theories of sex determination, such as Aristotle's, were popular until about 1900, when sex chromosomes were discovered. For most animals, however, sex is determined chromosomally. a)Give one example of an environmental factor that govern sex determination.(1) b)Males are heterogametic, Why?(1) c)With the help of a flow chart determine genetically in human beings the sex of offspring if the sperm carrying X chromosome fertilizes the egg.(2) OR Male has 46 chromosomes and female has 46 chromosomes. Then why does not their offspring has 46 pairs of chromosomes which is obtained by fusion of male and female gametes?	4

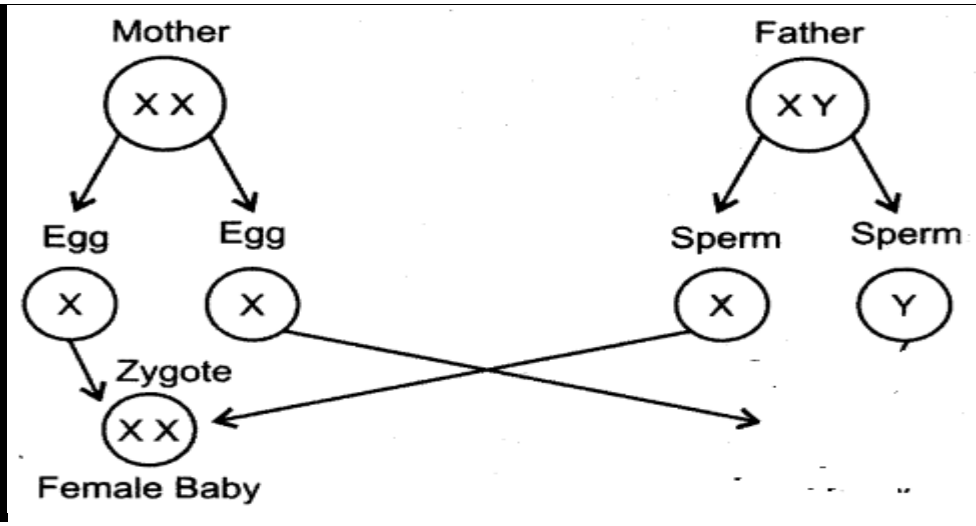
15	A solenoid is long helical coil of wire through which a current is run in order to create a magnetic field. The magnetic field of the solenoid is the superposition of the field due to the current through each coil. It is nearly uniform inside the solenoid and close to zero outside and is similar to the field of a bar magnet having a north pole at one end and a south pole at the other depending upon the direction of current flow. The magnetic field produced in the solenoid is dependent on a few factors such as, the current in the coil, number of turns per unit length etc. a) What decides the direction of magnetic field by a current carrying solenoid? 1 mark b) How can we compare a current carrying solenoid with a bar magnet? 1 mark c)How can we increase the strength of the magnetic field produced by a current carrying solenoid? OR How can we make an electromagnet with the help of a solenoid? 2 mark	4

ANSWER KEY
CLASS X
Science (086)
Term 2 (2021-22)

SECTION-A		
1	a)group 2 and period 4 b)2,8,8,2 c)ionic bond	½+½ ½ ½
2	As the molecular mass increases in any homologous series, a gradation in physical properties is seen. This is because the melting and boiling points increase with increasing molecular mass. .But the chemical properties, which are determined solely by the functional group, remain similar in a homologous series	1 1
3	a)A-prostate gland, B-seminal vesicle b)Sperms are in fluid form which makes their transport easier and this fluid also provide nutrition	½+½ ½+½
4	a)Bryophyllum, vegetative propagation b)Bears flowers and fruits much earlier than plants produced from seeds, plants produced are genetically similar to parent plant or any other correct advantage	½+½ ½+½
5	Parental types-round and yellow, wrinkled and green New combinations-wrinkled and yellow, round and green OR Tan fur is dominant, while black fur is recessive. Tan fur is the dominant trait, because it is expressed in the offspring of the cross. Black fur is the recessive trait, because it is hidden in the offspring of the cross.	½+½ ½+½ ½+½ 1
6	a)The strength of magnetic field is doubled/increases b)The strength of magnetic field increases two times/increases. OR Fig P-unlike poles Fig Q-like poles	1 1 1 1
7	Food web depicts a series of branching lines of food chain where many food chains are interlinked. If any one of the organism becomes endangered or extinct ,food chain offers alternative options for survival OR	2 1+1

	Increase in complex organic substances causes land and water pollution, may disturb the balance of ecosystem or any other logically correct reason.	
SECTION-B		
8	(i) a.Atomic size decreases due to increase in nuclear charge b. Atomic size increases due to increase in no. of shells (ii) a. In a period it decreases and b) In a group it increases	1 1 ½+½
9	Definition of isomers Structure of isomers of butane - NCERT textbook page no. 65 ,fig.4.8(b) First three members of alkane do not have branched structure	½ 1+1 ½
10	Explanation of di hybrid crossing  or any other example	1 2
11	Two 9 ohm resistors in parallel connected to one 9 ohm resistor in series 9 ohm 9ohm  1/R=1/9+1/9=2/9 9ohm R=9ohm+9/2= 13.5 ohm Two 9 ohm resistors in series connected to one 9 ohm resistor in parallel connection  ∴ R= 9ohm+9ohm=18 ohm	1½ 1½

	1/R=1/18+1/9=3/18 R=6 ohm	
12	P1=1000 W=1000/1000 kW, t_1 = 5h P2 = 400 W = 400/1000kW, t_2 = 10h No. Of days, n = 30 $E_1 = P_1 \times t_1 \times n$ = 1 kW x 5h x 30 = 150 kWh $E_2 = P_2 \times t_2 \times n$=400 /1000 kWx10hx30=120kWh :. Total energy = (150 +120) kWh = 270 kWh :: Total cost = 270 x 6 = Rs. 1620	1 1 1
13	Protect us from harmful radiations of sun Ozone is formed by combining diatomic oxygen molecule with one oxygen atom. Depletion by chemicals like CFCs and Freon	1 1 1
SECTION-C		
14	a)Temperature at which fertilized eggs are kept b)Males produce two types of gametes X and Y c)	1 1 2

	)  OR c)Gametes have half the number of chromosomes, thus ovum will have 23 and sperm will have 23.Fusion of these gametes restores 46 chromosomes	
15	a) Direction of flow of current through the solenoid b) The magnetic field produced by a current carrying solenoid is similar to the magnetic field produced by a bar magnet. c) Strength of magnetic field can be increased by increasing current and increasing the number of turns OR An electro magnet can be made by keeping a soft iron core inside a current carrying solenoid.	1X2 2 marks

