

PART - A

PHYSICS

SSLC study material April - 2024



UNITS :

- **Light : Reflection and Refraction**
- **The Human Eye and the Colourful World**
- **Electricity**
- **Magnetic effects of Electric current**
- **Sources of Energy**



ISARADDI'S CLASSES

Sanjeevkumar Isaraddi

isaraddiclass.com

9448245781



Light - Reflection and Refraction

Previous questions from SSLC Board



ISARADDI'S CLASSES

April 2019

1. To obtain a diminished image of an object from a concave mirror, position of the object should be

(F = principal focus, C = centre of curvature, P = pole)

(A) between C and F

(B) beyond C

(C) between P and F

(D) at F

2. Convex mirror is commonly used as rear-view mirror in vehicles. Why ?

Ans. :

- Convex mirror always give erect and diminished images
- As they are curved outwards they have wider field of view.

3. The focal length of a concave lens is 30 cm. At what distance should the object be placed from the lens so that it forms an image at 20 cm from the lens ? (2Marks)

Ans. :

Focal length of a lens $f = -30\text{cm}$

Image distance $v = -20\text{cm}$

Lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ OR $\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$

$$\frac{1}{u} = \frac{1}{-20} - \frac{1}{(-30)} = \frac{1}{-20} + \frac{1}{30}$$

$$\frac{1}{u} = \frac{-3+2}{60} \quad \frac{1}{u} = \frac{-1}{60}$$

$$u = -60 \text{ cm}$$

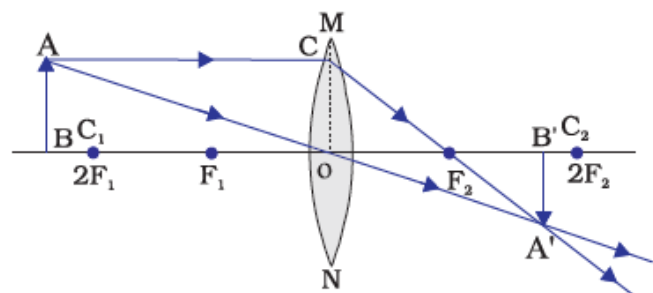
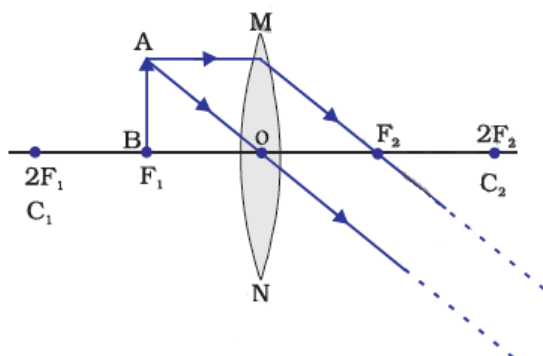
4. Draw the ray diagrams for the image formation in a convex lens when an object is placed (3Marks)

(i) at focus F_1

(ii) beyond $2F_1$.

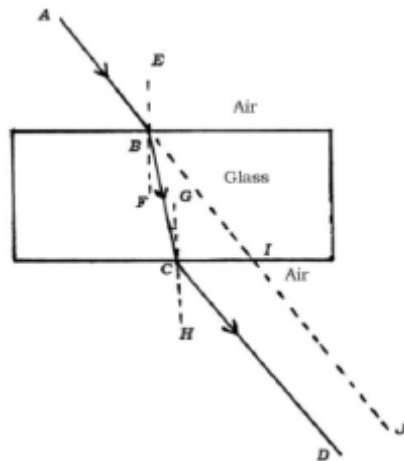
Ans. : (i) at focus F_1

(ii) beyond $2F_1$.



June 2019

1. Identify the emergent ray in the given figure. (1Mark)



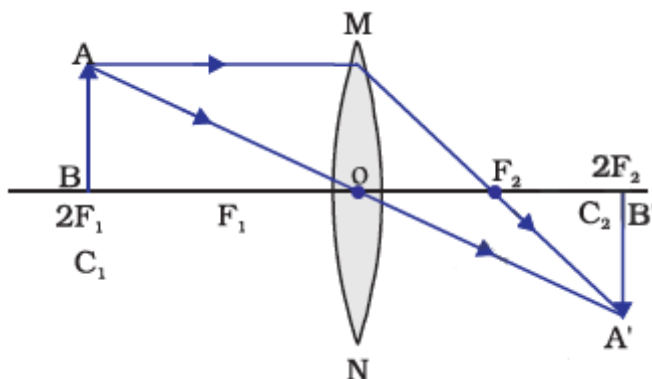
- (A) CD (B) BC (C) AB (D) IJ.

2. What is the centre of curvature of a spherical mirror ?

Ans. : The reflecting surface of a spherical mirror forms a part of a sphere. This sphere has a centre. This point is called the centre of curvature of the spherical mirror.

3. Draw the ray diagram to show the formation of image by a convex lens when the object is at $2F_1$. [F_1 : Principal focus]

Ans. :



4. A concave lens has focal length 30 cm. At what distance should the object be placed from the lens so that it forms an image at 20 cm from the lens ? Also, find the magnification produced by the lens.

Ans. : Focal length of a lens $f = -30\text{cm}$, Image distance $v = -20\text{cm}$

Lens formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ OR $\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$

$$\frac{1}{u} = \frac{1}{-20} - \frac{1}{(-30)}$$

$$\frac{1}{u} = \frac{1}{-20} + \frac{1}{30} = \frac{-3+2}{60} \qquad \frac{1}{u} = \frac{-1}{60}$$

$$u = -60 \text{ cm}$$

Magnification : $m = \frac{v}{u} \qquad m = \frac{-20}{-60} = \frac{1}{3}$

$$m = 0.33$$

April 2020

1. An object is kept at the centre of curvature of a concave mirror. The position and nature of the image formed is

- (A) between F and C and inverted (B) behind the mirror and erect
(C) between F and P and erect **(D) at the centre of curvature and inverted.**

2. An object is kept on the principal axis of a concave mirror of focal length 12 cm. If the object is at a distance of 18 cm from the mirror, calculate the image distance. Determine the nature of the image formed by calculating the magnification produced by the mirror.

Ans. :

Focal length $f = -12\text{cm}$, object distance $u = -18\text{cm}$, image distance $v = ?$,

Lens formula : $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$ OR $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

$$\frac{1}{v} = \frac{1}{-12} - \frac{1}{-18} = \frac{-3 + 2}{36}$$

$$\frac{1}{v} = -\frac{1}{36}$$

$$v = -36 \text{ cm}$$

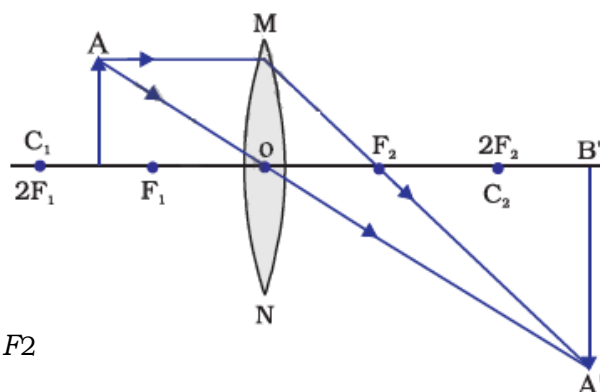
Magnification :

$$m = \frac{-v}{u} = \frac{-(-36)}{-18}$$
$$m = -2$$

Nature of the image : Real , inverted and larger than object

3. Draw the ray diagram when the object is kept between F_1 and $2F_1$ of the convex lens. With the help of the diagram mention the position and nature of the image formed. [F_1 : Principal focus of the lens]

Ans. :




Position of the image-beyond $2F_2$

Nature of the image - real inverted and enlarged.

