

# NEET (UG) - 2023 (Manipur)

## 6<sup>th</sup> June 2023

Time: 3 Hours 20 Minutes

Total Marks: 720

### Section – A (Physics)

1. Two particles A and B initially at rest, move towards each other under mutual force of attraction. At an instance when the speed of A is  $v$  and speed of B is  $3v$ , the speed of centre of mass is

(A)  $v$  (B)  $4v$   
(C)  $2v$  (D) Zero

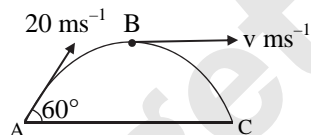
2. On the basis of electrical conductivity, which one of the following material has the smallest resistivity?

(A) Glass (B) Silicon  
(C) Germanium (D) Silver

3. A charge  $Q \mu\text{C}$  is placed at the centre of a cube. The flux coming out from any one of its faces will be (in SI unit):

(A)  $\frac{Q}{6\epsilon_0} \times 10^{-3}$  (B)  $\frac{Q}{6\epsilon_0} \times 10^{-6}$   
(C)  $\frac{Q}{\epsilon_0} \times 10^{-6}$  (D)  $\frac{2Q}{3\epsilon_0} \times 10^{-3}$

4. A ball is projected from point A with velocity  $20 \text{ ms}^{-1}$  at an angle  $60^\circ$  to the horizontal direction. At the highest point B of the path (as shown in figure), the velocity  $v \text{ m s}^{-1}$  of the ball will be



(A) Zero (B) 10  
(C) 20 (D)  $10\sqrt{3}$

5. A uniform electric field and a uniform magnetic field are acting along the same direction in a certain region. If an electron is projected in the region such that its velocity is pointed along the direction of fields, then the electron:

(A) speed will decrease  
(B) speed will increase  
(C) will turn towards right of direction of motion  
(D) will turn towards left of direction of motion

6. A certain wire A has resistance  $81 \Omega$ . The resistance of another wire B of same material and equal length but of diameter thrice the diameter of A will be:

(A)  $729 \Omega$  (B)  $243 \Omega$   
(C)  $81 \Omega$  (D)  $9 \Omega$

7. The amount of elastic potential energy per unit volume (in SI unit) of a steel wire of length 100 cm to stretch it by 1 mm is (if Young's modulus of the wire =  $2.0 \times 10^{11} \text{ N m}^{-2}$ ):

(A)  $10^7$  (B)  $10^5$   
(C)  $10^{11}$  (D)  $10^{17}$

8. If  $Z_1$  and  $Z_2$  are the impedances of the given circuits (a) and (b) as shown in figures, then choose the **correct** option.

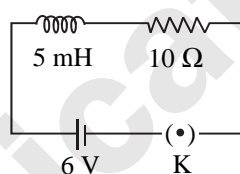


figure (a)

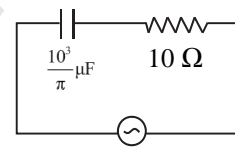


figure (b)

(A)  $Z_1 = Z_2$   
(B)  $Z_1 > Z_2$   
(C)  $Z_1 < Z_2$   
(D)  $Z_1 + Z_2 = 20 \Omega$

9. The ground state energy of hydrogen atom is  $-13.6 \text{ eV}$ . The energy needed to ionize hydrogen atom from its second excited state will be:

(A) 1.51 eV (B) 3.4 eV  
(C) 13.6 eV (D) 6.8 eV

10. The mechanical quantity, which has dimensions of reciprocal of mass ( $M^{-1}$ ) is:

(A) torque  
(B) gravitational constant  
(C) angular momentum  
(D) coefficient of thermal conductivity

11. A p-type extrinsic semiconductor is obtained when Germanium is doped with:

(A) Arsenic (B) Boron  
(C) Antimony (D) Phosphorus

12. The viscous drag acting on a metal sphere of diameter 1 mm, falling through a fluid of viscosity  $0.8 \text{ Pa s}$  with a velocity of  $2 \text{ ms}^{-1}$  is equal to:

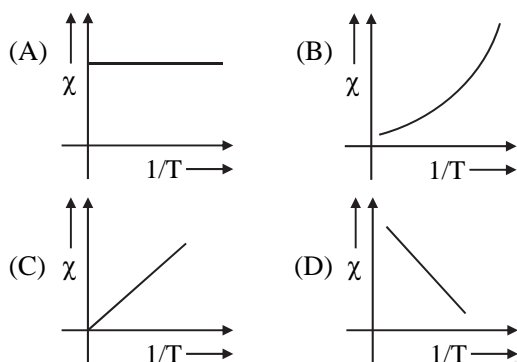
(A)  $1.5 \times 10^{-3} \text{ N}$  (B)  $20 \times 10^{-3} \text{ N}$   
(C)  $15 \times 10^{-3} \text{ N}$  (D)  $30 \times 10^{-3} \text{ N}$



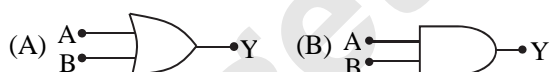
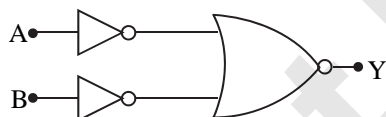
13. The maximum power is dissipated for an ac in a/an:  
(A) inductive circuit  
(B) capacitive circuit  
(C) resistive circuit  
(D) LC circuit

14. According to Gauss law of electrostatics, electric flux through a closed surface depends on:  
(A) the shape of the surface  
(B) the volume enclosed by the surface  
(C) the area of the surface  
(D) the quantity of charges enclosed by the surface

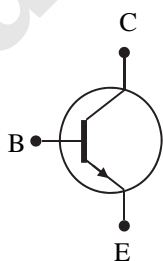
15. The variation of susceptibility ( $\chi$ ) with absolute temperature (T) for a paramagnetic material is represented as:



16. The given circuit is equivalent to:



- 17.



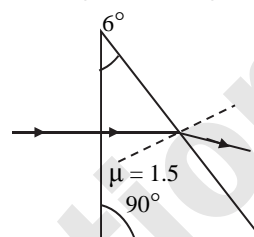
The above figure shows the circuit symbol of a transistor. Select the **correct** statements given below:

- i. The transistor has two segments of p-type semiconductor separated by a segment of n-type semiconductor.

- ii. The emitter is of moderate size and heavily doped.  
iii. The central segment is thin and lightly doped.  
iv. The emitter base junction is reverse biased in common emitter amplifier circuit.

- (A) i and ii (B) ii and iii  
(C) iii and iv (D) i and iv

18. A horizontal ray of light is incident on the right-angled prism with prism angle  $6^\circ$ . If the refractive index of the material of the prism is 1.5, then the angle of emergence will be:



- (A)  $4^\circ$  (B)  $6^\circ$  (C)  $9^\circ$  (D)  $10^\circ$

19. A particle moves with a velocity  $(5\hat{i} - 3\hat{j} + 6\hat{k}) \text{ ms}^{-1}$  horizontally under the action of constant force  $(10\hat{i} + 10\hat{j} + 20\hat{k}) \text{ N}$ . The instantaneous power supplied to the particle is:

- (A) 100 W (B) 140 W  
(C) 200 W (D) Zero

20. The maximum kinetic energy of the emitted photoelectrons in photoelectric effect is independent of:

- (A) frequency of incident radiation  
(B) wavelength of incident radiation  
(C) work function of material  
(D) intensity of incident radiation

21. The diameter of a spherical bob, when measured with vernier callipers yielded the following values: 3.33 cm, 3.32 cm, 3.34 cm, 3.33 cm and 3.32 cm.

The mean diameter to appropriate significant figures is:

- (A) 3.33 cm (B) 3.32 cm  
(C) 3.328 cm (D) 3.3 cm

22. Which of the following statement is **not** true?

- (A) Pressure is a vector quality  
(B) Relative density is a scalar quantity  
(C) Coefficient of viscosity is a scalar quantity  
(D) Surface tension is a scalar quantity

23. The position of a particle is given by

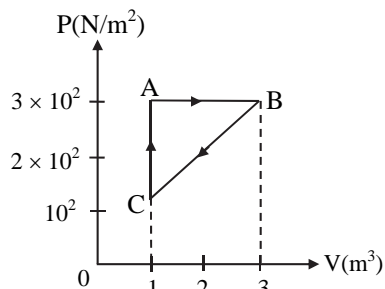
$$\vec{r}(t) = 4t\hat{i} + 2t^2\hat{j} + 5\hat{k}$$

where t is in seconds and r in metre. Find the magnitude and direction of velocity  $v(t)$ , at  $t = 1 \text{ s}$ , with respect to x-axis.