KENDRIYA VIDYALAYA SANGATHAN
ERNAKULAM REGION
SAMPLE PAPER

SCIENCE BLUE PRINT

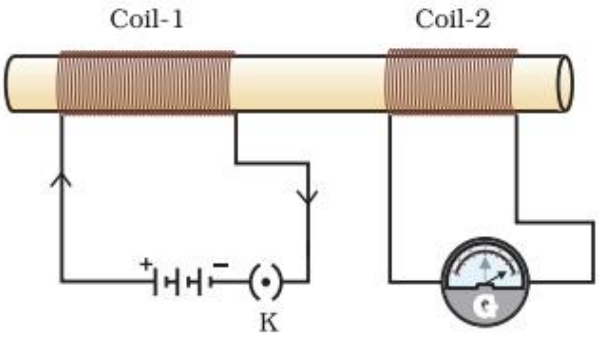
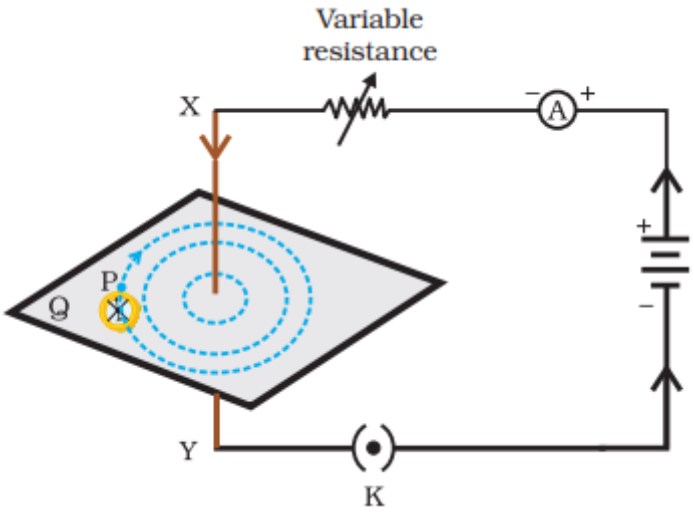
CLASS X MM 40 TIME 2 h

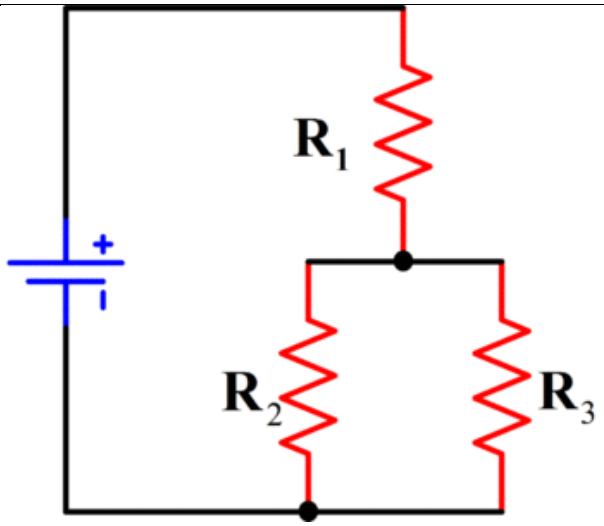
SL NO	CHAPTER	SA 2marks	SA 3 marks	LA 4marks	TOTAL
1	CARBON AND ITS COMPOUNS	1	1		5
2	PERIODIC CLASSIFICATION OF ELEMENTS	1	1		5
3	HOW DO ORGANISMS REPRODUCE?	2			4
4	HEREDITY AND EVOLUTION	1	1	1	9
5	ELECTRICITY		2		6
6	MAGNETIC EFFECT OF ELECTRIC CURRENT	1		1	6
7	OUR ENVIRONMENT	1	1		5
	TOTAL	14	18	8	40

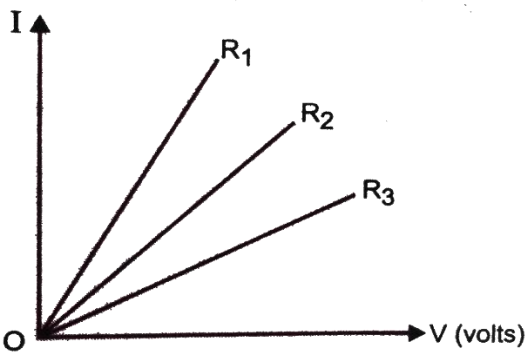
KENDRIYA VIDYALAYA SANGATHAN ERNAKULAM REGION

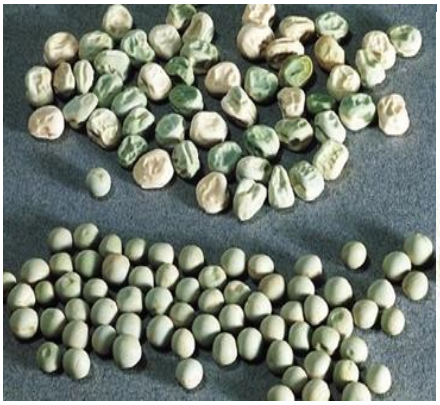
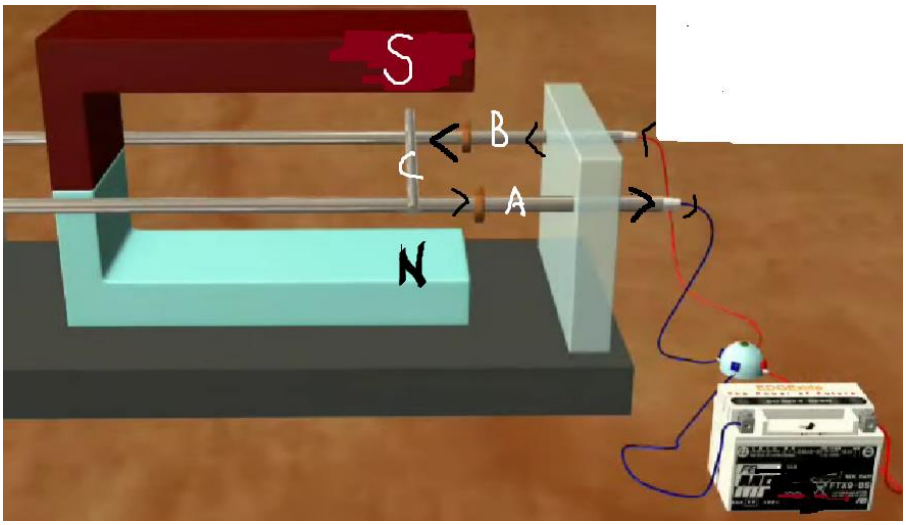
CLASS X SCIENCE MM 40 TIME 2 h

Qn no	QUESTIONS	MARKS
1	Elements forming ionic compounds attain noble gas configuration by either gaining or losing electrons from their outermost shells. Give reason to explain why carbon cannot attain noble gas configuration in this manner to form its compounds.	2
2	i)Write the electronic configuration of two elements X and Y whose atomic numbers are 20 and 17 respectively. ii)Write the molecular formula of the compound formed when element X reacts with element Y	2
3	Vegetative propagation is a technique being practiced widely to propagate some kinds of plants. Write any three advantages and one disadvantage of vegetative propagation.	2
4	A student in viewing under a microscope a permanent slide showing various stages of asexual reproduction of Hydra by budding . Draw diagrams of what he observes (in proper sequence)	2
5	Name the plant Mendel used for his experiment. How do Mendel's experiment show that traits are inherited independently? OR When organisms reproduce, variations are found among the offsprings. What is the significance of these variations in a population?	2

6	 A student took two different coils of copper wire having large number of turns and set up an arrangement as shown in the above figure. (i)What will you observe when the key 'K' in coil-1 a) disconnects the battery from coil-1 ? b) connects it back to coil -1? (ii) Write the basic phenomenon behind this observation. OR In the given figure, a battery a rheostat, an ammeter and a plug key are connected in a circuit . A long straight thick copper wire is inserted through the centre of a card board .Iron filings are sprinkled uniformly around the cardboard shows a pattern of concentric circles.  a) What do these concentric circles represent? b) Sate the rule by which you can find out the direction of magnetic field produced around the conductor XY? c)What happens to the direction of magnetic field lines, if the direction of current through the straight copper wire is reversed? d)Suggest a method to increase the strength of magnetic field around XY.	2
7	Bacteria and fungi are very important biotic components of ecosystem.	2