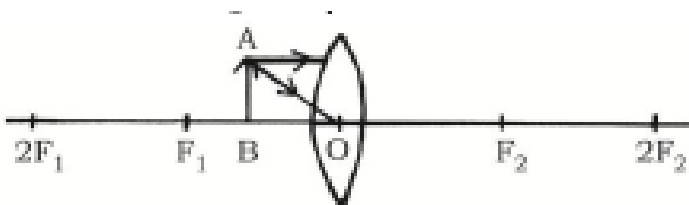
September 2020

The image of the English letter “ L ” in convex mirror looks like



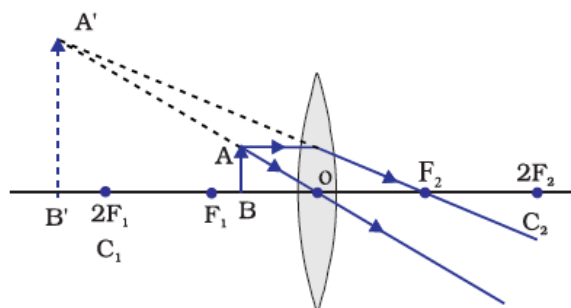
Ans. : B] 

2. Observe the given incomplete diagram. (1Mark)



Complete the diagram by drawing refracted rays and show the image formed

Ans :



2. Object distance and image distance of a lens are -30 cm and -10 cm respectively. Find the magnification and decide the type of lens used and nature of the image. (2Marks)

Ans. : Here, object distance $u = -30$ cm , image distance $v = -10$ cm

\therefore Magnification, $m = \frac{v}{u}$ $m = \frac{-10}{-30} = \frac{1}{3}$

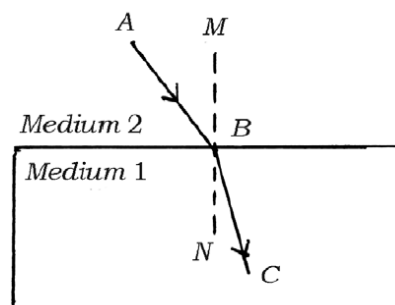
$$m = 0.33$$

- Here, as v is negative, the used lens is concave lens.
- As the magnification is positive and less than one [having positive sign] the image formed is erect, virtual and diminished.

3. a) State the laws of refraction of light.

(3Marks)

b) In the given figure, AB is the incident ray, BC is the refracted ray and MN is the normal at the point of incidence. Which medium is more denser ? Why ?



Ans : a) *Laws of refraction of light :*

- The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence, all lie in the same plane.
- The ratio of sine of angle of incidence to the sine of angle of refraction is a constant for the light of a given colour and for the given pair of media.

b) Medium 1 is more denser.

When a ray of light travels from rarer medium to denser medium, it always bends towards the normal.

4. a) Differentiate between convex mirror and concave mirror.

b) Define the principal focus of a convex lens.

Ans : a) Differences between convex mirror and concave mirror.

convex mirror	concave mirror.
It has outwardly bulged reflecting surface	It has inwardly curved reflecting surface
Principal focus lies behind the mirror	Principal focus lies in front of the mirror
It is known as diverging mirror	It is known as converging mirror
It always forms virtual , diminished erect images	It forms different types of images depending on the position of the object

b) Principal focus of a convex lens.

The rays, after refraction from the lens, are converging to a point on the principal axis. This point is called the principal focus of the lens.

July 2021 (MCQ based exam)

1. The focal length of a lens is + 0.50 m. The power of the lens and type are

(A) + 2.0 D and convex lens

(B) + 2.0 D and concave lens

(C) - 2.0 D and concave lens

(D) - 2.0 D and convex lens

2. The nature and the size of the image formed when an object is kept between the principal focus F_1 and optical centre O of a convex lens are

- (A) **virtual, erect and enlarged** (B) real, inverted and small size
(C) virtual, inverted and small size (D) real, inverted and enlarged

3. Observe the following table: In which material medium the speed of light is very high ?

Material	P	Q	R	S
Refractive index	1.52	1.44	2.42	1.33

- (A) Q (B) P (C) **S** (D) R

4. One property of a convex lens among the following is that, it

- (A) diverges the light rays (B) is thicker at the edges and thinner at the middle
(C) forms real and erect image (D) **is thinner at the edges and thicker at the middle**

Sept 2021 (MCQ based exam)

1. If the power of a lens is -2.5 D, the focal length of the lens and type is

- (A) $+0.40$ m and convex lens (B) -0.40 m and convex lens
(C) $+0.40$ m and concave lens (D) **-0.40 m and concave lens**

2. If an image is to be formed between F_2 and $2F_2$ in a convex lens, then the object should be placed [F : principal focus of a lens]

- (A) **beyond $2F_1$** (B) at $2F_1$ (C) between F_1 and $2F_1$ (D) at focus F_1

3. One property of concave lens among the following is, that

- (A) it converges the light rays
(B) **is thicker at the edges and thinner at the middle**
(C) is thinner at the edges and thicker at the middle
(D) it forms real and inverted image

4. The distance between the principal focus and the optical centre of a lens is

- (A) principal axis (B) object distance (C) image distance (D) **focal length**

April - 2022

1. To get diminished and real image of an object from a convex lens, the object should be placed -

- (A) at principal focus F_1 (B) between principal focus F_1 and $2F_1$
(C) **beyond $2F_1$** (D) between principal focus F_1 and optical centre O .

2. Mention the SI unit of power of lens.

Ans. : Diopetre

3. An object is placed at 25 cm in front of a concave mirror of focal length 15 cm. At what distance from the mirror should a screen be placed in order to obtain a sharp image ?

Ans. : Focal length $f = -15\text{cm}$, Object distance $u = -25\text{cm}$ Image distance $v = ?$

Formula $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ OR $\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$

$$\frac{1}{v} = \frac{1}{-15} - \frac{1}{-25} = \frac{-5 + 2}{75} = \frac{-3}{75}$$

So, $v = \frac{75}{-3} = -37.5\text{ cm}$

The screen should be placed at a distance of 37.5 cm, in front of the concave mirror.

4. A concave lens has focal length of 15 cm. At what distance should the object from the lens be placed so that it forms an image at 10 cm from the lens ?

Focal length $f = -15\text{cm}$, Image distance $v = -10\text{cm}$ Object distance $u = ?$

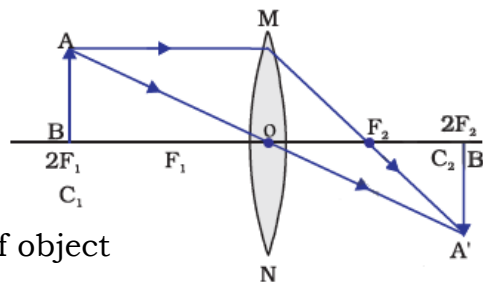
Formula $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$ OR $\frac{1}{u} = \frac{1}{v} - \frac{1}{f}$

$$\frac{1}{u} = \frac{1}{-10} - \frac{1}{-15} = \frac{-3 + 2}{30} = \frac{-1}{30}$$

So , $u = -30\text{ cm}$

The object is placed at a distance of 30 cm from the concave lens.

5. Draw the ray diagram to show the image formation by a convex lens, when the object is kept at $2F_1$ of the lens. With the help of the ray diagram mention the position and nature of the image formed.



Position of the image : at $2F_2$

Nature of the image : Real , inverted

and same size that of object

June - 2022

1. The correct statement among the following related to the concave lens is-

(A) converges the light rays

(B) diverges the light rays

(C) forms inverted image

(D) forms real image.

2. Calculate the power of convex lens with a focal length of + 0.5 m.

Ans. : Focal length (f) = + 0.5 m

Power of lens $P = \frac{1}{f} = \frac{1}{+0.5} = +2D$

2. a) State the two laws of refraction of light.

b) "The refractive index of diamond is 2.42." Write the meaning of this statement.

Ans. : a) Laws of refraction

i) The incident ray, the refracted ray and the normal to the interface of two transparent media at the point of incidence all lie in the same plane.

ii) The ratio of sine of angle of incidence to the sine of angle of refraction is a constant for the light of a given colour and for the given pair of media

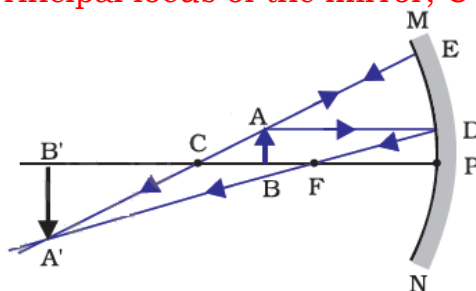
$$\text{OR } \frac{\sin i}{\sin r} = \text{Constant}$$

b) The ratio of the speed of light in air and the speed of light in diamond is 2.42.