- (A)  $3\sqrt{2} \text{ ms}^{-1}, 30^\circ$   
 (B)  $3\sqrt{2} \text{ ms}^{-1}, 45^\circ$   
 (C)  $4\sqrt{2} \text{ ms}^{-1}, 45^\circ$   
 (D)  $4\sqrt{2} \text{ ms}^{-1}, 60^\circ$

24. For the given cycle, the work done during isobaric process is:



- (A) 400 J (B) 600 J  
 (C) 200 J (D) Zero

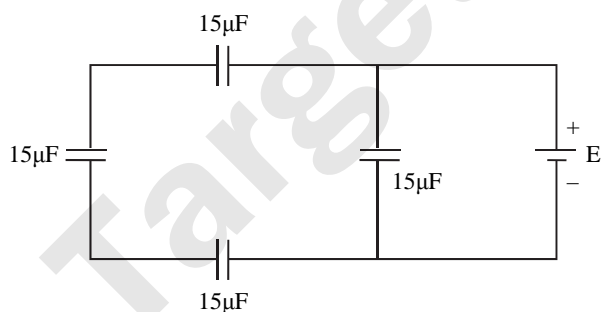
25. The de Broglie wavelength associated with an electron, accelerated by a potential difference of 81 V is given by:

- (A) 1.36 nm (B) 0.136 nm  
 (C) 13.6 nm (D) 136 nm

26. The 4<sup>th</sup> overtone of a closed organ pipe is same as that of 3<sup>rd</sup> overtone of an open pipe. The ratio of the length of the closed pipe to the length of the open pipe is:

- (A) 9 : 8 (B) 7 : 9  
 (C) 8 : 9 (D) 9 : 7

27. The equivalent capacitance of the arrangement shown in figure is:



- (A) 25 μF (B) 20 μF  
 (C) 30 μF (D) 15 μF

28.  $\epsilon_0$  and  $\mu_0$  are the electric permittivity and magnetic permeability of free space respectively. If the corresponding quantities of a medium are  $2\epsilon_0$  and  $1.5\mu_0$  respectively, the refractive index of the medium will nearly be

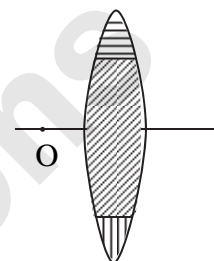
- (A) 3 (B) 2  
 (C)  $\sqrt{2}$  (D)  $\sqrt{3}$

29. A long straight wire of length 2 m and mass 250 g is suspended horizontally in a uniform horizontal magnetic field of 0.7 T. The amount of current flowing through the wire will be ( $g = 9.8 \text{ ms}^{-2}$ )

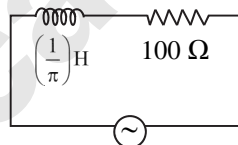
- (A) 2.75 A (B) 1.75 A  
 (C) 2.45 A (D) 2.25 A

30. A lens is made up of 3 different transparent media as shown in figure. A point object O is placed on its axis beyond  $2f$ . How many real images will be obtained on the other side?

- (A) No image will be formed  
 (B) 3  
 (C) 2  
 (D) 1



31. An ac source is connected in the given circuit. The value of  $\phi$  will be:



$$V = 220 \sin(100\pi t + \phi) \text{ volt}$$

- (A) 30° (B) 45°  
 (C) 60° (D) 90°

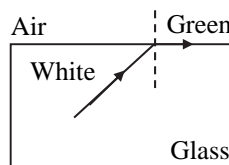
32. A bullet of mass  $m$  hits a block of mass  $M$  elastically. The transfer of energy is the maximum, when

- (A)  $M \ll m$  (B)  $M \gg m$   
 (C)  $M = m$  (D)  $M = 2m$

33. The escape velocity of a body on the earth surface is 11.2 km/s. If the same body is projected upward with velocity 22.4 km/s, the velocity of this body at infinite distance from the centre of the earth will be:

- (A) 11.2 km/s (B)  $11.2\sqrt{3}$  km/s  
 (C)  $11.2\sqrt{2}$  km/s (D) Zero

34. Which set of colours will come out in air for a situation shown in figure?



- (A) Orange, Red and Violet  
 (B) Blue, Green and Yellow  
 (C) Yellow, Orange and Red  
 (D) All



35. The wavelength of Lyman series of hydrogen atom appears in:  
 (A) ultraviolet region  
 (B) infrared region  
 (C) visible region  
 (D) far infrared region

**Section – B (Physics)**

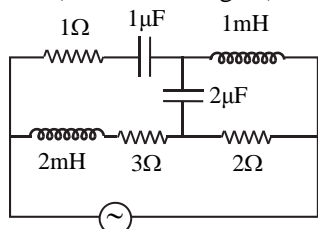
36. A particle is executing uniform circular motion with velocity  $\vec{v}$  and acceleration  $\vec{a}$ . Which of the following is TRUE?  
 (A)  $\vec{v}$  is a constant;  $\vec{a}$  is a constant  
 (B)  $\vec{v}$  is not a constant;  $\vec{a}$  is a constant  
 (C)  $\vec{v}$  is a constant;  $\vec{a}$  is not a constant  
 (D)  $\vec{v}$  is not a constant;  $\vec{a}$  is not a constant

37. A 1 kg object strikes a wall with velocity  $1 \text{ ms}^{-1}$  at an angle of  $60^\circ$  with the wall and reflects at the same angle. If it remains in contact with wall for 0.1 s, then the force exerted on the wall is:  
 (A)  $10\sqrt{3} \text{ N}$  (B)  $20\sqrt{3} \text{ N}$   
 (C)  $30\sqrt{3} \text{ N}$  (D) Zero

38. A simple pendulum oscillating in air has a period of  $\sqrt{3} \text{ s}$ . If it is completely immersed in non-viscous liquid, having density  $\left(\frac{1}{4}\right)^{\text{th}}$  of the material of the bob, the new period will be:  
 (A) 2 s (B)  $\frac{\sqrt{3}}{2} \text{ s}$   
 (C)  $2\sqrt{3} \text{ s}$  (D)  $\frac{2}{\sqrt{3}} \text{ s}$

39. An object is mounted on a wall. Its image of equal size is to be obtained on a parallel wall with the help of a convex lens placed between these walls. The lens is kept at distance  $x$  in front of the second wall. The required focal length of the lens will be:  
 (A)  $\frac{x}{2}$   
 (B)  $\frac{x}{4}$   
 (C) less than  $\frac{x}{4}$   
 (D) more than  $\frac{x}{4}$  but less than  $\frac{x}{2}$

40. For very high frequencies, the effective impedance of the circuit (shown in the figure) will be:



- (A) 1 Ω (B) 3 Ω (C) 4 Ω (D) 6 Ω

41. A copper wire of radius 1 mm contains  $10^{22}$  free electrons per cubic metre. The drift velocity for free electrons when 10 A current flows through the wire will be (Given, charge on electron =  $1.6 \times 10^{-19} \text{ C}$ ):

- (A)  $\frac{6.25}{\pi} \text{ m s}^{-1}$  (B)  $\frac{6.25 \times 10^5}{\pi} \text{ m s}^{-1}$   
 (C)  $\frac{6.25 \times 10^4}{\pi} \text{ m s}^{-1}$  (D)  $\frac{6.25}{\pi} \times 10^3 \text{ m s}^{-1}$

42. A container of volume  $200 \text{ cm}^3$  contains 0.2 mole of hydrogen gas and 0.3 mole of argon gas. The pressure of the system at temperature 200 K ( $R = 8.3 \text{ J K}^{-1} \text{ mol}^{-1}$ ) will be:

- (A)  $4.15 \times 10^5 \text{ Pa}$  (B)  $4.15 \times 10^6 \text{ Pa}$   
 (C)  $6.15 \times 10^5 \text{ Pa}$  (D)  $6.15 \times 10^4 \text{ Pa}$

43. A constant torque of 100 N m turns a wheel of moment of inertia  $300 \text{ kg m}^2$  about an axis passing through its centre. Starting from rest, its angular velocity after 3 s is:

- (A) 10 rad/s (B) 15 rad/s  
 (C) 1 rad/s (D) 5 rad/s

44. The emf of a cell having internal resistance  $1 \Omega$  is balanced against a length of 330 cm on a potentiometer wire. When an external resistance of  $2 \Omega$  is connected across the cell, the balancing length will be:

- (A) 115 cm (B) 332 cm  
 (C) 220 cm (D) 330 cm

45. If  $R$  is the radius of the earth and  $g$  is the acceleration due to gravity on the earth surface. Then the mean density of the earth will be:

- (A)  $\frac{3g}{4\pi R G}$  (B)  $\frac{4\pi G}{3gR}$   
 (C)  $\frac{\pi R G}{12g}$  (D)  $\frac{3\pi R}{4gG}$

46. If a conducting sphere of radius  $R$  is charged. Then the electric field at a distance  $r$  ( $r > R$ ) from the centre of the sphere would be, ( $V$  = potential on the surface of the sphere)

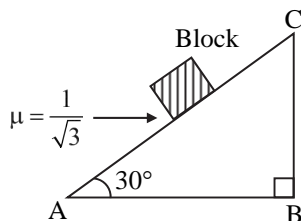
- (A)  $\frac{RV}{r^2}$  (B)  $\frac{V}{r}$   
 (C)  $\frac{rV}{R^2}$  (D)  $\frac{R^2V}{r^3}$

47. To produce an instantaneous displacement current of 2 mA in the space between the parallel plates of a capacitor of capacitance  $4 \mu\text{F}$ , the rate of change of applied variable potential difference  $\left(\frac{dV}{dt}\right)$  must

- be:  
 (A) 200 V/s (B) 400 V/s  
 (C) 800 V/s (D) 500 V/s



48. A block of mass 2 kg is placed on an inclined rough surface AC (as shown in figure) of coefficient of friction  $\mu$ . If  $g = 10 \text{ ms}^{-2}$ , the net force (in N) on the block will be:



- (A) 10 (B) 20  
(C)  $10\sqrt{3}$  (D) Zero
49. An emf is generated by an ac generator having 100 turn coil, of loop area  $1 \text{ m}^2$ . The coil rotates at a speed of one revolution per second and placed in a uniform magnetic field of 0.05 T perpendicular to the axis of rotation of the coil. The maximum value of emf is:
- (A) 62.8 V (B) 6.28 V  
(C) 3.14 V (D) 31.4 V
50. The angular momentum of an electron moving in an orbit of hydrogen atom is  $1.5\left(\frac{h}{\pi}\right)$ . The energy in the same orbit is nearly:
- (A) -1.3 eV (B) -1.4 eV  
(C) -1.5 eV (D) -1.6 eV