	Write the significance of these organisms in the ecosystem. OR Draw a food chain having four trophic levels. If 1000J of energy is available in the first trophic level, how much energy is available in the fourth trophic level? Give reason.	
	SECTION B	
8	Define the Atomic Size. Give its unit of measurement in the Modern periodic table .What trend is observed in the Atomic Radius in a group and a period and why is it so?	3
9	a) Draw the electron dot structure of i)nitrogen molecule ii)methane molecule b) i)What kind of chemical bond is present in these molecules? ii)How does this bond differ from the chemical bond existing in sodium chloride molecule? c)Why methane exist in gaseous state while sodium chloride exists in solid state under normal conditions? Explain in terms of nature of chemical bonds present in them. OR a)Write the structural formula of the following : i)ethane ii)ethyne iii)propene iv)butane b)Which among them are saturated ?	1 1 1 2 1
10	Different species use very different strategies for determining sex. Some rely entirely on environmental conditions. How is sex of a child determined in human beings? Explain.	3
11	 In the given circuit diagram ,suppose the resistors R1,R2 and R3 have the values 6 Ω, 10 Ω, 15 Ω, respectively, which have been connected to a battery of 24 V. Calculate (a) the total circuit resistance	3

	(b) the total current in the circuit, and (c) the current through R1	
12	i)State Ohm's law. A student carries out an experiment and plots the V-I graph of three samples of nichrome wire with resistance R1, R2, R3 respectively (see in figure).  ii) a) Which of these resistance R1, R2, R3, is the highest? b) If these nichrome wires are connected in a circuit to produce heat , which one will produce more heat? Why? OR When a voltmeter is connected directly across a resister, its reading is 2 V. An electric cell is sending the current of 0.4 A, measured by an ammeter, in the electric circuit in which a rheostat is also connected to vary the current. (a) Draw an equivalent labelled circuit for the given data. (b) Find the resistance of the resister. (c) Name and state the law applicable in the given case. d)A graph is drawn between a set of values of potential difference (V) across the resister and current (I) flowing through it. Show the nature of graph thus obtained.	3
13	Ozone (O3) is a molecule formed by three atoms of oxygen. While O2, is essential for all aerobic forms of life, ozone, is a deadly poison. But ozone layer at higher altitude of earth's atmosphere is beneficial for life on earth. The amount of ozone in the atmosphere began to drop sharply in the 1980s is a cause of concern . a)How is ozone formed in the atmosphere? b)What are the consequences of ozone depletion at the upper layers of atmosphere of earth? c)Write the reason for ozone layer depletion in the atmosphere.	3

14	  In pea plants, the traits round seed is dominant over the wrinkled seed. A pure variety plant with round seed is crossed with a plant that has wrinkled seeds. a)Work out the cross and write the ratio of plants with round and wrinkled seeds in F2 generation. b)What is the trait shown by F1 progeny? Why do all plants of the F1 progeny have same trait? c)How is F2 generation raised from F1 plants? OR Differentiate between dominant and recessive traits.	4
15	
 In the given figure, N,S- north and south poles of a strong horse shoe magnet A, B- metal rods C- small aluminium rod placed across the metal rods A strong horse-shoe magnet is kept in between two metal rods. Metal rods are connected to the battery.The circuit is completed by a small piece of aluminium rod placed freely on the metal rods which can easily move. When we switch on the circuit, electric current is passed through the aluminium rod C, in the direction ,from B to A, the aluminium rod is displaced.	4

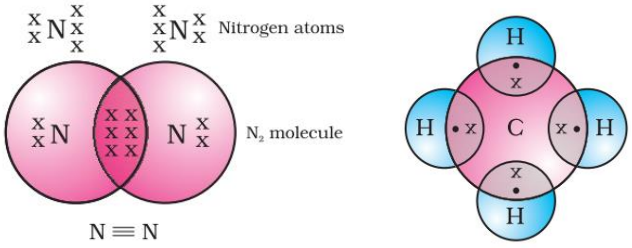
	a)Write the direction of displacement of the aluminium rod C. Is it towards inside the magnet or outside the magnet? b) What change do you make in this arrangement to make the rod move in the opposite direction? c)i)Why does the rod get displaced? ii)Name a device in which this phenomenon is applied in our day today life . OR State the rule which help us to identify the direction of displacement of the aluminium rod.	

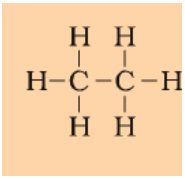
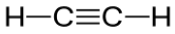
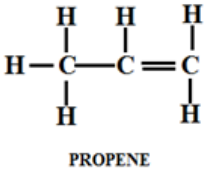
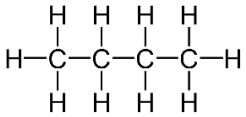
KENDRIYA VIDYALAYA SANGATHAN ERNAKULAM REGION