3. Draw the ray diagram of image formation when the object is kept at $2F_1$ of the convex lens. With the help of the ray diagram, mention the position and nature of the image formed. [F_1 : Principal focus of the lens]

Same as in April -2022

4. Draw the ray diagram of image formation when the object is kept between C and F of the concave mirror. With the help of the ray diagram mention the position and the nature of the image formed. [F : Principal focus of the mirror, C : Centre of curvature of mirror]



Position of the image : Beyond C

Nature of the image : real inverted and larger than the object

5. a) Write any four uses of concave mirror.

b) An object is placed at a distance of 15 cm on the principal axis in front of a concave lens with a focal length of 10 cm. Find the image distance.

Ans. : a) **Uses of concave mirror :**

i) Used in torches, search-lights , ii) Used in vehicles head lights

iii) Used as shaving mirrors ,

iv) The dentists used to examine teeth of patients v) Used in solar furnace.

b) Focal length $f = -10\text{cm}$, Object distance $u = -15\text{cm}$ Image distance $v = ?$

$$\text{Formula } \frac{1}{v} - \frac{1}{u} = \frac{1}{f} \quad \text{OR} \quad \frac{1}{u} = \frac{1}{f} + \frac{1}{v}$$

$$\frac{1}{u} = \frac{1}{-10} + \frac{1}{-15} = \frac{-3 - 2}{30} = \frac{-5}{30}$$

$$\text{So, } v = \frac{30}{-5} = -6 \text{ cm}$$

Image distance = - 6 cm.

April - 2023

1. A light ray enters to rarer medium from a denser medium. Then the speed of that light ray

- (A) decreases and bends towards the normal
- (B) increases and bends away from the normal**
- (C) decreases and bends away from the normal
- (D) increases and bends towards the normal

2. Light enters from air to benzene having refractive index 1.50. Calculate the speed of light in benzene. (Speed of light in air : $3 \times 10^8 \text{ ms}^{-1}$)

Solution :

$$\text{Refractive index of a medium} = \frac{\text{Speed of light in air}}{\text{Speed of light in Benzene}}$$

$$1.50 = \frac{3 \times 10^8}{\text{Speed of light in Benzene}}$$

$$\text{Speed of light in Benzene} = \frac{3 \times 10^8}{1.5}$$

$$\text{Speed of light in Benzene} = 2 \times 10^8 \text{ m}^{-1}$$

3. A concave lens has focal length of 12 cm. At what distance should the object from the lens be placed so that it forms an image at 9 cm from the lens ?

Solutions : $f = -12\text{cm}$, $v = -9\text{cm}$, $u = ?$

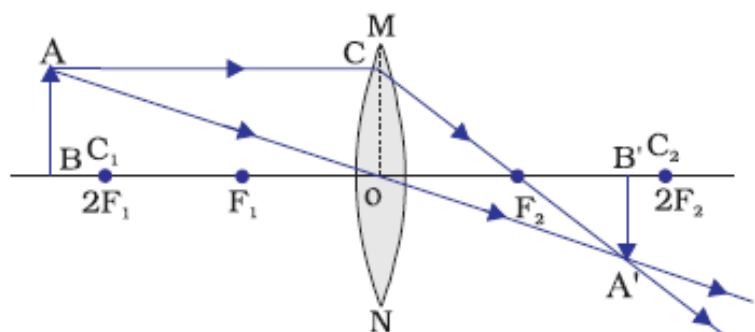
$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

$$\frac{1}{u} = \frac{1}{v} - \frac{1}{f} = \frac{1}{-9} - \frac{1}{-12}$$

$$\frac{1}{u} = \frac{1}{-9} + \frac{1}{12} = \frac{-4 + 3}{36} = \frac{-1}{36}$$

$$u = -36 \text{ cm}$$

4. Draw the ray diagram for the image formation in a convex lens when the object is placed beyond $2F_1$. Mention the position and nature of the image formed. [F_1 : Principal focus of the lens]



- Position of the image :
Between F_2 & $2F_2$.
- Nature of the image :
Real and inverted.

June - 2023

1. A mirror forms an erect and enlarged image of an object. Then the type of the mirror and the nature of the image respectively are

- (A) convex mirror and virtual image (B) concave mirror and real image
(C) plane mirror and real image (D) **concave mirror and virtual image.**

2. What is meant by the 'aperture' of a spherical mirror ? Mention the four uses of a concave mirror.

- The diameter of the reflecting surface of spherical mirror.

Uses of a concave mirror :

- Used in torches, search-lights and vehicle head lights to get parallel beam of light
- as a shaving mirror
- by dentists to see large images of the teeth
- in solar furnaces to concentrate sunlight

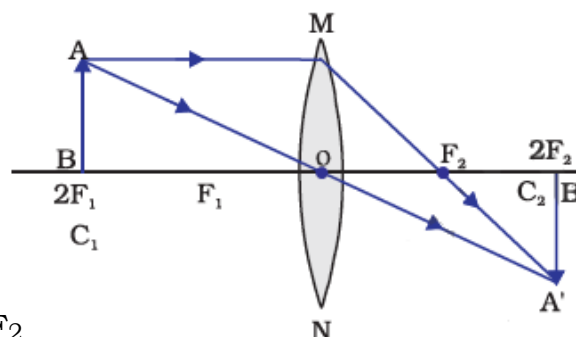
3. What is meant by the power of a lens ? Write the formula used to find the power of a lens. What is the SI unit of power of a lens ?

- The degree of convergence or divergence of light rays is the power of a lens
- Formula $P = \frac{1}{f}$
- SI unit of power of a lens is 'diopetre'.

4. If the focal lengths of two lenses A and B are + 0.50 m and - 0.40 m respectively. Mention the types of these lenses in the same order.

- + 0.50 m → Convex lens
- - 0.40 m → Concave lens

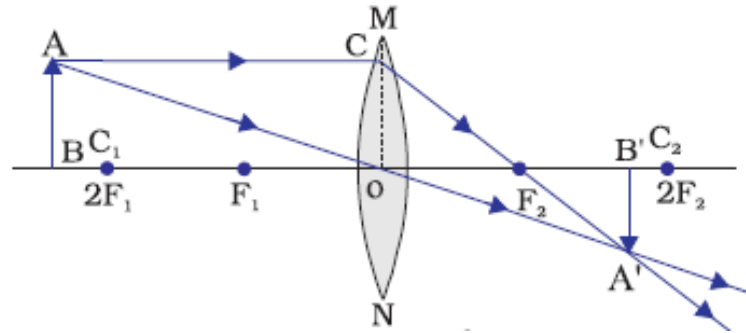
5. Draw the ray diagram for the image formation by a convex lens, when the object is placed at $2F_1$. With the help of the ray diagram mention the position and the nature of the image formed. [F_1 : Principal focus of the lens]



Position of the image : at $2F_2$

Nature of the image : Real and inverted

6. Draw the ray diagram for the image formation in a convex lens when the object is placed beyond $2F_1$. Mention the position and nature of the image formed. [F_1 : Principal focus of the lens]



- Position of the image : Between F_2 & $2F_2$.
- Nature of the image : Real and inverted.

MOST LIKELY QUESTIONS FOR 2024 (Including previous year questions)

1. Four objects A , B , C and D have refractive index 1.50 , 1.36 , 1.77 and 1.31 respectively. Which object will shine more ?