### Section – A (Chemistry)

51. Which amongst the following compounds will show geometrical isomerism?
- (A) 2-Methylprop-1-ene  
(B) 3,4-Dimethylhex-3-ene  
(C) Pent-1-ene  
(D) 2,3-Dimethylbut-2-ene
52. Select the element (M) whose trihalides CANNOT be hydrolysed to produce an ion of the form  $[M(\text{H}_2\text{O})_6]^{3+}$ .
- (A) Al (B) B  
(C) Ga (D) In
53. The CORRECT option for the rate law that corresponds to overall first order reaction is:
- (A) Rate =  $k[\text{A}]^{1/2} [\text{B}]^2$   
(B) Rate =  $k[\text{A}]^{-1/2} [\text{B}]^{3/2}$   
(C) Rate =  $k[\text{A}]^0 [\text{B}]^2$   
(D) Rate =  $k[\text{A}][\text{B}]$
54. Which one of the following represents all isoelectronic species?
- (A)  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{O}^-$ ,  $\text{F}^-$   
(B)  $\text{Ca}^{2+}$ , Ar,  $\text{K}^+$ ,  $\text{Cl}^-$   
(C)  $\text{Na}^+$ ,  $\text{Cl}^-$ ,  $\text{O}^-$ ,  $\text{NO}^+$   
(D)  $\text{N}_2\text{O}$ ,  $\text{N}_2\text{O}_4$ ,  $\text{NO}^+$ , NO

55. Cheilosis occurs due to deficiency of \_\_\_\_\_.
- (A) pyridoxamine (B) riboflavin  
(C) thiamine (D) nicotinamide

56. Consider the given reaction:  
 $\text{CH}_3\text{COCH}_3 \xrightarrow{\text{dil Ba(OH)}_2} \text{X}$   
The functional groups present in compound "X" are
- (A) alcohol and aldehyde  
(B) alcohol and ketone  
(C) ketone and double bond  
(D) double bond and aldehyde
57. The CORRECT option in which the density of argon (Atomic mass = 40) is highest:
- (A)  $0^\circ \text{C}$ , 4 atm (B)  $273^\circ \text{C}$ , 4 atm  
(C) STP (D)  $0^\circ \text{C}$ , 2 atm

58. Reagents which can be used to convert alcohols to carboxylic acids, are:
- (i)  $\text{CrO}_3 - \text{H}_2\text{SO}_4$   
(ii)  $\text{K}_2\text{Cr}_2\text{O}_7 + \text{H}_2\text{SO}_4$   
(iii)  $\text{KMnO}_4 + \text{KOH}/\text{H}_3\text{O}^+$   
(iv) Cu, 573 K  
(v)  $\text{CrO}_3, (\text{CH}_3\text{CO})_2\text{O}$   
Choose the **most appropriate** answer from the options given below.
- (A) (i) (ii) and (iii) only  
(B) (i) (ii) and (v) only  
(C) (ii) (iii) and (iv) only  
(D) (ii), (iv) and (v) only

59. The CORRECT order of dipole moments for molecules  $\text{NH}_3$ ,  $\text{H}_2\text{S}$ ,  $\text{CH}_4$  and HF, is:
- (A)  $\text{NH}_3 > \text{HF} < \text{CH}_4 > \text{H}_2\text{S}$   
(B)  $\text{HF} > \text{NH}_3 > \text{H}_2\text{S} > \text{CH}_4$   
(C)  $\text{CH}_4 > \text{H}_2\text{S} > \text{NH}_3 > \text{HF}$   
(D)  $\text{H}_2\text{S} > \text{NH}_3 > \text{HF} > \text{CH}_4$

60. Molar conductance of an electrolyte increases with dilution according to the equation:

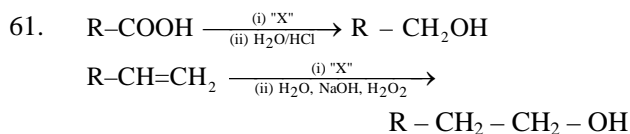
$$\Lambda_m = \Lambda_m^\circ - A\sqrt{c}$$

Which of the following statements are TRUE?

- (i) This equation applies to both strong and weak electrolytes.  
(ii) Value of the constant A depends upon the nature of the solvent.  
(iii) Value of constant A is same for both  $\text{BaCl}_2$  and  $\text{MgSO}_4$ .  
(iv) Value of constant A is same for both  $\text{BaCl}_2$  and  $\text{Mg(OH)}_2$ .

Choose the **most appropriate** answer from the options given below.

- (A) (ii) and (iii) only  
(B) (ii) and (iv) only  
(C) (i) and (ii) only  
(D) (i), (ii) and (iii) only



Identify 'X' in above reactions.

- (A)  $\text{NaBH}_4$  (B)  $\text{H}_2/\text{Pd}$   
(C)  $\text{B}_2\text{H}_6$  (D)  $\text{LiAlH}_4$

62. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**:

**Assertion (A):** Ionisation enthalpy increases along each series of the transition elements from left to right. However, small variations occur.

**Reason (R):** There is corresponding increase in nuclear charge which accompanies the filling of electrons in the inner d-orbitals.

In the light of the above statements, choose the **most appropriate** answer from the options given below.

- (A) Both (A) and (R) are correct and (R) is the correct explanation of (A).  
(B) Both (A) and (R) are correct but (R) is not the correct explanation of (A).  
(C) (A) is correct but (R) is not correct.  
(D) (A) is not correct but (R) is correct.

63. Which one of the following statements is **INCORRECT** related to Molecular Orbital Theory?

- (A) Molecular orbitals obtained from  $2p_x$  and  $2p_y$  orbitals are symmetrical around the bond axis.  
(B) A  $\pi$ -bonding molecular orbital has larger electron density above and below the internuclear axis.  
(C) The  $\pi^*$  antibonding molecular orbital has a node between the nuclei.  
(D) In the formation of bonding molecular orbital, the two electron waves of the bonding atoms reinforce each other.

64. Which amongst the following is used in controlling depression and hypertension?

- (A) Equanil (B) Prontosil  
(C) Seldane (D) Valium

65. Given below are two statements:

**Statement I :**

The value of wave function,  $\Psi$  depends upon the coordinates of the electron in the atom.

**Statement II :**

The probability of finding an electron at a point within an atom is proportional to the orbital wave function.

In the light of the above statements, choose the **CORRECT** answer from the options given below:

- (A) Both Statement I and Statement II are true.  
(B) Both Statement I and Statement II are false.  
(C) Statement I is true but Statement II is false.  
(D) Statement I is false but Statement II is true.

66. Match **List-I** with **List-II**.

	<b>List-I</b> (Mixtures/Sample)		<b>List-II</b> (Technique used for purification)
(i)	Glycerol from spent lye	(a)	Steam distillation
(ii)	Chloroform + Aniline	(b)	Fractional distillation
(iii)	Fractions of crude oil	(c)	Distillation under reduced pressure
(iv)	Aniline + Water	(d)	Distillation

Choose the **CORRECT** answer from the options given below:

- (A) i - a, ii - b, iii - c, iv - d  
(B) i - a, ii - c, iii - b, iv - d  
(C) i - c, ii - d, iii - b, iv - a  
(D) i - d, ii - b, iii - a, iv - c

67. Which of the following is **CORRECTLY** matched?

- (A) Acidic oxides  $\Rightarrow \text{Mn}_2\text{O}_7, \text{SO}_2, \text{TeO}_3$   
(B) Amphoteric oxides  $\Rightarrow \text{BeO}, \text{Ga}_2\text{O}_3, \text{GeO}$   
(C) Basic oxides  $\Rightarrow \text{In}_2\text{O}_3, \text{K}_2\text{O}, \text{SnO}_2$   
(D) Neutral oxides  $\Rightarrow \text{CO}, \text{NO}_2, \text{N}_2\text{O}$

68. The density of 1 M solution of a compound 'X' is  $1.25 \text{ g mL}^{-1}$ . The **CORRECT** option for the molality of solution is (Molar mass of compound X = 85 g)

- (A) 1.165 m (B) 0.858 m  
(C) 0.705 m (D) 1.208 m

69. Given below are two statements:

**Statement I :**

High density polythene is formed in the presence of catalyst triethylaluminium and titanium tetrachloride.

**Statement II :**

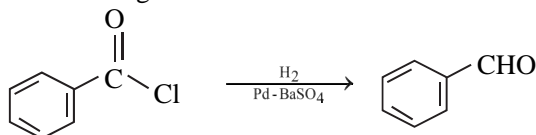
High density polymers are chemically inert.

In the light of the above statements, choose the **CORRECT** answer from the options given below:

- (A) Both Statement I and Statement II are true.  
(B) Both Statement I and Statement II are false.  
(C) Statement I is correct but Statement II is false.  
(D) Statement I is incorrect but Statement II is true.