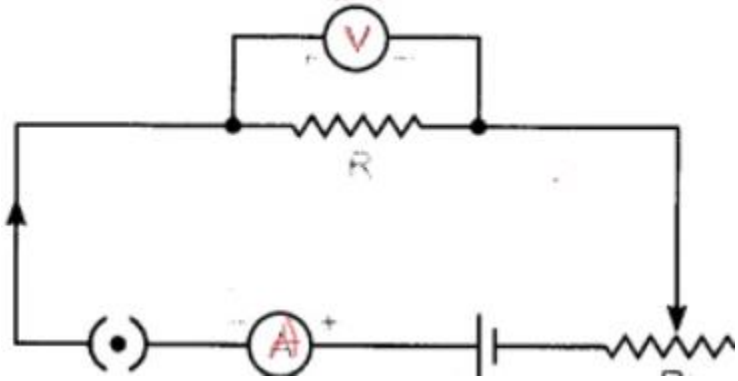
CLASS X SCIENCE MM 40 TIME 2 h

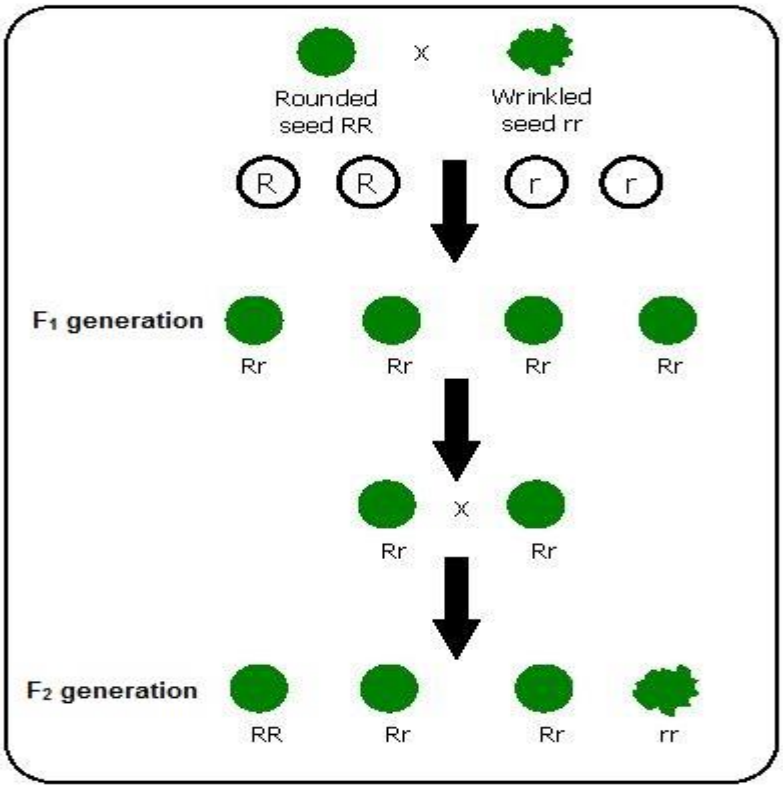
MARKING SCHEME

Qn no	VALUE POINTS	MARKS
1	(i) It could gain four electrons forming C4– anion. But it would be difficult for the nucleus with six protons to hold on to ten electrons, that is,four extra electrons. (ii) It could lose four electrons forming C4+ cation. But it would require a large amount of energy to remove four electrons leaving behind a carbon cation with six protons in its nucleus holding on to just two electrons.	1 1
2	i)X 2,8,8,2 Y 2,8,7 ii)XY_2	1
3	Advantages --early maturation and early yield, ideal method to propagate seedless varieties, new plants are genetically similar to the parents, so best method to propagate high yielding varieties. Disadvantage –reduces variation in the population so do not promote evolution.	11/2 1/2
4	Diagram labelling	1 1
5	Garden pea/Pisum sativum In the cross between pea plants having two different traits, (dihybrid cross) like round green seeds with wrinkled yellow seeds, two new combination of traits were obtained like round yellow seeds and wrinkled green seeds. This is possible only because the inheritance of shape does not influence the inheritance of colour.So inheritance of one character is independent of the inheritance of other character. OR When there is a sudden change the environment,organisms with suitable variations survive .Through them the species also will survive. Accumulation of variations for many generations results in origin of new species.	1 1 1 1
6	i)a)galvanometer needle shows a momentary deflection to left side	½

	indicating a momentary current in coil2 b) galvanometer needle shows a momentary deflection to the opposite side indicating a momentary current in opposite direction in coil2 ii)electromagnetic induction OR a)magnetic field lines around the conductor carrying current b)statement - right hand thumb rule c)direction of magnetic field is also reversed. d)by increasing the electric current in the circuit.	½ 1
7	They are decomposers which help in the cycling of nutrient elements in nature. They also act as cleansing agents of our environment by removing dead organic matter by decomposing them. OR grass → grasshopper → shrew → owl 1J	1 1 1 1
8	The distance between the centre of the nucleus and the outermost shell of an isolated atom is called its radius. Picometre The atomic radius decreases in moving from left to right along a period. This is due to an increase in nuclear charge which tends to pull the electrons closer to the nucleus and reduces the size of the atom.	1 1/2 1/2 1
9	a)  b) i)covalent bond ii)these molecules have covalent bond/bond formed by sharing of electrons where as sodium chloride molecule has ionic bind between the atoms/bond formed by transfer of electrons. c)methane ---covalent compound—has low melting and boiling point—interparticle force of attraction is less. sodium chloride ---ionic compound—has high melting and boiling point—inter ionic force of attraction is more. OR	1 ½ ½ 2

	a)i) ii) iii)    PROPENE iv)  b)ethane and butane	1
10	Sex is determined by sex chromosome in human beings. Sex chromosomes are of two types X and Y XX-female, XY -male Male produces two types of gamates/sperms --X type and Ytype and all ova are X type . If X type of sperm fuses with ovum—results in female baby If Y type of sperm fuses with ovum---results in male baby	1 1 1
11	a)total circuit resistance : R2parallel to R3 effective resistance 1/Rp=1/R1+1/R2 =1/10+1/15 1/Rp = 5/30=1/6 ; Rp =6 ohm Total resistance R =6+6=12 ohm b)potential difference V =24V Current I = V/R = 24/12=2A c)current trough R1= 2A	11/2 1 1/2
12	i)At constant temperature , the potential difference across the ends of a resistor is directly proportional to the current flowing through it. ii)a)R3 b)R3 produces more heat Heat generated is directly proportional to the resistance for a given current. OR a)	1 1 1 1

	 b)Resistance of the resistor R =V/I = 2/0.4=5ohm c) Ohm's law: At constant temperature , the potential difference across the ends of a resistor is directly proportional to the current flowing through it. d) straight line	½ 1 ½
13	a) $O_2 \xrightarrow{UV} O + O$ $O + O_2 \rightarrow O_3$ (Ozone) b)cataract, skin cancer c)CFC/HCFC	1 1 1
14	a)	 1

	 round seeds: wrinkled seeds = 3: 1 b) F1—all --round seeds All have same genetic constitution Rr. Round is the dominant trait so all F1plants are round seeded. c) self pollination of F1 plants OR Dominant trait: A trait that can be expressed by a single copy of gene Recessive trait : A trait which requires two copies of genes for expression	1 1 1 1
15	a)towards inside the magnet b)change the direction of current / change the pole of horse shoe magnet c)i)a current carrying conductor placed in a magnetic field will experience a force ii)electric motor OR Fleming's left-hand rule: stretch the thumb,forefinger and middle finger of your left hand such that they are mutually perpendicular. If the first finger points in the direction of magnetic field and the second finger in the direction of current, then the thumb will point in the direction of motion or the force acting on the conductor.	1 1 1 1 1

SAMPLE QUESTION PAPER
CLASS X
Science (086)
Term 2 (2021-22)

Max. Marks:40 **Time allowed: 2 hours**

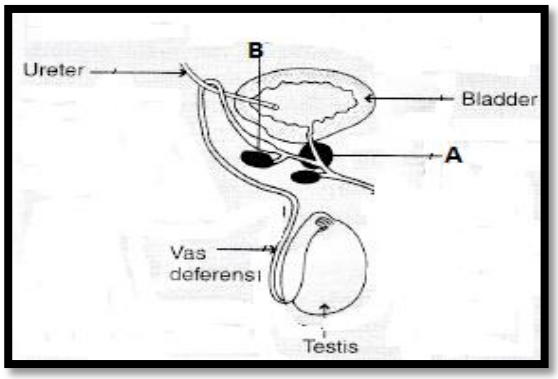
General Instructions:

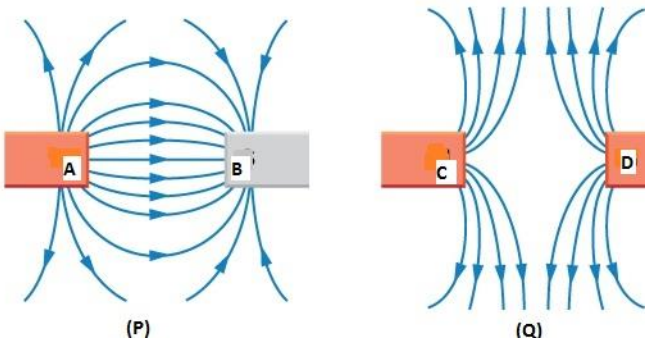
i) All questions are compulsory.

ii) The question paper has **three sections** and **15 questions**. All questions are compulsory.

iii) Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case based questions of 4 marks each.

iv) Internal choices have been provided in some questions. A student has to attempt only one of the alternatives in such questions