- a) Object A b) Object B **c) Object C** d) Object D

Explanation : As the refractive index of an object increases it shines more

2. An object is placed between f and $2f$ of a convex lens. Correct statement for the image formed here is

- a) real and larger than object** b) erect and smaller than object
c) inverted and equal size d) virtual and larger than object

3. Four convex lens P , Q , R and S have focal length 20cm , 15cm, 5cm and 10cm respectively. The power of lens is more in -

- a) P b) Q **c) R** d) S

Explanation : Power of lens is inversely proportional to focal length

4. An object was kept at any distance from concave lens , the nature of the image is

- a) virtual , erect and larger than object b) virtual , inverted and smaller than object
c) virtual , erect and smaller than object d) virtual , erect and equal size

5. Mention the conditions when a ray of light travels from one media to another, refraction does not take place.

Ans :

- If the angle of incidence is equal to 90° or 0°
- If the refractive indexes of both media are same.

6. A ray of light travelling in air enters obliquely into water. Does the light ray bend towards the normal or away from the normal? Why?

Ans :

- The light-ray bends towards the normal
- Because the ray of light goes from a rarer medium to a denser medium.

7. Observe the information given in Table

Media	Refractive index
Kerosene	1.44
Turpentine	1.47
Water	1.33

In which of these does the light travel fastest? Give reason to your answer.

Ans :

- In water light travels faster.
- Because water has the lowest refractive index, therefore light travels fastest in this optically rarer medium than kerosene and turpentine oil.

8. Observe the information given in Table

Media	Refractive index
Fused glass	1.46
Crown glass	1.52
Diamond	2.42
Flint glass	1.65

Find out the medium having highest optical density. Give reason to your answer

Ans : Diamond has highest optical density

- As the refractive index of a media increases , its optical density also increases.

9. The magnification produced by a lens is +1. What does this mean ?

Ans : (i) $m = 1$ indicates the size of image is same as that of object.
(ii) positive sign of m indicates that an erect image is formed.

10. Find the focal length of a lens of power -2.0 D. What type of lens is this ?

Ans: Here, $P = -2.0 \text{ D}$

Focal of length of lens $f = \frac{1}{P} = \frac{1}{-2} = -0.5\text{m or } -50\text{cm}$

The type of lens is concave because the focal length is negative.

11. List four characteristics of the images formed by plane mirrors.

Characteristics of the image formed by a plane mirror are

- image distance is same as that of object distance
- image formed is virtual and erect
- image formed is of the same size as that of the object
- image formed is laterally inverted (left appears right and right appears left).

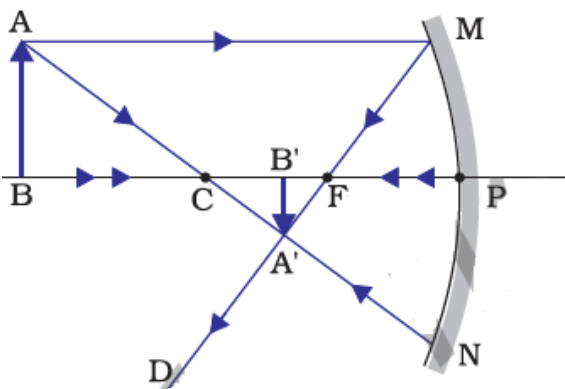
12. Draw the ray diagrams for the image formed by the concave mirror when an object was kept at -

i) Beyond C

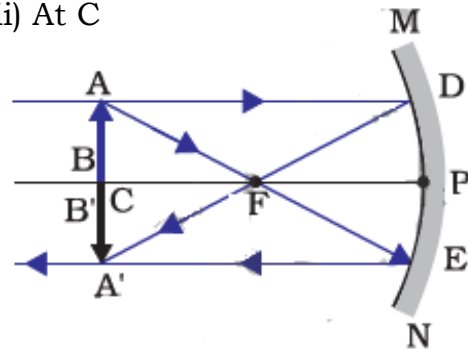
ii) At C

iii) Between C and F

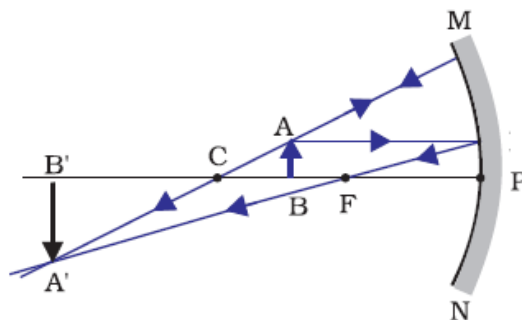
i) Beyond C



ii) At C



iii) Between C and F



13. A 10 cm long awl pin is placed vertically in front of a concave mirror. A 5 cm long image of the awl pin is formed at 30 cm in front of the mirror. Find the focal length of this mirror .

Given : Object size $h = 10\text{cm}$, Image size $h' = 5\text{ cm}$, Image distance $v = -30\text{ cm}$

Magnification formula $\frac{h^i}{h} = \frac{-v}{u}$, $\frac{5}{10} = \frac{-30}{u}$ $u = \frac{-30 \times 10}{5}$ $u = -60\text{cm}$

Now , the mirror formula $\frac{1}{v} + \frac{1}{u} = \frac{1}{f}$ OR $\frac{1}{f} = \frac{1}{-30} + \frac{1}{-60} = \frac{-2-1}{60} = \frac{-3}{60}$

$$f = \frac{60}{-3} = -20\text{cm}$$

Focal length of the concave mirror is -20cm

14. Rays from Sun converge at a point 15 cm in front of a concave mirror. Where should an object be placed so that size of its image is equal to the size of the object?

(a) 15 cm in front of the mirror

(b) 30 cm in front of the mirror

(c) between 15 cm and 30 cm in front of the mirror

(d) more than 30 cm in front of the mirror

15. Observe the information given in Table

Media	Refractive index
Kerosene	1.44
Mustard oil	1.46
Water	1.33
Glycerine	1.74

16. In which of these does the refracted ray bends more towards normal ? Give reason to your answer.

Ans : In Glycerine , because it is more optically denser than others.

When light travels from rare medium to denser medium the refracted ray bends towards normal.

17. Refractive index of diamond with respect to glass is 1.6 and absolute refractive index of glass is 1.5. Find out the absolute refractive index of diamond.

Given : Refractive index of diamond with respect to glass = 1.6

Refractive index of glass = 1.5

Then , Absolute refractive index of diamond = $1.6 \times 1.5 = 2.4$

18. Name the type of mirrors used in the design of solar furnaces. Explain how high temperature is achieved by this device.

- Concave mirrors are used to design solar furnaces.
- These mirrors converge parallel beam of light on the furnace. Therefore a high temperature is attained at that point.

19. A spherical mirror produces an image of magnification -1 on a screen placed at a distance of 50 cm from the mirror.

(a) Write the type of mirror.

(b) Find the distance of the image from the object.

(c) What is the focal length of the mirror?

(a) Concave mirror (because negative sign of magnification indicates the nature of image is real. Only concave mirror produce real images)

(b) Magnification value 1 indicates that object and image are of same size. It means object and image are in the same distance.

So, distance of the image from the object is, $v - u = 0$

(c) As the image is formed at centre of curvature i.e., $v = R$.

\therefore focal length of the mirror, $f = \frac{-50}{2} = -25$ cm

20. A student wants to obtain an erect image of an object using a concave mirror of 12 cm focal length. What should be the range of distance of the candle flame from the mirror? State the nature and size of the image he is likely to observe.

- To obtain an erect image, the object is placed in between pole and the focus of the concave mirror.
- So range of distance of the candle flame from the mirror is in between 12 cm.
- Nature of the image = Virtual and erect.
- Size of the image = Enlarged

21. If the image formed by a mirror for all positions of the object placed in front of it is always diminished, erect and virtual, state the type of the mirror. Write one use of such mirrors giving with reason

- Only Convex mirror forms such images.
- Convex mirrors are commonly used as rear-view (wing) mirrors in vehicles because they always give an erect, diminished image. Also, they have a wider field of view as they are curved outwards. Thus, convex mirrors enable the driver to view a large area.

22. If the image formed by a lens for all positions of the object placed in front of it is always virtual, erect and diminished, state the type of the lens. If the numerical value of focal length of such a lens is 20 cm, find its power

- Concave lens always forms virtual, erect and diminished image for all positions of the object.