70. The following conversion is known as:



- (A) Etard reaction  
(B) Rosenmund reaction  
(C) Stephen reaction  
(D) Gattermann-Koch reaction

71. Match **List – I** with **List – II**.

	<b>List – I (Hydride)</b>		<b>List – II (Type of hydride)</b>
(i)	NaH	(a)	Electron precise
(ii)	PH <sub>3</sub>	(b)	Saline
(iii)	GeH <sub>4</sub>	(c)	Metallic
(iv)	LaH <sub>2.87</sub>	(d)	Electron rich

Choose the CORRECT answer from the options given below:

- (A) i - a, ii - c, iii - b, iv - d  
(B) i - b, ii - d, iii - a, iv - c  
(C) i - c, ii - d, iii - b, iv - a  
(D) i - b, ii - c, iii - d, iv - a

72. INCORRECT set of quantum numbers from the following is:

- (A)  $n = 4, l = 2, m_l = -2, -1, 0, +1, +2, m_s = -1/2$   
(B)  $n = 5, l = 3, m_l = -3, -2, -1, 0, +1, +2, +3, m_s = +1/2$   
(C)  $n = 4, l = 3, m_l = -3, -2, -1, 0, +1, +2, +3, m_s = -1/2$   
(D)  $n = 5, l = 2, m_l = -2, -1, +1, +2, m_s = +1/2$

73. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

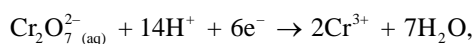
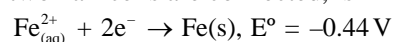
**Assertion (A):** Lithium and beryllium unlike their other respective group members form compounds with pronounced ionic character.

**Reason (R):** Lithium and Magnesium have similar properties due to diagonal relationship.

In the light of the above statements, choose the CORRECT answer from the options 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.

74. The CORRECT value of cell potential in volt for the reaction that occurs when the following two half cells are connected, is



$$E^\circ = +1.33 \text{ V}$$

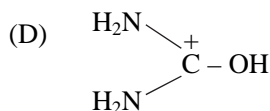
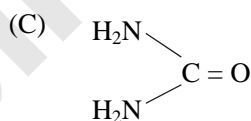
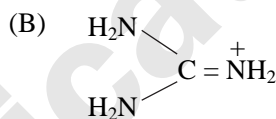
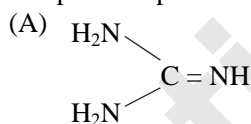
- (A) +0.01 V                      (B) +0.89 V  
(C) +1.77 V                      (D) +2.65 V

75. An acidic buffer is prepared by mixing:

- (A) strong acid and its salt with strong base.  
(B) strong acid and its salt with weak base.  
(C) weak acid and its salt with strong base.  
(D) equal volumes of equimolar solutions of weak acid and weak base.

(The  $\text{pK}_a$  of acid =  $\text{pK}_b$  of the base)

76. Which amongst the following compounds/species is least basic?



77. The CORRECT van der Waals equation for 1 mole of a real gas is:

(A)  $\left(p + \frac{an^2}{V^2}\right)(V^2 - nb) = RT$

(B)  $\left(p + \frac{an^2}{V}\right)(V - nb) = nRT$

(C)  $\left(p + \frac{a}{V^2}\right)(V - b) = RT$

(D)  $\left(p + \frac{V^2}{a}\right)(V - b) = RT$

78. The  $E^\circ$  values for

$$\text{Al}^+/\text{Al} = +0.55 \text{ V and } \text{Tl}^+/\text{Tl} = -0.34 \text{ V}$$

$$\text{Al}^{3+}/\text{Al} = -1.66 \text{ V and } \text{Tl}^{3+}/\text{Tl} = +1.26 \text{ V.}$$



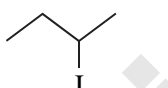
Identify the INCORRECT statement.

- (A)  $\text{Al}^+$  is unstable in solution.  
(B) Tl can be easily oxidised to  $\text{Tl}^+$  than  $\text{Tl}^{3+}$ .  
(C) Al is more electropositive than Tl.  
(D)  $\text{Tl}^{3+}$  is a good reducing agent than  $\text{Tl}^{1+}$ .



79. Given below are two statements:  
**Statement I:** Hydrated chlorides and bromides of Ca, Sr and Ba on heating undergo hydrolysis.  
**Statement II:** Hydrated chlorides and bromides of Be and Mg on heating undergo dehydration.  
In the light of the above statements, choose the CORRECT answer from the options given below:
- (A) Both Statement I and Statement II are true.  
(B) Both Statement I and Statement II are false.  
(C) Statement I is correct but Statement II is false.  
(D) Statement I is incorrect but Statement II is true.
80. Which of the following forms a set of a complex and a double salt, respectively?
- (A)  $K_2PtCl_2 \cdot 2NH_3$  and  $KAl(SO_4)_2 \cdot 12H_2O$   
(B)  $NiCl_2 \cdot 6H_2O$  and  $NiCl_2(H_2O)_4$   
(C)  $CuSO_4 \cdot 5H_2O$  and  $CuCl_2 \cdot 4NH_3$   
(D)  $PtCl_2 \cdot 2NH_3$  and  $PtCl_4 \cdot 2HCl$
81. For a reaction  $3A \rightarrow 2B$   
The average rate of appearance of B is given by  $\frac{\Delta[B]}{\Delta t}$ . The CORRECT relation between the average rate of appearance of B with the average rate of disappearance of A is given in option:
- (A)  $\frac{-2\Delta[A]}{3\Delta t}$  (B)  $\frac{\Delta[A]}{\Delta t}$   
(C)  $\frac{-\Delta[A]}{\Delta t}$  (D)  $\frac{-3\Delta[A]}{2\Delta t}$
82. For a weak acid HA, the percentage of dissociation is nearly 1% at equilibrium. If the concentration of acid is  $0.1 \text{ mol L}^{-1}$ , then the CORRECT option for its  $K_a$  at the same temperature is:
- (A)  $1 \times 10^{-5}$  (B)  $1 \times 10^{-3}$   
(C)  $1 \times 10^{-4}$  (D)  $1 \times 10^{-6}$
83. Which of the following is a positively charged sol?
- (A) Silver sol  
(B)  $Sb_2S_3$  sol  
(C) Methylene blue sol  
(D) Congo red sol
84. Which amongst the following reactions of alkyl halides produces isonitrile as a major product?
- (i)  $R-X + HCN \rightarrow$   
(ii)  $R-X + AgCN \rightarrow$   
(iii)  $R-X + KCN \rightarrow$   
(iv)  $R-X + NaCN \xrightarrow[C_2H_5OH]{H_2O}$

Choose the **most appropriate** answer from the options given below:

- (A) (ii) only  
(B) (i) and (ii) only  
(C) (iv) only  
(D) (iii) and (iv) only
85. The CORRECT order for the rate of  $\alpha, \beta$ -dehydrohalogenation for the following compounds is \_\_\_\_\_.
- (i)  I
- (ii)  I
- (iii)  I
- (A) (iii) < (ii) < (i)  
(B) (ii) < (iii) < (i)  
(C) (i) < (ii) < (iii)  
(D) (ii) < (i) < (iii)

### Section – B (Chemistry)

86. Type of isomerism exhibited by compounds  $[Cr(H_2O)_6]Cl_3$ ,  $[Cr(H_2O)_5Cl]Cl_2 \cdot H_2O$ ,  $[Cr(H_2O)_4Cl_2]Cl \cdot 2H_2O$  and the value of coordination number (CN) of central metal ion in all these compounds, respectively is:
- (A) Ionisation isomerism, CN = 4  
(B) Solvate isomerism, CN = 6  
(C) Geometrical isomerism, CN = 2  
(D) Optical isomerism, CN = 4
87. Given below are two statements:  
**Statement I:** In an organic compound, when inductive and electromeric effects operate in opposite directions, the inductive effect predominates.  
**Statement II:** Hyperconjugation is observed in o-xylene.  
In the light of the above statements, choose the CORRECT answer from the options given below:
- (A) Both Statement I and Statement II are true.  
(B) Both Statement I and Statement II are false.  
(C) Statement I is true but Statement II is false.  
(D) Statement I is false but Statement II is true.
88. Choose the CORRECT sequence of reagents in the conversion of 4-nitrotoluene to 2-bromotoluene.
- (A)  $Br_2$ ;  $Sn/HCl$ ;  $NaNO_2/HCl$ ;  $H_2O/H_3PO_2$   
(B)  $Sn/HCl$ ;  $Br_2$ ;  $NaNO_2/HCl$ ;  $H_2O/H_3PO_2$   
(C)  $NaNO_2/HCl$ ;  $Sn/HCl$ ;  $Br_2$ ;  $H_2O/H_3PO_2$   
(D)  $Sn/HCl$ ;  $NaNO_2/HCl$ ;  $Br_2$ ;  $H_2O/H_3PO_2$



89. How are edge length 'a' of the unit cell and radius 'r' of the sphere related to each other in ccp structure? (Choose correct option for your answer.)

- (A)  $a = 4r/\sqrt{3}$  (B)  $a = 2\sqrt{2} r$   
(C)  $a = 2r$  (D)  $a = r/2\sqrt{2}$

90. Which statement is NOT true about photochemical smog?

- (A) Photochemical smog occurs in warm, dry and sunny climate.  
(B) Common components of photochemical smog are ozone, nitric oxide, acrolein, formaldehyde and peroxyacetyl nitrate.  
(C) Photochemical smog is harmful to humans but has no effect on plants.  
(D) Plants like Pinus, Juniparus can help in reducing the photochemical smog.

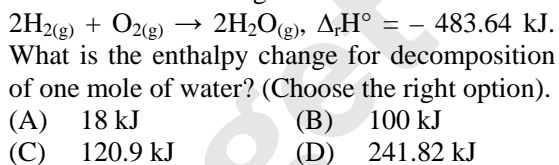
91. How many number of tetrahedral voids are formed in 5 mol of a compound having cubic close packed structure? (Choose the correct option)

- (A)  $3.011 \times 10^{24}$  (B)  $6.022 \times 10^{24}$   
(C)  $1.550 \times 10^{24}$  (D)  $3.011 \times 10^{25}$

92. The CORRECT option for a redox couple is:

- (A) Both the reduced and oxidised forms involve same element.  
(B) Cathode and anode together.  
(C) Both are oxidised forms involving same element.  
(D) Both are reduced forms involving same element.