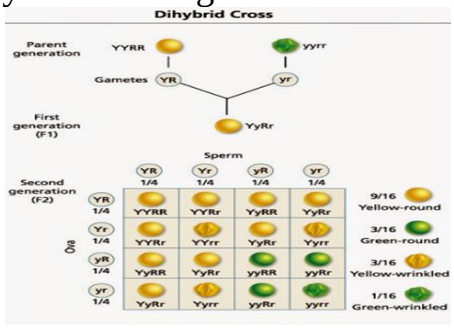
	SECTION-A	
1.	1)An element 'Z' has four shells and same number of electrons in the first and fourth shell as well as second and third shell. a)Identify its group and period. b)Write the electronic configuration of the element. c)What type bond will it form with the element 'X'(2,8,6)	2
2.	In any homologous series there is a gradation in physical properties but the chemical properties remain similar. Justify the given statement with valid reasons.	2
3	 a)Identify the glands A and B in the figure given above. b)Write two functions of the secretions of these glands.	2
4.	Rahul noticed that buds in the notches along the leaf margin of a plant fall on the soil and develop, into new plants. a)Identify the plant and the specific mode of asexual reproduction. b)List two advantages of this mode of propagation in plants	2
5	In the given Mendelian di hybrid cross 4 types of combinations were seen in the F_2 generation. Identify and classify these types as parental types and new combinations.	2

	 ORd When two purebred rabbits, a male with black fur and a female with tan fur are crossed , all of the F_1 generation had tan fur. Identify the dominant and recessive trait .Justify your answer giving reason for this identification.	
6	How would the strength of magnetic field in a current carrying loop be affected if a)the radius of the loop is reduced to half of its original radius? b)strength of current through the loop is doubled? OR  P and Q shows the magnetic field lines of force between the poles of the magnet. Identify the poles A,B,C and D	2
7	Food web increases the stability of an ecosystem. Justify OR State and explain any two possible consequences of elimination of decomposers from the earth.	2
	SECTION-B	
8	i. How and why does the atomic size of the elements vary as we move a) from left to right in a period and b) down a group? ii. How does the tendency of the elements to lose electrons change in the modern periodic table a) in a group and b) in a period?	
9	Define the term isomers. Draw the structures of two isomers of butane. Explain why we cannot have isomers of first three members of alkane series	
10	Explain with suitable example how Mendel proved that traits are inherited independently	
11	Show how would you join three resistors, each of resistance 9 ohm so that the equivalent resistance of the combination is (i) 13.5 ohm (ii) 6 ohm	
12	Calculate the total cost of running the following electrical devices in the month of September, if the rate of 1 unit of electricity is Rs. 6.00 (i) Electric heater of 1000W for 5 hours daily (ii) Electric refrigerator of 400W for 10 hours daily	
13	(i)Write down the importance of ozone layer and mention how its formed. (ii)Explain the causes of depletion of ozone layer	

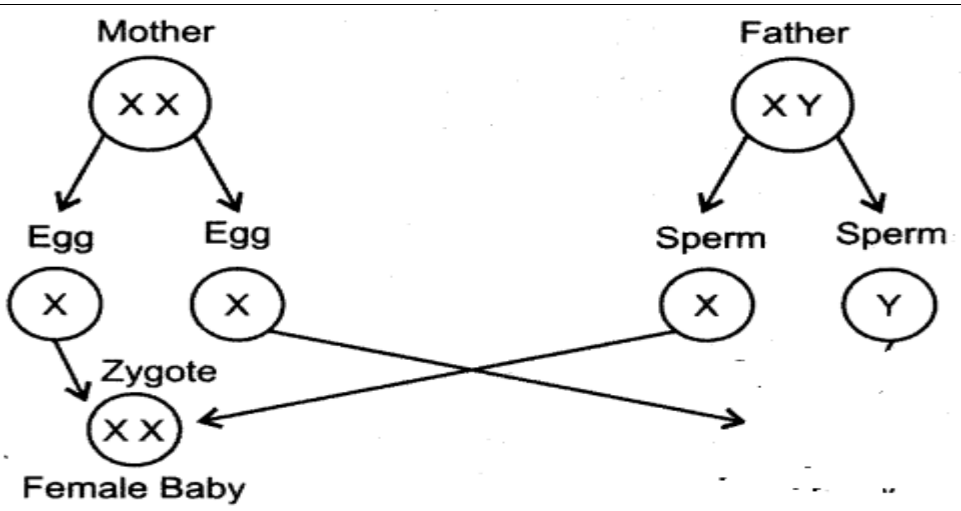
	SECTION-C **This section has 02 case-based questions (14 and 15). Each case is followed by 03 sub-questions (a, b and c). Parts a and b are compulsory. However, an internal choice has been provided in part c.**	
14	Whether an animal will become a male, a female, or a hermaphrodite is determined very early in development. Scientists have worked for hundreds of years to understand the sex-determination system. Environmental theories of sex determination, such as Aristotle's, were popular until about 1900, when sex chromosomes were discovered. For most animals, however, sex is determined chromosomally. a)Give one example of an environmental factor that govern sex determination.(1) b)Males are heterogametic, Why?(1) c)With the help of a flow chart determine genetically in human beings the sex of offspring if the sperm carrying X chromosome fertilizes the egg.(2) OR Male has 46 chromosomes and female has 46 chromosomes. Then why does not their offspring has 46 pairs of chromosomes which is obtained by fusion of male and female gametes?	4
15	A solenoid is long helical coil of wire through which a current is run in order to create a magnetic field. The magnetic field of the solenoid is the superposition of the field due to the current through each coil. It is nearly uniform inside the solenoid and close to zero outside and is similar to the field of a bar magnet having a north pole at one end and a south pole at the other depending upon the direction of current flow. The magnetic field produced in the solenoid is dependent on a few factors such as, the current in the coil, number of turns per unit length etc. a) What decides the direction of magnetic field by a current carrying solenoid? 1 mark b) How can we compare a current carrying solenoid with a bar magnet? 1 mark c)How can we increase the strength of the magnetic field produced by a current carrying solenoid? OR How can we make an electromagnet with the help of a solenoid? 2 mark	4

ANSWER KEY
CLASS X
Science (086)
Term 2 (2021-22)

SECTION-A		
1	a)group 2 and period 4 b)2,8,8,2 c)ionic bond	½+½ ½ ½
2	As the molecular mass increases in any homologous series, a gradation in physical properties is seen. This is because the melting and boiling points increase with increasing molecular mass. .But the chemical properties, which are determined solely by the functional group, remain similar in a homologous series	1 1
3	a)A-prostate gland, B-seminal vesicle b)Sperms are in fluid form which makes their transport easier and this fluid also provide nutrition	½+½ ½+½
4	a)Bryophyllum, vegetative propagation b)Bears flowers and fruits much earlier than plants produced from seeds, plants produced are genetically similar to parent plant or any other correct advantage	½+½ ½+½
5	Parental types-round and yellow, wrinkled and green New combinations-wrinkled and yellow, round and green OR Tan fur is dominant, while black fur is recessive. Tan fur is the dominant trait, because it is expressed in the offspring of the cross. Black fur is the recessive trait, because it is hidden in the offspring of the cross.	½+½ ½+½ ½+½ 1
6	a)The strength of magnetic field is doubled/increases b)The strength of magnetic field increases two times/increases. OR Fig P-unlike poles Fig Q-like poles	1 1 1 1
7	Food web depicts a series of branching lines of food chain where many food chains are interlinked. If any one of the organism becomes endangered or extinct ,food chain offers alternative options for survival OR	2 1+1

	Increase in complex organic substances causes land and water pollution, may disturb the balance of ecosystem or any other logically correct reason.	
SECTION-B		
8	(i) a.Atomic size decreases due to increase in nuclear charge b. Atomic size increases due to increase in no. of shells (ii) a. In a period it decreases and b) In a group it increases	1 1 ½+½
9	Definition of isomers Structure of isomers of butane - NCERT textbook page no. 65 ,fig.4.8(b) First three members of alkane do not have branched structure	½ 1+1 ½
10	Explanation of di hybrid crossing  or any other example	1 2
11	Two 9 ohm resistors in parallel connected to one 9 ohm resistor in series 9 ohm 9ohm  1/R=1/9+1/9=2/9 9ohm R=9ohm+9/2= 13.5 ohm Two 9 ohm resistors in series connected to one 9 ohm resistor in parallel connection  ∴ R= 9ohm+9ohm=18 ohm	1½ 1½