Focal length of the lens = - 20 cm or - 0.2m

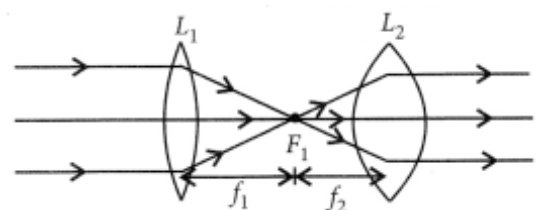
$$\text{Power of the lens } P = \frac{1}{f} = \frac{1}{-0.2} = -5D$$

23. Under what condition with a glass lens placed in a transparent liquid become invisible.

If the refractive index of glass lens is equal to the refractive index of liquid then the glass lens placed in a transparent liquid will become invisible.

24. Describe and illustrate with a diagram, how we should arrange two converging lenses so that a parallel beam of light entering one lens emerges as a parallel beam after passing through the second lens.

Suppose we have two converging lens of focal lengths f_1 and f_2 . We will keep the two converging lens at a distance of $f_1 + f_2$ so that a parallel beam of light entering one lens emerges as a parallel beam after passing through the second lens.



Human Eye and Colorful world

Previous questions from SSLC Board

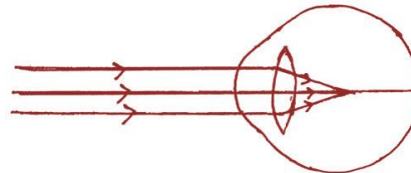
April 2019



1. The change that occurs in the eye to see the distant objects clearly is

- (A) focal length of the eye lens decreases
- (B) curvature of the eye lens increases
- (C) focal length of the eye lens increases**
- (D) ciliary muscles of the eye contract

2. Observe the given figure. Name the eye defect indicated in the figure and also mention the lens used to correct this defect.



Ans : Near sightedness or Myopia

Concave lens has to be used to correct this defect.

3. What is Tyndall effect ?

Ans. : The phenomenon of scattering of light by the colloidal particles is called Tyndall effect

4. What is dispersion of light ? Mention the colour that bends the least and the colour that bends the most when light undergoes dispersion through a prism.

Ans. : The splitting of light into its component colours is called dispersion.

The colour that bends the least is - Red

and the colour that bends the most is - Violet

5. Mention any four phenomena that can be observed due to atmospheric refraction of light on the earth.

Ans. :

- Twinkling of stars
- Advance sunrise and delayed sunset
- Difference in the actual and apparent positions of stars.
- Formation of rainbow

June 2019

1. What is the function of pupil of the human eye ? (1Mark)

Ans. : The pupil regulates and controls the amount of light entering the eye.

2. (i) What is Tyndall effect ?

(ii) Name the colour that bends the least and the colour that bends the most when white light is dispersed by a prism.

Ans. : (i) The phenomenon of scattering of light by the colloidal particles is called Tyndall effect

(ii) The colour that bends the least is - Red
and the colour that bends the most is - Violet

3. (i) What is meant by the power of accommodation of the eye ?

(ii) What are the far point and near point of the human eye with normal vision ?

Ans. : (i) The ability of the eye lens to adjust its focal length is called accommodation.

(ii) Far point - infinity and Near point - 25 cm

4. What is hypermetropia or far-sightedness ? Name the type of lens used to correct it.

Ans. : A person can see distant objects clearly but cannot see nearby objects distinctly. This defect is called as hypermetropia or far-sightedness.

Convex lens has to be used to correct this defect.

April 2020

1. Explain the experiment conducted by Newton to show that white light contains seven colours. Sun appears red in colour during sunrise but appears white at noon. Explain with the reasons. (5 marks)

Ans. : Newton's experiment -

- Isaac Newton was the first to use a glass prism to obtain the spectrum of sunlight.
- He tried to split the colours of the spectrum of white light further by using another similar prism.
- Then he placed a second identical prism in an inverted position with respect to the first prism, allowed all the colours of the spectrum to pass through the second prism.
- He found a beam of white light emerging from the other side of the second prism.
- This observation gave Newton the idea that the sunlight is made up of seven colours.

Light from the Sun near the horizon passes through thicker layers of air and larger distance in the earth's atmosphere.

Near the horizon, most of the blue light and shorter wavelengths are scattered away by the particles. Red light has longer wave length and reaches to our eyes. This gives rise to the reddish appearance of the Sun.

While at noon, light would travel relatively shorter distance and very little amount of blue and violet colours are scattered hence the sun appears white.

June - 2020

1. The sky as seen from the surface of the moon appears dark because,
- (A) only a little of the blue and violet colours are scattered
(B) all the colours are absorbed by the atmosphere present in the moon
(C) all the colours are scattered

(D) atmospheric particles needed to scatter the light are not present.

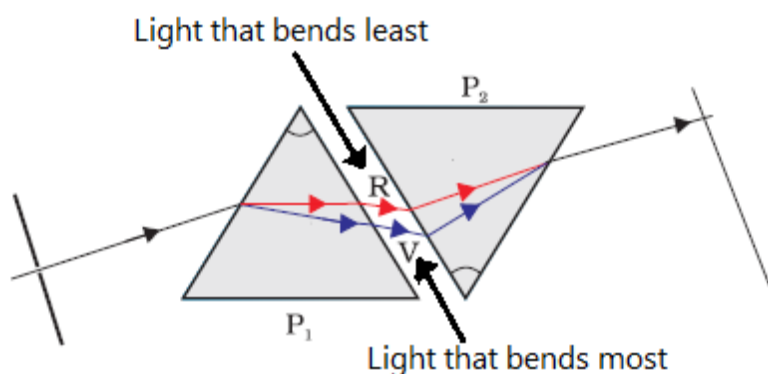
2. A student sitting in the last bench has difficulty in reading the blackboard writing. Which is the defect of vision the student has ? How can it be corrected ?

Ans. : Student had the defect of near-sightedness or Myopia.
Concave lens has to be used to correct this defect.

3. Draw the diagram to show the recombination of the spectrum of white light and label the following parts.

- a) The ray of light that bends the most
b) The ray of light that bends the least.

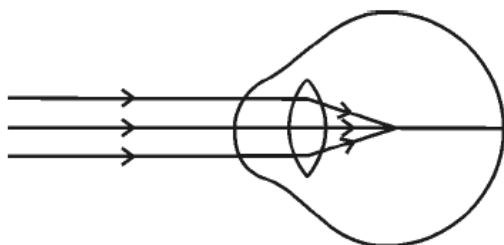
Ans. :



(This Unit was not considered for examination for the year 2021 & 2022)

April 2023

1. Observe the given figure. Identify the eye defect indicated in this figure.



- (A) Presbyopia (B) Hypermetropia
(C) Myopia (D) Cataract

Ans. : (C) Myopia

2. How does rainbow form in the nature ? Explain. Mention the colour of the light that bends the most and that bends the least

- It is caused by dispersion of sunlight by tiny water droplets present in the atmosphere.
- The water droplets in the atmosphere act like small prisms.
- They refract and disperse the incident sunlight, then reflect it internally and finally refract it again.
- Due to the dispersion of light and internal reflection different colours reach observer's eye.

Violet colour bends the most. Red colour bends the least.

3. How does the eye lens accommodate to see the distant objects and nearby objects ? Explain.

- When ciliary muscles relax, the curvature of the lens decreases and becomes thin. Then focal length of the lens increases and distant objects are clearly visible.
- When ciliary muscles contract, the curvature of the lens increases and becomes thick. Then focal length of the lens decreases and nearby objects are clearly visible.

June 2023

a) How does the lens of human eye accommodate to see the nearby objects and the distant objects ? Explain.

b) Explain the formation of rainbow in the nature.

Ans : Same as in April 2023

MOST LIKELY QUESTIONS FOR 2024(Including previous year questions)

1. How our pupil adjust for the dim light and bright light ?

Ans : Pupil will dialate when light is dim light so as to allow more light , while it constricts in bright light to minimise the entry of light

2. A person needs a lens of power – 2.5 D for correction of her vision.

(a) What kind of defect in vision is she suffering from?

(b) What is the focal length of the corrective lens?