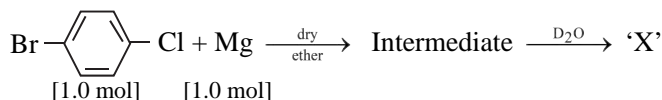
93. Consider the following reaction:

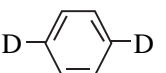
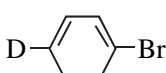


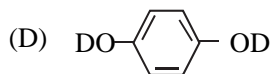
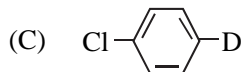
94. The CORRECT sequence given below containing neutral, acidic, basic and amphoteric oxide each, respectively, is:

- (A) NO, CO<sub>2</sub>, ZnO, CaO  
(B) NO, CO<sub>2</sub>, CaO, ZnO  
(C) NO, ZnO, CO<sub>2</sub>, CaO  
(D) ZnO, NO, CaO, CO<sub>2</sub>

95. Identify 'X' in the following reaction.



- (A)   
(B) 



96. Read the following statements and choose the set of CORRECT statements:

- (i) Chrome steel is used for cutting tools and crushing machines.  
(ii) The fine dust of aluminium is used in paints and lacquers.  
(iii) Copper is used for reduction of alcohol.  
(iv) Zinc dust is used as a reducing agent in the manufacture of paints.  
(v) Iron is used for galvanising zinc.

Choose the **most appropriate** answer from the options given below:

- (A) (i), (ii) and (iv) only  
(B) (ii), (iii) and (iv) only  
(C) (iv) and (v) only  
(D) (i) and (iv) only

97. Which amongst the following aqueous solutions of electrolytes will have minimum elevation in boiling point? Choose the correct option.

- (A) 0.1 M MgSO<sub>4</sub> (B) 1 M NaCl  
(C) 0.05 M NaCl (D) 0.1 M KCl

98. Given below are two statements: one is labelled as **Assertion (A)** and the other is labelled as **Reason (R)**.

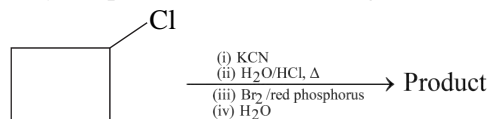
**Assertion (A):** Ionisation enthalpies of early actinoids are lower than for early lanthanoids.

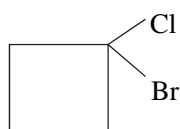
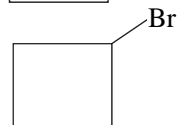
**Reason (R):** Electrons are entering 5f orbitals in actinoids which experience greater shielding from nuclear charge.

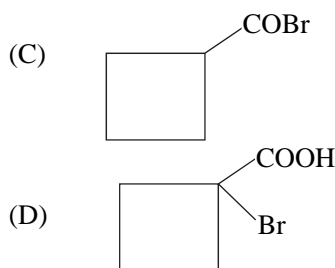
In the light of the above statements, choose the CORRECT answer from the options given below:

- (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.

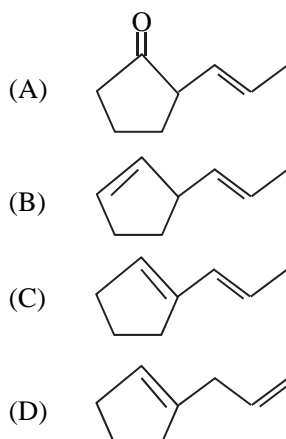
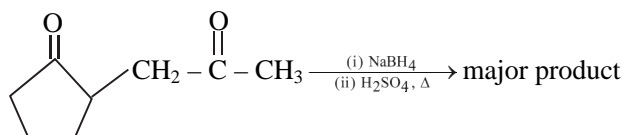
99. Identify the product in the following reaction.



- (A)   
(B) 



100. The major product formed in the following conversion is \_\_\_\_\_.



**Section – A (Botany)**

101. Match List-I with List-II

	List - I		List - II
i.	Chlorophyll a	a.	Yellow to yellow orange
ii.	Chlorophyll b	b.	Yellow green
iii.	Xanthophyll	c.	Blue green
iv.	Carotenoid	d.	Yellow

Choose the **correct** answer from the options given below :

- (A) i – b, ii – c, iii – a, iv – d  
 (B) i – d, ii – c, iii – b, iv – a  
 (C) i – c, ii – b, iii – d, iv – a  
 (D) i – c, ii – a, iii – d, iv – b

102. Doubling of the number of chromosomes can be achieved by disrupting mitotic cell division soon after

- (A) Prophase (B) Metaphase  
 (C) Anaphase (D) Telophase

103. Ligation of foreign DNA at which of the following site will result in loss of tetracycline resistance of pBR322?

- (A) *EcoR I* (B) *BamH I*  
 (C) *Pst I* (D) *Pvu I*

104. Which classes of algae possess pigment fucoxanthin and pigment phycoerythrin, respectively?

- (A) Chlorophyceae and Rhodophyceae  
 (B) Rhodophyceae and Phaeophyceae  
 (C) Phaeophyceae and Chlorophyceae  
 (D) Phaeophyceae and Rhodophyceae

105. Plants offer rewards to animals in the form of pollen and nectar and the animals facilitate the pollination process. This is an example of :

- (A) Commensalism (B) Mutualism  
 (C) Amensalism (D) Competition

106. In which of the following sets of families, the pollen grains are viable for months?

- (A) Rosaceae, Liliaceae and Poaceae  
 (B) Leguminosae, Solanaceae and Rosaceae  
 (C) Solanaceae, Poaceae and Liliaceae  
 (D) Brassicaceae, Liliaceae and Poaceae

107. The species of plants that plays a vital role in controlling the relative abundance of other species in a community is called \_\_\_\_\_.

- (A) exotic species  
 (B) keystone species  
 (C) alien species  
 (D) endemic species

108. The dissolution of synaptonemal complex occurs during

- (A) Diakinesis (B) Leptotene  
 (C) Pachytene (D) Diplotene

109. Match List-I with List-II

	List - I		List - II
i.	Hydrarch succession	a.	Gradual change in the species composition
ii.	Xerarch succession	b.	Faster and climax reached quickly
iii.	Ecological succession	c.	Lichens to mesic conditions
iv.	Secondary succession	d.	Phytoplankton to mesic conditions

Choose the **correct** answer from the options given below :

- (A) i – a, ii – d, iii – b, iv – c  
 (B) i – d, ii – c, iii – a, iv – b  
 (C) i – d, ii – b, iii – c, iv – a  
 (D) i – c, ii – a, iii – d, iv – b

110. In 'rivet popper hypothesis', Paul Ehrlich compared the rivets in an airplane to

- (A) ecosystem  
 (B) genera within a family  
 (C) species within a genus  
 (D) genetic diversity



111. Match List-I with List-II.

	List – I (Type of cross)		List – II (Phenotypic ratio)
i.	Monohybrid Cross	a.	1 : 1
ii.	Dihybrid Cross	b.	1 : 2 : 1
iii.	Incomplete dominance	c.	3 : 1
iv.	Test Cross	d.	9 : 3 : 3 : 1

Choose the **correct** answer from the options given below :

- (A) i – b, ii – c, iii – d, iv – a  
(B) i – d, ii – c, iii – a, iv – b  
(C) i – c, ii – d, iii – b, iv – a  
(D) i – b, ii – d, iii – c, iv – a

112. Match List-I with List-II.

	List – I		List – II
i.	Protein	a.	C = C double bonds
ii.	Unsaturated fatty acid	b.	Phosphodiester bond
iii.	Nucleic acid	c.	Glycosidic bonds
iv.	Polysaccharide	d.	Peptide bonds

Choose the **correct** answer from the options given below :

- (A) i – d, ii – a, iii – b, iv – c  
(B) i – a, ii – d, iii – c, iv – b  
(C) i – b, ii – a, iii – d, iv – c  
(D) i – d, ii – c, iii – a, iv – b

113. The phenomenon which is influenced by auxin and also played a major role in its discovery :

- (A) Gravitropism  
(B) Apical Dominance  
(C) Phototropism  
(D) Root initiation

114. In *Calotropis*, aestivation is :

- (A) Imbricate (B) Twisted  
(C) Valvate (D) Vexillary

115. Given below are two statements :

**Statement I:** RuBisCO is the most abundant enzyme in the world.

**Statement II:** Photorespiration does not occur in C<sub>4</sub> plants.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (A) Both Statement I and Statement II are correct  
(B) Both Statement I and Statement II are incorrect

- (C) Statement I is correct but Statement II is incorrect  
(D) Statement I is incorrect but Statement II is correct

116. Consider the following tissues in the stelar region of a stem showing secondary growth.

- i. Primary xylem  
ii. Secondary xylem  
iii. Primary phloem  
iv. Secondary phloem

Arrange these in the **correct** sequence of their position from pith towards cortex.

- (A) i, ii, iii, iv (B) ii, i, iv, iii  
(C) i, ii, iv, iii (D) ii, i, iii, iv

117. Identify the **correct** statements regarding Mass flow hypothesis.

- i. Mass flow is faster than diffusion.  
ii. Mass flow is the result of pressure difference between the end points.  
iii. Different substances involved in mass flow move at different paces.  
iv. Mass flow can result through either a positive or a negative hydrostatic pressure gradient.