	1/R=1/18+1/9=3/18 R=6 ohm	
12	P1=1000 W=1000/1000 kW, t_1 = 5h P2 = 400 W = 400/1000kW, t_2 = 10h No. Of days, n = 30 $E_1 = P_1 \times t_1 \times n$ = 1 kW x 5h x 30 = 150 kWh $E_2 = P_2 \times t_2 \times n$=400 /1000 kWx10hx30=120kWh :. Total energy = (150 +120) kWh = 270 kWh :: Total cost = 270 x 6 = Rs. 1620	1 1 1
13	Protect us from harmful radiations of sun Ozone is formed by combining diatomic oxygen molecule with one oxygen atom. Depletion by chemicals like CFCs and Freon	1 1 1
SECTION-C		
14	a)Temperature at which fertilized eggs are kept b)Males produce two types of gametes X and Y c)	1 1 2

	)  OR c)Gametes have half the number of chromosomes, thus ovum will have 23 and sperm will have 23.Fusion of these gametes restores 46 chromosomes	
15	a) Direction of flow of current through the solenoid b) The magnetic field produced by a current carrying solenoid is similar to the magnetic field produced by a bar magnet. c) Strength of magnetic field can be increased by increasing current and increasing the number of turns OR An electro magnet can be made by keeping a soft iron core inside a current carrying solenoid.	1X2 2 marks

TERM-2

CBSE - CLASS 10 -

SCIENCE

SAMPLE PAPER 5 –

BLUE PRINT

Total Marks-40
Time duration-2 hours
Total no of Questions - 15

Section A - 14 Marks 7 X 2 = 14

Section B - 18 Marks 6 X 3 = 18

Section C - 8 Marks 2 X 4 = 08

Total - 40 Marks

Chap. No	Chap. Name	2 marks	3 marks	4 marks
4	Carbon and its compounds	1	1+1(int)	-
5	Periodic classification of Elements	1	1	-
8	How do organisms Reproduce?	1	-	-
9	Heredity and Evolution	2+1 (int)	1	1 {1+1+2+2 (int)}
12	Electricity	-	2+1(int)	-
13	Magnetic effects of Electric current	1+1(int)	-	1 {1+1+2+2 (int)}
15	Our Environment	1+1(int)	1	-
TOTAL		14	18	8

KENDRIYA VIDYALAYA ERNAKULAM REGION

CLASS X

Max. Marks : 40 **Science**

Time : 2 hour

General Instructions:

i) All questions are compulsory.

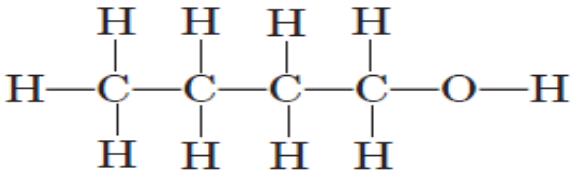
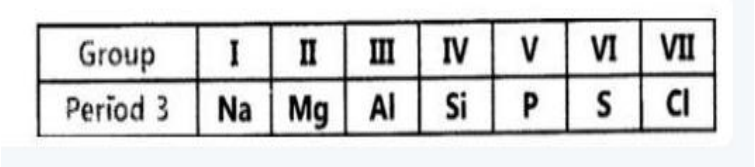
ii) The question paper has three sections and 15 questions. All questions are compulsory.

iii) Section–A has 7 questions of 2 marks each; Section–B has 6 questions of 3 marks each; and Section–C has 2 case based questions of 4 mark

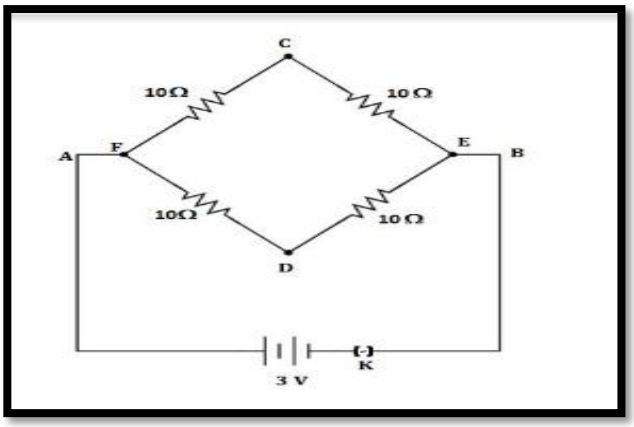
iv) Internal choices have been provided in some questions.

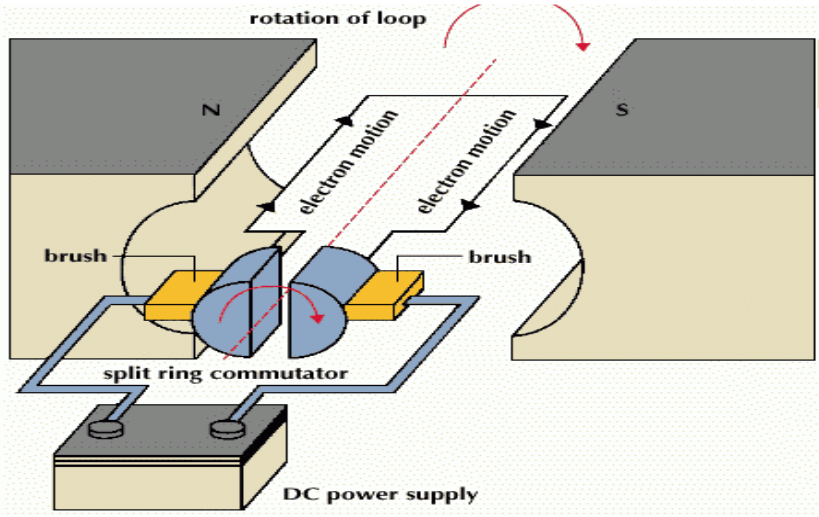
A student has to attempt only one of the alternatives in such questions.

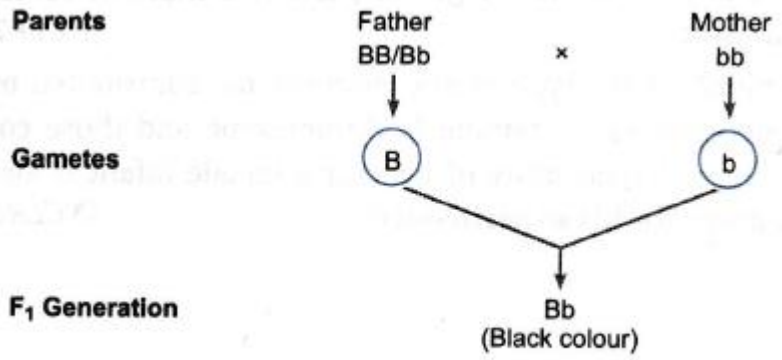
SECTION A		
1.	What are hydrocarbons? Give ONE point of difference between saturated and unsaturated hydrocarbons.	2
2.	Two elements X and Y have atomic numbers 12 and 17 respectively. To which period of the modern periodic table do these two elements belong? What type of bond is formed between them?	2
3.	The sex of the children is determined by what they inherit from their father and not their mother." Justify	2
4.	Our food grains such as wheat and rice, vegetables and fruits, and even meat are found to contain varying amounts of pesticide residues. State the reason to explain how and why it happens?	2
5.	Unsafe sexual act can lead to various infections. Name two bacterial and two viral infections caused due to unsafe sex. OR Suggest any two contraceptive methods to control the size of population	2