(c) What is the nature of the corrective lens?

Ans : (a) The defect is near sightedness or Myopia

(b) Focal length of the lens $f = \frac{1}{P} = \frac{1}{-2.5} = -0.4 \text{ m or } -40 \text{ cm}$

(c) The nature of the corrective lens is - Concave lens

3. An eye defect which can not be rectified by using lens -

(A) Myopia (B) Hypermetropia (C) Presbyopia **(D) Cataract**

4. A person with a myopic eye cannot see objects beyond 1.2 m distinctly. What should be the type of the corrective lens used to restore proper vision?

Ans : Given : person cannot see object beyond the 1.2m So, in order to view objects beyond 1.2m the focal length of the lens should be 1.2m

Hence , the power of the lens $P = \frac{1}{f} = \frac{1}{1.2} = 0.83 \text{ D}$

As the defect was myopic , the corrective lens should be concave lens with power of - 0.83D

5. Why is a normal eye not able to see clearly the objects placed closer than 25 cm?

- This is because the ciliary muscles of eye are unable to contract beyond a certain limit.
- If the object is placed at a distance less than 25 cm from the eye . then the object appears blurred
- Because light rays coming from object meet beyond the retina.

6. Define the angle of deviation.

The angle between the direction of incident ray and the emergent ray, is called the angle of deviation.

7. Why do we see a rainbow in the sky only after rainfall?

A rainbow is always formed in a direction opposite to that of the Sun. The water droplets act like small prisms. They refract and disperse the incident sunlight as a rainbow.

8. Is the position of a star as seen by us its true position? Justify your answer.

- No , It's an apparent position.
- Due to the atmospheric refraction , the apparent position of the star is slightly different from its actual position.
- The star appears slightly higher (above) than its actual position when viewed near the horizon

9. The change in focal length of an eye lens is caused by the action of the

- (A) pupil. (B) retina. **(C) ciliary muscles.** (D) iris.

10. The danger signals installed at the top of tall buildings are red in colour. These can be easily seen from a distance because among all other colours, the red light

- (a) is scattered the most by smoke or fog
(b) is scattered the least by smoke or fog
(c) is absorbed the most by smoke or fog
(d) moves fastest in air

11. Why does the sky appear dark instead of blue to an astronaut?

There is no atmospheric particles to scatter the light, hence it appears dark

12. State the function of each of the following parts of human eye:

- (i) Cornea (ii) Iris (iii) Pupil (iv) Ciliary muscles (iv) Retina

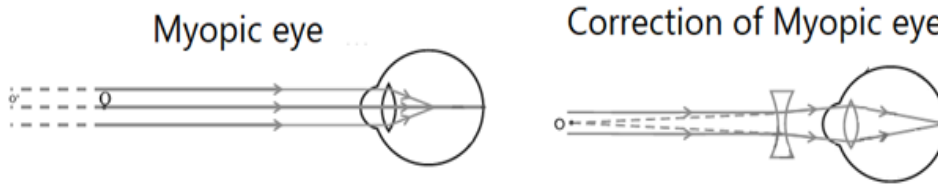
(i) Cornea : It is a transparent bulge on the front surface of eyeball which refracts most of the light rays entering the eye.

(ii) Irish is a dark muscular diaphragm that controls the size of the pupil.

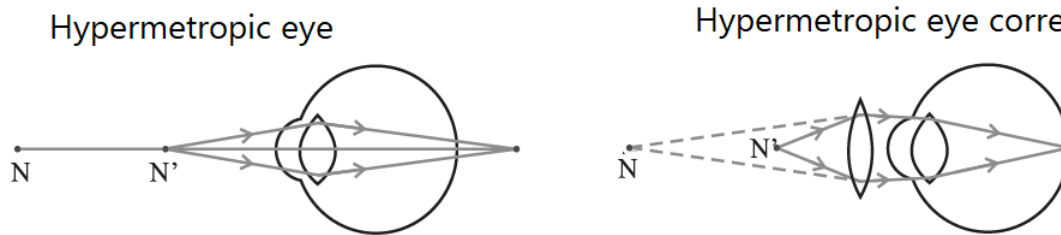
(iii) Pupil: It controls the amount of light entering into the eye.

- (iv) Ciliary muscles: Ciliary muscles holds the eye lens and helps in the adjustment of its focal length.
- (v) Retina: It capture light and convert it into electric signals that are translated into images by the brain.

13. Draw the diagram showing the Myopic eye and its correction by lens.



14. Draw the diagram showing the Hypermetropic eye and its correction by lens.



15. “The time difference between the actual sunset and the apparent sunset is about 2 minutes” What is the reason for the same? Explain

The Sun is visible to us about 2 minutes before the actual sunrise, and about 2 minutes after the actual sunset because of atmospheric refraction. By actual sunrise, we mean the actual crossing of the horizon by the Sun. Figure shows the actual and apparent positions of the Sun with respect to the horizon. The time difference between actual sunset and the apparent sunset is about 2 minutes. The apparent flattening of the Sun’s disc at sunrise and sunset is also due to the same phenomenon.

16. Give reason: (i) reddish appearance of the sun at the sunrise or the sunset and (ii) white appearance of the sun at noon when it is overhead.

(i) At sun-rise and the sun-set, light from the sun passes through thicker layers of air and larger distance in the earth’s atmosphere. As the red colour has longest wavelength hence, it is least scattered by the air and dust particles. So, the sun appears reddish.

(ii) At noon, when sun is overhead, the distance to be travelled is least. All wavelengths are scattered equally and hence sun appears white.

17. What happens when a narrow beam of (i) a monochromatic light and (ii) white light passes through a glass prism?

- i) It gets refracted at the surface and the light gets deviated from its initial path
- ii) the white light undergoes dispersion and splits into its constituent colours along with deviation from its initial path.

Electricity

Previous questions from SSLC Board



April 2019

1. The resistance of a conductor is 27Ω . If it is cut into three equal parts and connected in parallel, then its total resistance is (1Mark)

(A) 6Ω

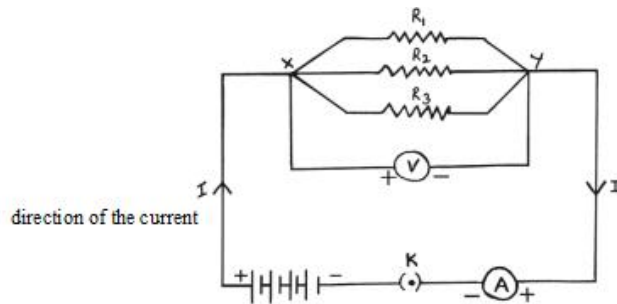
(B) 3Ω

(C) 9Ω

(D) 27Ω

2. Draw the diagram of an electric circuit in which the resistors R_1 , R_2 and R_3 are connected in parallel including an ammeter and a voltmeter and mark the direction of the current. (2Marks)

Ans. :



3. It is advantageous to connect electric devices in parallel instead of connecting them in series. Why ?

Ans :

- The appliances connected in series need currents of widely different values to operate properly.
- In a series circuit, if one component fails, the circuit is broken and none of the components work.
- But in a parallel circuit current divides through the electrical gadgets.
- This is helpful particularly when each gadget has different resistance and requires different current to operate properly

OR

According to Joule's law of heating, mention the factors on which heat produced in a resistor depends. According to this law write the formula used to calculate the heat produced.

Ans : 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,

(iii) directly proportional to the time for which the current flows through the resistor

(iv) $H = I^2Rt$

4. An electric refrigerator rated 400 W is used for 8 hours a day. An electric iron box rated 750 W is used for 2 hours a day. Calculate the cost of using these appliances for 30 days, if the cost of 1 kWh is Rs. 3/-.