Choose the **correct** answer from the options given below:

- (A) i, ii, iii only (B) i, ii, iv only  
(C) i, iii, iv only (D) ii, iii, iv only

118. Fatty acids are connected with the respiratory pathway through:

- (A) Dihydroxy acetone phosphate  
(B) Pyruvic acid  
(C) Acetyl CoA  
(D)  $\alpha$ -Ketoglutaric acid

119. Inulin is a polymer of:

- (A) Amino acids (B) Glucose  
(C) Fructose (D) Galactose

120. A heterozygous pea plant with violet flowers was crossed with a homozygous pea plant with white flowers. Violet is dominant over white. Which one of the following represents the expected combinations among 40 progenies formed?

- (A) All 40 produced violet flowers  
(B) All 40 produced white flowers  
(C) 30 produced violet and 10 produced white flowers  
(D) 20 produced violet and 20 produced white flowers

121. The amount of nutrients such as carbon, nitrogen, potassium and calcium present in the soil at any given time is referred to as:

- (A) Humus (B) Detritus  
(C) Standing state (D) Standing crop



122. Thermostable DNA polymerase used in PCR was isolated from:  
(A) *Agrobacterium tumefaciens*  
(B) *Bacillus thuringiensis*  
(C) *Thermus aquaticus*  
(D) *Escherichia coli*

123. Match List-I with List-II.

	List – I		List – II
i.	Pteropsida	a.	<i>Psilotum</i>
ii.	Lycopsida	b.	<i>Equisetum</i>
iii.	Psilopsida	c.	<i>Adiantum</i>
iv.	Sphenopsida	d.	<i>Selaginella</i>

Choose the **correct** answer from the options given below:

- (A) i – b, ii – c, iii – d, iv – a  
(B) i – c, ii – d, iii – a, iv – b  
(C) i – b, ii – c, iii – a, iv – d  
(D) i – c, ii – a, iii – d, iv – b
124. What will happen if fresh water lake gets contaminated by addition of polluted water with high BOD?  
(A) Number of submerged aquatic plants in the lake will increase  
(B) Number of aquatic animals in the lake will increase  
(C) Amount of dissolved oxygen in the lake will decrease  
(D) The lake will remain unaffected
125. Nitrates and phosphates flowing from agricultural farms into water bodies are a significant cause of:  
(A) Mineralisation (B) Stratification  
(C) Eutrophication (D) Humification
126. Transfer of pollen grains from anther to stigma of another flower of same plant is known as:  
(A) Autogamy (B) Cleistogamy  
(C) Geitonogamy (D) Xenogamy
127. Match List-I with List-II.

	List – I		List – II
i.	Auxin	a.	Promotes female flower formation in cucumber
ii.	Gibberellin	b.	Overcoming apical dominance
iii.	Cytokinin	c.	Increase in the length of grape stalks
iv.	Ethylene	d.	Promotes flowering in pineapple

Choose the **correct** answer from the options given below:

- (A) i – a, ii – c, iii – d, iv – b  
(B) i – c, ii – b, iii – a, iv – d

- (C) i – b, ii – a, iii – d, iv – c  
(D) i – d, ii – c, iii – b, iv – a

128. How many times decarboxylation occurs during each TCA cycle?  
(A) Once (B) Twice  
(C) Thrice (D) Many
129. For chemical defence against herbivores, *Calotropis* has  
(A) toxic ricin  
(B) distasteful quinine  
(C) cardiac glycosides  
(D) strychnine
130. Name the component that binds to the operator region of an operon and prevents RNA polymerase from transcribing the operon.  
(A) Repressor protein  
(B) Inducer  
(C) Promotor  
(D) Regulator protein
131. The last chromosome sequenced in Human Genome Project was:  
(A) Chromosome 22  
(B) Chromosome 14  
(C) Chromosome 6  
(D) Chromosome 1
132. In which disorder change of single base pair in the gene for beta globin chain results in change of glutamic acid to valine?  
(A) Haemophilia  
(B) Phenylketonuria  
(C) Thalassaemia  
(D) Sickle cell anemia
133. The transverse section of a plant part showed polyarch, radial and exarch xylem, with endodermis and pericycle. The plant part is identified as:  
(A) Dicot stem (B) Monocot stem  
(C) Monocot root (D) Dicot root
134. In a pea flower, five petals are arranged in a specialized manner with one posterior, two lateral and two anterior. These are named as \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_ respectively.  
(A) Keel, Standard and Carina  
(B) Standard, Wings and Keel  
(C) Keel, Wings and Standard  
(D) Vexillum, Keel and Standard
135. During symport two different molecules move across the membrane  
(A) in same direction with the help of same carrier  
(B) in opposite direction with the help of same carrier



- (C) in same direction with the help of different carriers located at a common site  
(D) in same direction with the help of different carriers located at different sites in the same cell

**Section – B (Botany)**

136. Which of the following mineral ion is **not** remobilized in plants?  
(A) Nitrogen (B) Phosphorus  
(C) Potassium (D) Calcium
137. Match Column-I with Column-II.

Column – I		Column – II	
i.	<i>Nitrococcus</i>	a.	Denitrification
ii.	<i>Rhizobium</i>	b.	Conversion of ammonia to nitrite
iii.	<i>Thiobacillus</i>	c.	Conversion of nitrite to nitrate
iv.	<i>Nitrobacter</i>	d.	Conversion of atmospheric nitrogen to ammonia

Choose the **correct** option:

- (A) i – b, ii – d, iii – a, iv – c  
(B) i – a, ii – b, iii – c, iv – d  
(C) i – c, ii – a, iii – d, iv – b  
(D) i – d, ii – c, iii – b, iv – a
138. In angiosperms the correct sequence of events in formation of female gametophyte in the ovule is
- 3 successive free nuclear divisions in functional megaspores.
  - Degeneration of 3 megaspores.
  - Meiotic division in megaspore mother cell.
  - Migration of 3 nuclei towards each pole.
  - Formation of wall resulting in seven celled embryo sac.

Choose the **correct** answer from the options given below:

- (A) ii, iii, i, iv, v (B) iii, ii, i, iv, v  
(C) i, ii, iii, iv, v (D) iii, v, i, iv, ii

139. Match List-I with List-II.

List - I		List - II	
i.	Kanamycin	a.	Delivers genes into animal cells
ii.	<i>Cla</i> I	b.	Selectable marker
iii.	Disarmed retroviruses	c.	Restriction site
iv.	Kanamycin <sup>R</sup> gene	d.	Antibiotic resistance

Choose the **correct** answer from the options given below:

- (A) i – d, ii – c, iii – a, iv – b  
(B) i – b, ii – d, iii – a, iv – c  
(C) i – b, ii – c, iii – a, iv – d  
(D) i – c, ii – a, iii – d, iv – b

140. Which of the following statements is true?  
(A) Most algal genera are diplontic  
(B) Most bryophytes do not have haplo-diplontic life cycle  
(C) All pteridophytes exhibit haplo-diplontic pattern  
(D) Seed bearing plants follow haplontic pattern

141. Consider the following plant tissues:

- Axillary buds
- Fascicular vascular cambium
- Interfascicular cambium
- Cork cambium
- Intercalary meristem

Identify the lateral meristems among the above.

- (A) i, ii, iii and v only  
(B) i, ii, iv and v only  
(C) i, iii and iv only  
(D) ii, iii and iv only

142. A certain plant homozygous for yellow seeds and red flowers was crossed with a plant homozygous for green seeds and white flowers. The F<sub>1</sub> plants had yellow seeds and pink flowers. The F<sub>1</sub> plants were selfed to get F<sub>2</sub> progeny. Assuming independent assortment of the two characters, how many phenotypic categories are expected for these characters in the F<sub>2</sub> generation?

- (A) 4 (B) 6  
(C) 9 (D) 16

143. Given below are two statements :

**Statement I:** The process of translocation through phloem is unidirectional but through xylem, it is bidirectional.

**Statement II:** The most readily mobilized elements are phosphorus, sulphur, nitrogen and potassium.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (A) Both Statement I and Statement II are correct  
(B) Both Statement I and Statement II are incorrect  
(C) Statement I is correct but Statement II is incorrect  
(D) Statement I is incorrect but Statement II is correct

144. Which of the following statements is **not** correct?

- (A) Plant growth is generally determinate.  
(B) Plant growth is measurable.  
(C) Phase of cell elongation of plant cells is characterized by increased vacuolation.  
(D) Cells in the meristematic phase of growth exhibit abundant plasmodesmatal connections.