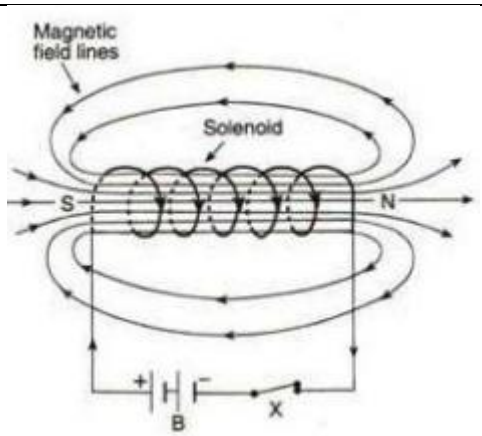
	.	
6.	The gene for red hair (bb) is recessive to the gene for black hair BB). What will be the hair colour of a child if he inherits a gene for red colour from his mother and a gene for black hair from his father? Express with the help of flow chart.	2
7.	Sketch the pattern of field lines to represent the magnetic field through and around a current carrying soleniod. Or Explain what happens if a bar magnet with its north pole towards one face of a coil connected to a galvanometer is a. Moved quickly towards the coil. b. Kept stationary inside the coil.	2
	SECTION – B	
8.	A covalent bond forms when the bonded atoms have a lower total energy than that of widely separated atoms. **a.** Why are covalent compounds generally poor conductors of electricity? **b.** Carbon does not form ionic compounds. Why? c Explain the formation of covalent bonds in carbon dioxide and methane **OR** An organic molecule has the following structur  a. To which homologous series does this molecule belong? b. Which is the next member of this series? c. Write the next two homologues of each of the following C_2H_4 and CH_3CHO.	3
9.	The elements of the third period of the Periodic Table are given below:Which atom is bigger, Na or S? Why?Identify the most (i) metallic and (ii) non-metallic element in Period 3. 	3

Group	I	II	III	IV	V	VI	VII
Period 3	Na	Mg	Al	Si	P	S	Cl

10.	In one of his experiments with pea plants Mendel observed that when a pure tall pea plant is crossed with pure dwarf pea plant, in the first generation F1, only tall plants appear. a. What happens to the traits of the dwarf plants in this case? b. What did Mendel conclude from this experiment? c. Write the ratio he obtained in the F2 generation?	3
11.	Draw a schematic diagram of an electric circuit comprising of 3 cells and an electric bulb, ammeter, plug-key in the ON mode and another with same components but with two bulbs in parallel and a voltmeter across the combination.	3
12.	Find the current drawn from the battery by the network of resistors shown in the figure.  OR How does resistance of a wire depend on its length? A given wire of resistance 1Ω is stretched to double its length. What will be the new resistance?	3
13.	What are trophic levels? In a food chain consisting of snake, insect, grass, frog, assign an appropriate trophic level to frog.	3
	SECTION C	
14.	Read the passage given below and answer the following questions An electric motor is a rotating device that converts electrical energy into mechanical energy. Electric motor is used as an important component in electric fans, refrigerators, mixers, washing machines, computers, MP3 players, etc.	4

	 a. Write the principle behind the working of electric motor.1 b.What is the role of split rings in an electric motor.1 c. Suggest when does a current carrying conductor kept in a magnetic field experience maximum force. 2 Or State and explain the rule that gives the direction of force in a current carrying conductor placed in a magnetic field.	
15.	Gregor Mendel also known as the "Father of genetics" chose to use pea plants for his experiments regarding the inheritance of hereditary traits' a. Why did Mendel select pea plant in his experiment?1 b. List two visible contrasting characters of garden pea Mendel used for his experiment.1 c. A pure tall pea plant bearing violet flowers is crossed with short pea plant bearing white flowers. There were all tall and violet flowers in F1 generation. Show that the traits are inherited independently in F2 generation by the F2 ratio.2 OR The genotype of green stemmed tomato plants is denoted as "GG" and that of purple stemmed tomato plants as "gg". When these two are crossed i. What colour of stem would you expect in their F1 progeny? ii. Differentiate between dominant and recessive traits.	4

	SCIENCE SAMPLE PAPER 5 - MARKING SCHEME	
1.	a. Carbon compounds which contain just carbon and hydrogen. b. Saturated hydrocarbons contain single bond, unsaturated hydrocarbons contain double / triple bonds or other relevant points.	1 + 1
2.	The elements belong to the 3rd period. The type of bond formed is Ionic bond.	1 + 1
3.	All children will inherit an **X** chromosome from their mother, despite whether they are a boy or girl. Thus, the **sex** of the child will be determined by the type of chromosome inherited from their father. Or diag. rep.	2
4.	This increase in the concentration of harmful chemicals with each step of the food chain is called biomagnification. That is why meat contain higher pesticide concentration than plant products since animals occupy higher trophic level than plants.	2
5.	Bacterial infections: Gonorrhoea , Syphilis Viral infections: HIV-AIDS, Warts OR Any two methods	2
6.	Given, Mother has red hair which is recessive, i.e.,bb Father has black hair which is dominant, i.e., BB or Bb. The inheritance pattern can be shown as follows  Thus, the child will have black hair.	2
7.		2 3



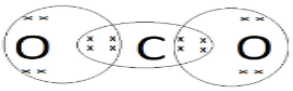
OR

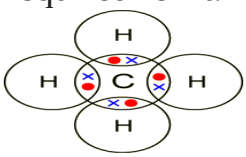
a. There will be a momentary deflection in the galvanometer showing induced current.
b. There will be no deflection - no current is produced in the coil.

SECTION B

8. a. Covalent compounds lack free electrons or do not form ions so they are poor conductors of electricity. 3
b. Carbon is tetravalent so to form ionic bonds, Carbon cannot gain 4 electrons because it would be difficult for nucleus with six protons to hold 10 electrons similarly losing 4 electrons does not happen as tremendous energy is required for it.

c.