Ans. :

The total energy consumed by the refrigerator in 30 days

$$= 400 \times 8 \times 30 = 96000 \text{ Wh} = 96 \text{ kWh}$$

The total energy consumed by the iron box in 30 days

$$= 750 \times 2 \times 30 = 45000 \text{ Wh} = 45 \text{ kWh}$$

The total energy consumed by the refrigerator and iron box is

$$= 96 \text{ kWh} + 45 \text{ kWh} = 141 \text{ kWh}$$

The sum of bill amount for 141 kWh at rate of Rs. 3 per 1 kWh is

$$= 141 \times 3$$

$$= \text{Rs. } 423.$$

June 2019

1. A piece of metallic wire of resistance R is cut into 3 equal parts. These parts are then connected in parallel. If the total resistance of this combination is R' , then the value of $R : R'$ is (1Mark)

- (A) 1 : 3 (B) 9 : 1 (C) 1 : 9 (D) 3 : 1.

Ans. : (B) 9 : 1

2. A bulb is marked 220 V and 40 W. Calculate the current flowing through the bulb and its resistance.

Ans. : Current flowing through the bulb $I = \frac{P}{V} = \frac{40}{220} = 0.18 \text{ A}$

Resistance of a bulb $R = \frac{V}{I} = \frac{220}{0.18} = 1222 \Omega$

3. (i) Define electric potential difference. How is ammeter connected in an electric circuit?

(ii) Explain the application of heating effect of electric current in an electric bulb and the fuse used in an electric circuit.

Ans : (i) Electric potential difference between two points in an electric circuit is defined as the work done to move a unit charge from one point to the other.

An ammeter is always connected in series in a circuit through which the current is to be measured

(ii) A strong metal with high melting point like tungsten which gets very hot and emits light is used in an electric bulb.

If a current larger than the specified value flows through the circuit then the fuse melts and breaks the circuit.

4. (i) State Ohm's law

(ii) Explain the factors on which the resistance of a conductor depend.

Ans : (i) *Ohm's law* : The potential difference V , across the ends of a given metallic wire in an electric circuit is directly proportional to the current flowing through it, provided its temperature remains the same.

(ii) The resistance of a conductor depends on the following factors :

Length of the conductor , Area of cross-section , Nature of the material and Temperature.

Resistance is directly proportional to length of the conductor.

Resistance is inversely proportional to the area of cross-section.

April 2020

1. What is the SI unit of potential difference ? Name the device used to measure the potential difference.

Ans. : * Volt * Volt meter

2. The resistivity of manganese wire of length 1 m is $1.84 \times 10^{-6} \Omega \text{ m}$ at 20°C . If the diameter of the wire is $3 \times 10^{-4} \text{ m}$, what will be the resistance of the wire at that temperature ? (2Marks)

Ans. : Resistivity $\rho = 1.84 \times 10^{-6} \Omega \text{ m}$ Length $l = 1 \text{ m}$

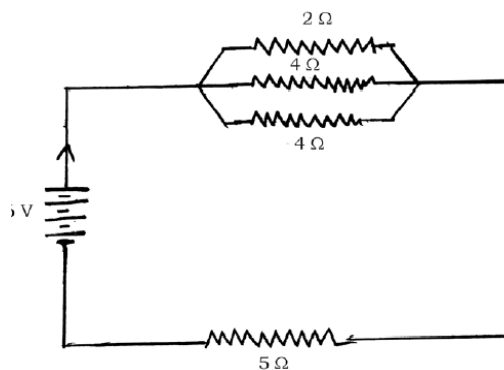
Diameter $d = 3 \times 10^{-4} \text{ m}$

$$\text{Area of cross-section } A = \frac{\pi d^2}{4} = \frac{3.142 \times 3 \times 10^{-4} \times 3 \times 10^{-4}}{4} = \frac{28.2 \times 10^{-8}}{4} \\ = 7.06 \times 10^{-8}$$

$$\text{Resistance } R = \frac{\rho l}{A} = \frac{1.84 \times 10^{-6} \times 1}{7.06 \times 10^{-8}} = 0.2606 \times 10^2 \\ = 26.06 \Omega$$

3. Observe the given circuit :

Calculate the total resistance in the circuit and the total current flowing in the circuit.



Ans : In parallel connection, $\frac{1}{R_p} = \frac{1}{2} + \frac{1}{4} + \frac{1}{4}$

$$\frac{1}{R_p} = \frac{2+1+1}{4} \quad \frac{1}{R_p} = \frac{4}{4} = \frac{1}{1} \quad R_p = 1 \Omega$$

Total resistance in the circuit $R = R_p + R_4 = 1 + 5 = 6 \Omega$

Total current in the circuit

$$I = \frac{V}{R} \quad I = \frac{6}{6} \quad I = 1 \text{ A}$$

3. State Joule's law of heating. Explain the working of electric filament bulb. (3Marks)

Ans : **Joule's law of heating :**

The heat produced in a resistor is

- i) directly proportional to the square of the current for a given resistance.
- ii) directly proportional to the resistance for a given circuit.
- iii) directly proportional to the time for which the current flows through the resistor.

Working of electric filament bulb :

- A strong metal with high melting point such as tungsten is used for making bulb filaments.
- Most of the power consumed by the filament appears as heat, but a small part of it is in the form of light radiated.

OR

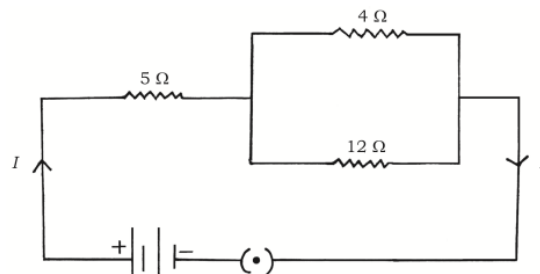
State Ohm's law. How ammeter and voltmeter should be connected in electric circuit ?
What is the use of these instruments, in the circuit ?

Ans : **Ohm's law :** The potential difference V across the ends of a given metallic wire in an electric circuit is directly proportional to the current flowing through it at constant temperature.

- Ammeter should be connected in series.
- Voltmeter should be connected in parallel in the circuit.
- Ammeter is used to measure current.
- Voltmeter is used to measure potential difference.

September 2020

1. Observe the given circuit diagram.
Calculate the total resistance and the total current flowing through the circuit.



Ans : Here, $R_1 = 5 \Omega$, $R_2 = 4 \Omega$, $R_3 = 12 \Omega$, $V = 24V$

- Total resistance of a circuit : $R_T = R_1 + \left[\frac{1}{R_2} + \frac{1}{R_3} \right]$

$$R_T = 5 + \left[\frac{1}{4} + \frac{1}{12} \right] , R_T = 5 + \left[\frac{3 + 1}{12} \right]$$

$$R_T = 5 + \left[\frac{4}{12} \right] , R_T = 5 + \left[\frac{1}{3} \right] , R_T = 5 + 3 = 8 \Omega$$

- Total current in the circuit

$$I = \frac{V}{R} \quad I = \frac{24}{8} \quad I = 3A$$

2. What is the meaning of the statement “The potential difference between two points is 1 V” ? Name the device used to measure potential difference. What is resistance of a conductor ? What is electric power ? Write three formulae used to find it. (5Marks)

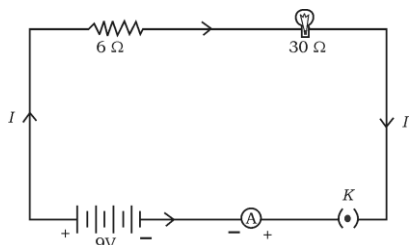
Ans :

- If 1 Joule (1J) of work is done to move a charge of 1 Coulomb (1 C) from one point to another point in a current carrying conductor, the potential difference between the two points is 1 volt .
- The device used to measure it is voltmeter.
- The property of a conductor to restrain or to retard the motion of electric charges flowing through it is called resistance of a conductor.
- The rate at which electric energy is dissipated or consumed in an electric circuit is called electric power.
- Three formulae used to find electric power are -

$$P = VI \quad , \quad P = I^2R \quad , \quad P = \frac{V^2}{R}$$

July 2021 (MCQ based exam)

1. An electric lamp whose resistance is 30Ω and a conductor of 6Ω resistance are connected in series to 9V battery as shown in the figure. The total current flowing in the circuit is