145. Which of the following statement is **incorrect** about *Agrobacterium tumifaciens*?
- (A) It transforms normal plant cells into tumorous cells.  
(B) It delivers 'T-DNA' into plant cell.  
(C) It is used to deliver gene of interest in both prokaryotic as well as eukaryotic host cells.  
(D) 'Ti' plasmid from *Agrobacterium tumifaciens* used for gene transfer is not pathogenic to plant cells.
146. Given below are two statements :
- Statement I:** The process of copying genetic information from one strand of the DNA into RNA is termed as transcription.  
**Statement II:** A transcription unit in DNA is defined primarily by the three regions in the DNA, i.e., a promotor, the structural gene and a terminator.
- In the light of the above statements, choose the **correct** answer from the options given below:
- (A) Both Statement I and Statement II are true  
(B) Both Statement I and Statement II are false  
(C) Statement I is true but Statement II is false  
(D) Statement I is false but Statement II is true
147. Which scientist conducted an experiment with <sup>32</sup>P and <sup>35</sup>S labelled phages for demonstrating that DNA is the genetic material?
- (A) F. Griffith  
(B) O.T. Avery, C.M. MacLeod and M. McCarty  
(C) James D. Watson and F.H.C. Crick  
(D) A.D. Hershey and M.J. Chase
148. Which out of the following statements is incorrect?
- (A) Both ATP and NADPH + H<sup>+</sup> are synthesised during non-cyclic photophosphorylation.  
(B) Stroma lamellae lack PS II and NADP reductase  
(C) Grana lamellae have both PS I and PS II  
(D) Cyclic photophosphorylation involves both PS I and PS II
149. During which stages of mitosis and meiosis, respectively does the centromere of each chromosome split?
- (A) Telophase, Anaphase I  
(B) Anaphase, Anaphase II  
(C) Metaphase, Metaphase II  
(D) Prophase, Telophase I

150. Match the following:

	Type of flower		Example
i.	Zygomorphic	a.	Mustard
ii.	Hypogynous	b.	Plum
iii.	Perigynous	c.	Cassia
iv.	Epigynous	d.	Cucumber

Select the **correct** option:

- (A) i – d, ii – a, iii – c, iv – b  
(B) i – c, ii – a, iii – b, iv – d  
(C) i – a, ii – b, iii – d, iv – c  
(D) i – a, ii – b, iii – c, iv – d

**Section – A (Zoology)**

151. Which of the following statements are correct with respect to the hormone and its function?
- i. Thyrocalcitonin (TCT) regulates the blood calcium level.  
ii. In males, FSH and androgens regulate spermatogenesis.  
iii. Hyperthyroidism can lead to goitre.  
iv. Glucocorticoids are secreted in Adrenal Medulla.  
v. Parathyroid hormone is regulated by circulating levels of sodium ions.
- Choose the most appropriate answer from the options given below:
- (A) ii and iii only      (B) i and iv only  
(C) iii and v only      (D) i and ii only
152. 'X' and 'Y' are the components of Binomial nomenclature. This naming system was proposed by 'Z':
- (A) X – Specific epithet, Y – Generic name, Z – Carolus Linnaeus  
(B) X – Generic name, Y – Specific epithet, Z – R.H. Whittaker  
(C) X – Generic name, Y – Specific epithet, Z – Carolus Linnaeus  
(D) X – Specific epithet, Y – Generic name, Z – R.H. Whittaker
153. Select the sequence of steps in Respiration.
- i. Diffusion of gases (O<sub>2</sub> and CO<sub>2</sub>) across alveolar membrane.  
ii. Diffusion of O<sub>2</sub> and CO<sub>2</sub> between blood and tissues.  
iii. Transport of gases by the blood.  
iv. Pulmonary ventilation by which atmospheric air is drawn in and CO<sub>2</sub> rich alveolar air is released out.  
v. Utilisation of O<sub>2</sub> by the cells for catabolic reactions and resultant release of CO<sub>2</sub>.
- Choose the **correct** answer from the options given below:
- (A) ii, iii, v, iv, i      (B) i, iii, ii, v, iv  
(C) iv, i, iii, ii, v      (D) iii, ii, i, v, iv





164. House fly belongs to \_\_\_\_\_ family.  
(A) Calliphoridae (B) Muscidae  
(C) Cyprinidae (D) Hominidae
165. Diacetyl morphine is also called as:  
(A) Crack (B) Smack  
(C) Amphetamine (D) Barbiturate
166. Which of the following statements are **correct**?  
i. Reproductive health refers to total well-being in all aspects of reproduction.  
ii. Amniocentesis is legally banned for sex determination in India.  
iii. "Saheli" - a new oral contraceptive for females was developed in collaboration with ICMR (New Delhi).  
iv. Amniocentesis is used to determine genetic disorders and survivability of foetus.  
Choose the **most appropriate** answer from the options given below:  
(A) i, ii and iv only (B) i and iii only  
(C) ii and iii only (D) iv and iii only
167. Which one of the following is the quiescent stage of cell cycle?  
(A) G<sub>1</sub> (B) G<sub>0</sub> (C) M (D) G<sub>2</sub>
168. Match List-I with List-II

	List-I (ECG)		List-II (Electrical activity of heart)
i.	P-wave	a.	Depolarisation of ventricles
ii.	QRS complex	b.	End of systole
iii.	T wave	c.	Depolarisation of atria
iv.	End of T wave	d.	Repolarisation of ventricles

Choose the **correct** answer from the options given below:

- (A) i - d, ii - c, iii - a, iv - b  
(B) i - c, ii - a, iii - d, iv - b  
(C) i - d, ii - a, iii - c, iv - b  
(D) i - a, ii - d, iii - c, iv - b
169. Which of the following is **not** a secondary metabolite?  
(A) Anthocyanin (B) Lecithin  
(C) Curcumin (D) Morphine
170. Given below are two statements:  
**Statement I:** Intra Cytoplasmic Sperm Injection (ICSI) is another specialised procedure of *in-vivo* fertilisation.  
**Statement II:** Infertility cases due to inability of the male partner to inseminate female can be corrected by artificial insemination (AI).

In the light of the above statements, choose the **correct** answer from the options given below:

- (A) Both Statement I and Statement II are true.  
(B) Both Statement I and Statement II are false.  
(C) Statement I is correct but Statement II is false.  
(D) Statement I is incorrect but Statement II is true.
171. Match List-I with List-II.

	List-I		List-II
i.	Eosinophils	a.	6 - 8%
ii.	Lymphocytes	b.	2 - 3%
iii.	Neutrophils	c.	20 - 25%
iv.	Monocytes	d.	60 - 65%

Choose the **correct** answer from the options given below:

- (A) i - b, ii - c, iii - d, iv - a  
(B) i - b, ii - c, iii - a, iv - d  
(C) i - d, ii - a, iii - b, iv - c  
(D) i - d, ii - a, iii - c, iv - b
172. Select **incorrect** statement, regarding chemical structure of insulin.  
(A) C-peptide is not present in mature insulin molecule.  
(B) Polypeptide chains A and B are linked by disulphide bridges.  
(C) Mature insulin molecule consists of three polypeptide chains - A, B and C.  
(D) Insulin is synthesized as prohormone which contains extra stretch of C-peptide.

173. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

**Assertion (A):** Ascending limb of loop of Henle is impermeable to water and allows transport of electrolytes actively or passively.

**Reason (R):** Dilution of filtrate takes place due to efflux of electrolytes in the medullary fluid.

In the light of the above statements, choose the **correct** answer from the options 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.

174. Match List-I with List-II.

	List-I		List-II
i.	Typhoid	a.	Protozoan
ii.	Elephantiasis	b.	<i>Salmonella</i>
iii.	Ringworm	c.	Aschelminthes
iv.	Malaria	d.	<i>Microsporium</i>



Choose the **correct** answer from the options given below:

- (A) i – b, ii – c, iii – d, iv – a
- (B) i – b, ii – d, iii – c, iv – a
- (C) i – a, ii – d, iii – c, iv – b
- (D) i – a, ii – c, iii – d, iv – b

175. The Cockroach is:

- (A) Ureotelic only
- (B) Ureotelic and Uricotelic
- (C) Ammonotelic only
- (D) Uricotelic only

176. Brainstem of human brain consists of:

- (A) Thalamus, Hypothalamus and Corpora quadrigemina
- (B) Amygdala, Hippocampus and Corpus Callosum
- (C) Mid-brain, Pons and Medulla Oblongata
- (D) Forebrain, Cerebellum and Pons

177. Match List-I with List-II

	List-I		List-II
i.	Non-medicated IUDs	a.	Multiload 375
ii.	Copper releasing IUDs	b.	Rubber barrier
iii.	Hormone releasing IUDs	c.	Lippes loop
iv.	Vaults	d.	LNG- 20

Choose the **correct** answer from the options given below:

- (A) i – c, ii – a, iii – d, iv – b
- (B) i – c, ii – d, iii – b, iv – a
- (C) i – d, ii – c, iii – a, iv – b
- (D) i – b, ii – d, iii – c, iv – a

178. Which one of the following acts as an inducer for lac operon?

- (A) Glucose (B) Galactose
- (C) Sucrose (D) Lactose

179. Identify the fossil of man who showed the following characteristics.

- i. Brain capacity of 1400 cc
- ii. Used hides to protect their body
- iii. Buried their dead bodies

In the light of above statements, choose the **correct** answer from the options given below:

- (A) *Homo habilis*
- (B) *Australopithecus*
- (C) *Homo erectus*
- (D) Neanderthal man

180. Arrange the sequence of different hormones for their role during gametogenesis.

- i. Gonadotropin LH stimulates synthesis and secretion of Androgen

ii. Gonadotropin releasing hormone from hypothalamus

iii. Androgen stimulates spermatogenesis

iv. Gonadotropin FSH helps in the process of spermiogenesis

v. Gonadotropins from anterior pituitary gland

Choose the **correct** answer from the options given below:

- (A) ii, v, i, iii, iv (B) iv, ii, i, iii, v
- (C) v, i, iv, ii, iii (D) iii, i, iv, v, ii

181. Given below are two statements:

**Statement I:** In bacteria, the mesosomes are formed by the extensions of plasma membrane.

**Statement II:** The mesosomes, in bacteria, help in DNA replication and cell wall formation.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (A) Both Statement I and Statement II are correct.
- (B) Both Statement I and Statement II are incorrect.
- (C) Statement I is correct but Statement II is incorrect.
- (D) Statement I is incorrect but Statement II is correct.

182. Match List-I with List-II.

	List-I		List-II
i.	Deforestation	a.	Responsible for heating of Earth's surface and atmosphere
ii.	Reforestation	b.	Conversion of forested areas to non-forested areas
iii.	Green-house effect	c.	Natural ageing of lake by nutrient enrichment of its water
iv.	Eutrophication	d.	Process of restoring a forest that once existed but was removed

Choose the **correct** answer from the option given below:

- (A) i – c, ii – a, iii – b, iv – d
- (B) i – b, ii – d, iii – a, iv – c
- (C) i – d, ii – c, iii – b, iv – a
- (D) i – a, ii – b, iii – c, iv – d

183. Select the **correct** statements about sickle cell anaemia.

- i. There is a change in gene for beta globin.
- ii. In the beta globin, there is valine in the place of Lysine.