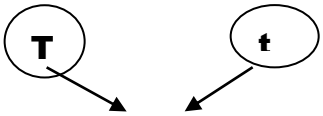
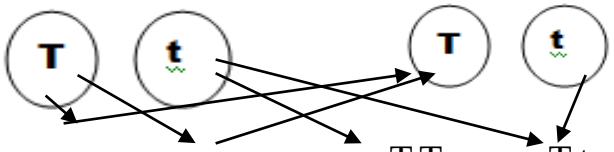
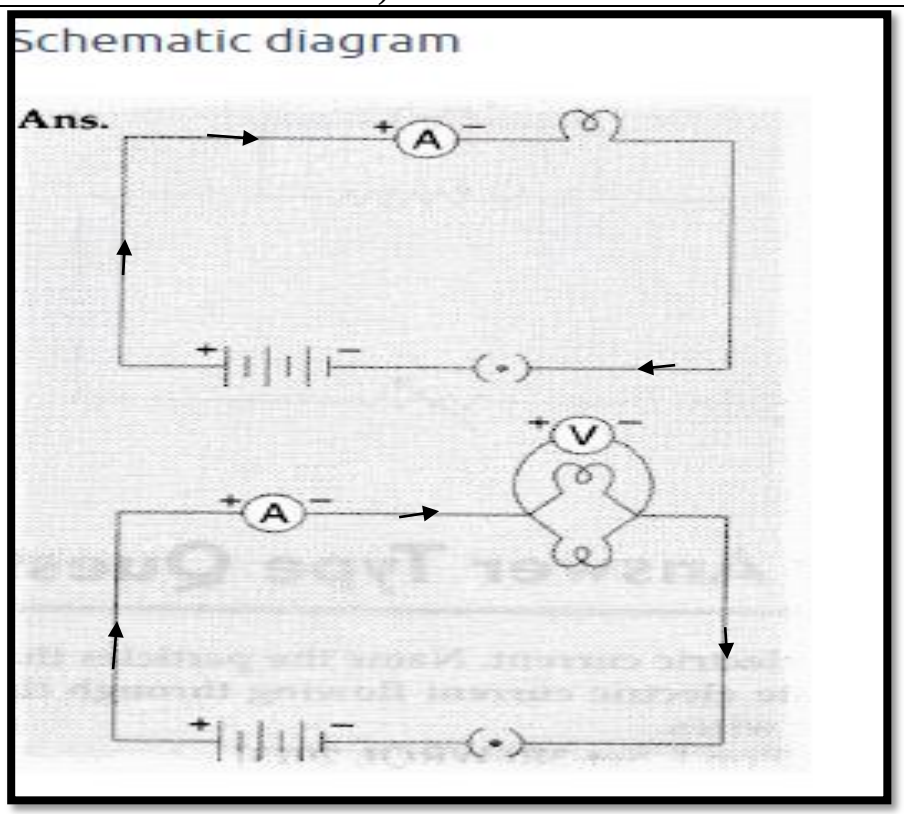


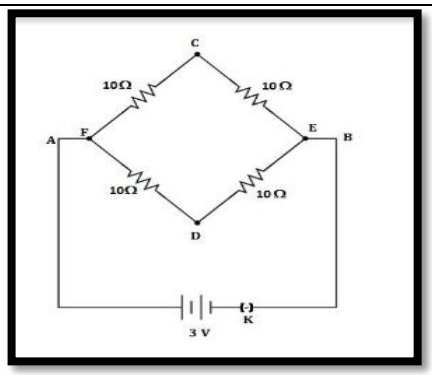
Or

a. Alcohol
b. $C_5H_{11}OH$
c. C_3H_6 , C_2H_5CHO

9. a. Na. Atomic size goes on decreasing along a period from left to right. It is due to increased nuclear charge due to increase in number of protons and force of attractions between nucleus and valence electrons. 3
b. Most metallic – Na
Non-metallic - Cl

10 a) The dwarf trait is recessive and can only be expressed when present in homozygous condition. The cross produces hybrid tall in the first generation and thus the dominant allele for tallness masks the dwarf allele. Hence the dwarf trait cannot be expressed. 3

	Parents- (Tall)male TT X (dwarf) female t t Gametes F1-  Tt (Hybrid tall) On selfing: T t X T t  Gametes F2- T T T t T t t t Phenotypic ratio- 3 tall: 1 dwarf Genotypic ratio- 1 pure tall: 2 hybrid tall: 1 dwarf b) When the F, generation plants were self-fertilised, he observed that in the plants of second generation, F2 both tall plants and dwarf plants were present. He also observed that traits might not show up in an individual but were passed to the next generation. c) 3tall :1dwarf	
10	 	3
11	Resistance of the upper branch FCE are in series.	3



So, equivalent resistance in the branch FCE= R_1 = 10 Ω + 10 Ω = 20 Ω
Resistance of lower branch FDE are in series
So, equivalent resistance in the branch FDE = R_2 = 10 Ω + 10 Ω = 20 Ω
The two resistance R_1 and R_2 are parallel to each other.

If R is the equivalent resistance of network, then
$1/R_p = 1/20 + 1/20$
or R_p = 10 Ω
Current, V = IR

$$I = \frac{V}{R} = \frac{3\ V}{10\ \Omega} = 0.3\ A$$

or

$R \propto l$

Resistance of a wire is directly proportional to the length of the wire. Therefore, a longer conductor offers more resistance

b.

Let 'l' be the length and 'a' be the area of cross – section of the resisto resistance, R = 1Ω when the wire is stretched to double its length, the new le = 2l and the new area of cross section,

$a' = a/2$

$$\therefore \text{Resistance } (R') = \rho\frac{I'}{a'} = \rho\frac{2I}{a/2}$$

$$\therefore R' = 4p\frac{I}{a} = 4R$$

$$\therefore R' = 4 \times 1 = 4\Omega$$

13	**Trophic levels refers to the various steps in a food chain as per the flow of energy. Each step of the food chain is known as a trophic level. 10% of food taken by one trophic level is available for the next trophic level.**	3

	Grass → Insect → Frog → Snake Frog is 3rd trophic level.	
14	The electric motor works on the **principle of magnetic effects of current**. The principle of electric motor is when a current carrying conductor is placed in a magnetic field it experiences a force.ie when a rectangular coil is placed in a magnetic field and current is passed through it, the coil rotates as a result of the forces acting on the coil. b. In electric motors, the split rings acts as a commutator. The reversal of current also reverses the direction of force acting on the two arms . The reversing of the current is repeated at each half rotation, giving rise to a continuous rotation of the coil and to the axle. c. When the conductor is held perpendicular to the magnetic field, it experiences maximum force Or Fleming's Left hand rule gives the direction of force on a current carrying conductor placed perpendicular to the magnetic field. Fleming's Left hand rule: According to this rule, stretch the thumb, fore-finger and middle finger of left hand such that they are mutually perpendicular. If the middle finger points in the direction of the magnetic field, the fore-finger points in the direction of flow of current, then the thumb points in the direction of motion i.e., force acting on the conductor.	4
15	Mendel chose pea plants for his experiments because of the following reasons: (i) The flowers of this plant are bisexual. (ii) They are self-pollinating, and thus, self and cross-pollination can easily be performed. (iii) It had several pairs of contrasting characteristics were easy to recognize and study. iv.easy to raise ,short life span**,** b plant height ..Tall and Dwarf shape of the seed ...Round and Wrinkled c. A dihybrid cross between a pure Tall pea plant bearing violet flowers (Dominant) Genotype TTVV and Dwarf pea plant bearing white flowers (recessive) Genotype ttvv. Or	4

F_1 TtVv (Selfing) TtVv

Gametes ♀ \ ♂	TV	tV	Tv	tv
TV	TTVV	TtVV	TTVv	TtVv
tV	TtVV	ttVV	TtVv	TtVv
Tv	TTVv	TtVv	TTvv	Ttvv
tv	TtVv	ttVv	Ttvv	ttvv

F_2

Phenotypic ratio : Tall violet Tall white dwarf violet dwarf white

d. 9 : 3 : 3 : 1

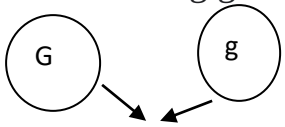
Or

The genotype of green stemmed tomato plant is GG and the genotype of purple stemmed tomato plant is gg. A. When we cross them to produce progeny in the F1 generation, we will find that all the **plants have green stems** (this shows us that green coloured stem is dominant)

Parent male green stem female purple stem

GG X g g

gametes



F1 generation G g all green

Dominant Trait	**Recessive Trait**
It is a trait or characteristic, which is able to express itself over another contrasting trait. even if only one copy exists Trait that appears in F1 generation	It is a trait which is unable to express its effect in the presence of the dominant trait.

The End