- iii. It is an example of point mutation.  
iv. In the normal gene U is replaced by A.  
Choose the **correct** answer from the options given below:  
(A) i, ii and iv only (B) i and iii only  
(C) ii, iii and iv only (D) ii and iv only

184. Given below are two statements:  
**Statement I:** The nose contains mucus-coated receptors which are specialised for receiving the sense of smell and are called olfactory receptors.  
**Statement II:** Wall of the eye ball has three layers. The external layer is called choroid (dense connective tissue), middle layer is sclera (thin pigmented layer) and internal layer is retina (ganglion cells, bipolar cells and photoreceptor cells).  
In the light of the above statements, choose the **correct** answer from the options given below:  
(A) Both Statement I and Statement II are true.  
(B) Both Statement I and Statement II are false.  
(C) Statement I is true but Statement II is false.  
(D) Statement I is false but Statement II is true.

185. Match List-I with List-II.

	List-I		List-II
i.	Contractile vacuole	a.	<i>Asterias</i>
ii.	Water vascular system	b.	<i>Amoeba</i>
iii.	Canal system	c.	<i>Spongilla</i>
iv.	Flame cells	d.	<i>Taenia</i>

Choose the **correct** answer from the options given below:

- (A) i - c, ii - b, iii - a, iv - d  
(B) i - b, ii - a, iii - c, iv - d  
(C) i - d, ii - b, iii - a, iv - c  
(D) i - a, ii - c, iii - b, iv - d

**Section - B (Zoology)**

186. Arrange the events of Renin - Angiotensin mechanism in correct sequence.  
i. Activation of JG cells and release of renin.  
ii. Angiotensin II activates release of aldosterone.  
iii. Fall in glomerular blood pressure.  
iv. Reabsorption of Na<sup>+</sup> and water from distal convoluted tubule.  
v. Angiotensinogen is converted to Angiotensin I and then to Angiotensin II.  
Choose the **correct** answer from the options given below:  
(A) i, iv, iii, ii, v (B) ii, i, v, iv, iii  
(C) iii, i, v, ii, iv (D) i, iv, v, iii, ii

187. Select the correct statements:  
i. Platyhelminthes are triploblastic pseudocoelomate and bilaterally symmetrical organisms.  
ii. Ctenophores reproduce only sexually and fertilization is external.  
iii. In tapeworm, fertilization is internal but sexes are not separate.  
iv. Ctenophores are exclusively marine, diploblastic and bioluminescent organisms.  
v. In sponges, fertilization is external and development is direct.

Choose the **correct** answer from the options given below:

- (A) i and v only (B) ii and iv only  
(C) i, iii and iv only (D) ii, iii and iv only

188. Select the correct sequential steps regarding absorption of fatty acids and glycerol, in intestine.  
i. Micelles are reformed into small protein coated fat globules called chylomicrons.  
ii. Micelles move into intestinal mucosa.  
iii. Fatty acids and glycerol are incorporated into small droplets called micelles.  
iv. Lacteals release the absorbed substances into blood stream.  
v. Chylomicrons are transported into lacteals.  
Choose the **correct** answer from the options given below:

- (A) iii, ii, i, v, iv (B) ii, iii, v, i, iv  
(C) i, v, ii, iv, iii (D) iv, v, ii, iii, i

189. Given below are two statements:  
**Statement I:** In cockroach, the forewings are transparent and prothoracic in origin.  
**Statement II:** In cockroach, the hind wings are opaque, leathery and mesothoracic in origin.  
In the light of the above statements, choose the **correct** answer from the options given below:  
(A) Both Statement I and Statement II are true.  
(B) Both Statement I and Statement II are false.  
(C) Statement I is correct but Statement II is false.  
(D) Statement I is incorrect but Statement II is true.

190. Match List-I with List-II.

	List-I		List-II
i.	Cytokine barriers	a.	Mucus coating of respiratory tract
ii.	Cellular barriers	b.	Interferons
iii.	Physiological barriers	c.	Neutrophils and Macrophages
iv.	Physical barriers	d.	Tears and Saliva



Choose the **correct** answer from the options given below:

- (A) i – c, ii – a, iii – b, iv – d
- (B) i – b, ii – c, iii – a, iv – d
- (C) i – b, ii – c, iii – d, iv – a
- (D) i – c, ii – a, iii – d, iv – b

191. With reference to Hershey and Chase experiments. Select the **correct** statements.

- i. Viruses grown in the presence of radioactive phosphorus contained radioactive DNA.
- ii. Viruses grown on radioactive sulphur contained radioactive proteins.
- iii. Viruses grown on radioactive phosphorus contained radioactive protein.
- iv. Viruses grown on radioactive sulphur contained radioactive DNA.
- v. Viruses grown on radioactive protein contained radioactive DNA.

Choose the **most appropriate** answer from the options given below:

- (A) i and iii only
- (B) ii and iv only
- (C) iv and v only
- (D) i and ii only

192. The salient features of genetic code are:

- i. The code is palindromic
- ii. UGA act as initiator codon
- iii. The code is unambiguous and specific
- iv. The code is nearly universal

Choose the **most appropriate** answer from the options given below:

- (A) i and ii only
- (B) iii and iv only
- (C) i and iv only
- (D) ii and iii only

193. Select the correct statements regarding dissolved Oxygen and Biochemical Oxygen Demand.

- i. BOD is inversely related to dissolved oxygen.
- ii. Low dissolved oxygen and high BOD lead to loss of aquatic life.
- iii. High BOD leads to high dissolved oxygen.
- iv. Both BOD and dissolved oxygen are indicator of health of a water body.
- v. Both BOD and dissolved oxygen are affected by amount of organic matter in the water body.

Choose the **most appropriate** answer from the options given below:

- (A) i, ii, iii, iv only
- (B) ii, iii, iv, v only
- (C) i, ii, iii, v only
- (D) i, ii, iv, v only

194. Select the incorrect statement with respect to Multiple Ovulation Embryo Transfer (MOET) Technology.

- (A) Cow is administered with hormones to induce super-ovulation.
- (B) Super-ovulating cow is either mated with elite bull or is artificially inseminated.

(C) Fertilised eggs at 4 to 6 cells – stages are recovered non-surgically from super-ovulating cow and transferred to surrogate mother.

(D) It is used to increase herd size in a short time.

195. Match List-I with List-II.

	List-I		List-II
i.	Gene therapy	a.	Separation of DNA fragments
ii.	RNA interference	b.	Diagnostic test for AIDS
iii.	ELISA	c.	Cellular defence
iv.	Gel electrophoresis	d.	Allows correction of a gene defect

Choose the **correct** answer from the options given below:

- (A) i – d, ii – c, iii – b, iv – a
- (B) i – d, ii – c, iii – a, iv – b
- (C) i – d, ii – a, iii – b, iv – c
- (D) i – d, ii – b, iii – c, iv – a

196. Given below are two statements:

**Statement I:** Parathyroid hormone acts on bones and stimulates the process of bone resorption.

**Statements II:** Parathyroid hormone along with Thyrocalcitonin plays a significant role in carbohydrate metabolism.

In the light of the above statements, choose the **correct** answer from the options given below:

- (A) Both Statement I and Statement II are true.
- (B) Both Statement I and Statement II are false.
- (C) Statement I is correct but Statement II is false.
- (D) Statement I is incorrect but Statement II is true.

197. Select the correct statement/s with respect to mechanism of sex determination in Grasshopper.

- i. It is an example of female heterogamety.
- ii. Male produces two different types of gametes either with or without X chromosome.
- iii. Total number of chromosomes (autosomes and sex chromosomes) is same in both males and females.
- iv. All eggs bear an additional X chromosome besides the autosomes.

Choose the **correct** answer from the options given below:

- (A) i only
- (B) i and iii only
- (C) ii and iv only
- (D) i, iii and iv only



198. Match List-I with List-II.

	List-I		List-II
i.	Columnar epithelium	a.	Ducts of glands
ii.	Ciliated epithelium	b.	Inner lining of stomach and intestine
iii.	Squamous epithelium	c.	Inner lining of bronchioles
iv.	Cuboidal epithelium	d.	Endothelium

Choose the **correct** answer from the options given below:

- (A) i – b, ii – c, iii – a, iv – d  
(B) i – b, ii – c, iii – d, iv – a  
(C) i – c, ii – b, iii – a, iv – d  
(D) i – c, ii – b, iii – d, iv – a

199. Given below are two statements: one is labelled as Assertion (A) and the other is labelled as Reason (R).

**Assertion (A):** A person goes to high altitude and experiences “Altitude Sickness” with symptoms like breathing difficulty and heart palpitations.

**Reason (R):** Due to low atmospheric pressure at high altitude, the body does not get sufficient oxygen.

In the light of the above statements, choose the **correct** answer from the options 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.

200. Which of the following statements are correct with respect to Golgi apparatus?

- i. It is the important site of formation of glycoprotein and glycolipids.  
ii. It produces cellular energy in the form of ATP.  
iii. It modifies the protein synthesized by ribosomes on ER.  
iv. It facilitates the transport of ions.  
v. It provides mechanical support.

Choose the **most appropriate** answer from the options given below:

- (A) i and iv only  
(B) iv and v only  
(C) ii and iii only  
(D) i and iii only