- (A) 4 A (B) 36 A **(C) 0.25 A** (D) 0.6 A

2. The metal used in the filament of an electric bulb is

- (A) manganese **(B) tungsten** (C) nickel (D) chromium

3. A device used to change the resistance in the electric circuit is

- (A) voltmeter (B) ammeter (C) galvanometer **(D) rheostat**

4. ‘Ohm’ is the SI unit of

- (A) electric potential difference **(B) resistance**
 (C) electric current (D) electric charge

Sept 2021 (MCQ based exam)

1. The SI unit of electric potential difference is

- (A) volt** (B) ampere (C) ohm (D) coulomb

2. The resistance of an electric heater coil is 110Ω . Then electric current, that an electric heater draws from a 220 V source is,

- (A) 0.5 A (B) 0.11 A **(C) 2 A** (D) 3 A

3. A device that is connected in series in an electric circuit is

- (A) voltmeter (B) bar magnet (C) turbine **(D) ammeter**

4. Observe the following table :

The best conductor of electricity among these materials is

- (A) N **(B) M**
(C) K (D) L

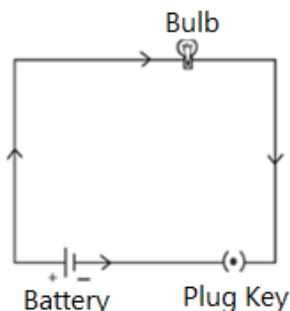
Material	Resistivity (Ωm)
K	2.63×10^{-8}
L	5.20×10^{-8}
M	1.60×10^{-8}
N	6.84×10^{-8}

April - 2022

1. The correct formula that shows the relationship between potential difference, electric current and resistance in an electric circuit is -

- (A) $I = \frac{V}{R}$ (B) $I = VR$ (C) $V = \frac{I}{R}$ **(D) $R = \frac{V}{I}$.**

2. Draw the schematic diagram of an electric circuit comprising of electric cell, electric bulb, ammeter and plug key



3. a) What are the advantages of connecting electrical devices in parallel in an electric circuit instead of connecting them in series ?

b) How are ammeter and voltmeter connected in an electric circuit ? What are their function ?

Ans. : a) Advantages of connecting electrical devices in parallel are :

- The parallel circuit divides current through the electrical gadgets.
- When one component fails, the circuit does not fail
- The total resistance in parallel circuit decreases, so that
- Electrical gadgets get current as per their resistance required.

- b)
- In an electrical circuit ammeter is connected in series
 - In an electrical circuit voltmeter is connected in parallel
 - Ammeter measures the rate of electric current in a circuit
 - Voltmeter measures the potential difference across the ends of a conductor

June - 2022

1. The SI unit of resistivity is-

- (A) ohm (B) volt (C) watt **(D) ohm-metre.**

2. An electric bulb with a resistance of 50Ω is connected to 10 V battery in an electric circuit. Calculate the electric current flowing through the electric bulb and electric power of the bulb.

Ans. : Given : $R = 50 \Omega$, $V = 10 \text{ V}$, $I = ?$, $P = ?$

So , $I = \frac{V}{R} = \frac{10}{50} = 0.2 \text{ A}$ Electric current flowing through bulb is 0.2 A

Then , $P = V \times I = 10 \times 0.2 = 2 \text{ W}$, Power of the bulb is 2W

3. a) State Joule's law of heating. Name any two devices that work on the application of this law.

b) Why are the alloys like nichrome used in electrical heating devices ?.

a) **Joule's law of heating** : The heat produced in a resistor is

i) directly proportional to the square of the current for a given resistance.

ii) directly proportional to the resistance for a given circuit.

iii) directly proportional to the time for which the current flows through the resistor.

The devices that work on this law are -

Electric Toaster , Electric Oven , Electric Kettle, Electric Bulb , Electric Fuse

b) Resistivity of alloys are more than / higher than that of metals. Alloys do not oxidise (burn) readily at high temperature. Alloys have high melting point.

4. a) State Ohm's law. In domestic electric circuit electrical appliances are not connected in series. Why ?

b) Write the factors on which resistance of a conductor depends.

a) The potential difference (V) across the ends of a given metallic wire in an electric circuit is directly proportional to the current (I) flowing through it, provided its temperature remains the same.

$$V = IR$$

- In a series circuit the current is constant throughout the electric circuit due to this all electrical appliances not possible to work at the same value.
- In a series connection, when one component fails, the circuit is broken.

b) Factors on which resistance of a conductor depends :

- i) Length of a conductor
- ii) Area of cross-section of a conductor
- iii) Nature of the material
- iv) Temperature.

iii) The total resistance of the circuit.

$$\frac{1}{R_p} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{10} + \frac{1}{20} + \frac{1}{60} = \frac{6+3+1}{60} = \frac{10}{60} = \frac{1}{6}$$

$R_p = 6\Omega$

June - 2023

1. Draw the symbol diagram of rheostat used in electric circuit.



OR



2. 1000 J of heat is produced each 2 seconds in a 5 Ω resistor. Find the potential difference across the resistor.

Solution : $H = 1000 \text{ J}$, $R = 5 \Omega$, $t = 2$

$$H = I^2 R t \quad \text{OR} \quad I = \sqrt{\frac{H}{Rt}} = \sqrt{\frac{1000}{5 \times 2}} = \sqrt{\frac{1000}{10}} = \sqrt{100} = 10 \text{ A}$$

Potential difference across the resistor

$$V = IR = 10 \times 5$$

$$V = 50 \text{ V}$$

3. A wire of given material having length 'l' and area of crosssection 'A' has a resistance of '4 Ω '. Find the resistance of another wire of the same material having length $\frac{1}{2}$ and area of cross-section '2A'.

Solution : For first wire $R_1 = \rho \frac{l}{A} = 4\Omega$

For second wire $R_2 = \rho \frac{\frac{l}{2}}{2A} = \frac{1}{4} \cdot \rho \frac{l}{A}$

$$R_2 = \frac{1}{4} \times 4 = 1\Omega$$

4. A bread-toaster rated 350 W is used for 15 hours a day. An electric iron box rated 250 W is used for 5 hours a day. Calculate the cost of using these appliances for 30 days, if the cost of 1 kWh is Rs. 4.

Solution : The energy consumed by the bread-toaster in 30 days

$$= 350 \text{ W} \times 15 \text{ hours} \times 30 \text{ days}$$

$$= 157500 \text{ Wh}$$

$$= 157.5 \text{ kWh}$$

The energy consumed by the iron box in 30 days

$$= 250 \text{ W} \times 5 \text{ hours} \times 30 \text{ days}$$

$$= 37500 \text{ Wh OR} = 37.5 \text{ kWh}$$

The total cost of energy at the rate of Rs. 4 · 00 for 1 kWh for 30 days.

$$= (157.5 + 37.5) \text{ kWh} \times 4$$

$$= 195 \times 4$$

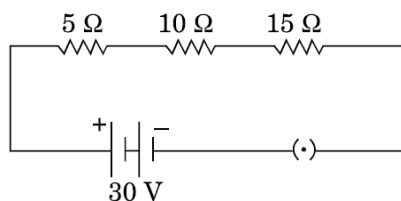
$$= \text{Rs. } 780$$

5. In which method the resistors R_1 and R_2 could be connected so that the equivalent resistance of that electric circuit becomes low ? What is the change in the value of current in the circuit by this type of connection ?

- Parallel connection
- The value of the current increases.

MOST LIKELY QUESTIONS FOR 2024 (Including previous year questions)

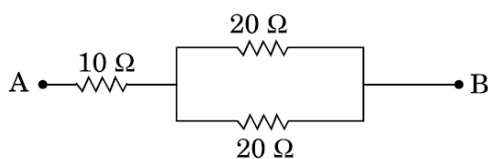
1. Observe the following circuit , calculate the total current flowing in the circuit



Ans : Total resistance of the circuit = $5 \Omega + 10 \Omega + 15 \Omega = 30 \Omega$

Total current flowing in the circuit $I = \frac{V}{R} = \frac{30}{30} = 1A$

2. Calculate the total resistance of the circuit given below ,



If point A and B are connected to a 12V battery , find the current flowing in this circuit ?

Ans : Given data : $R_1 = 10 \Omega$, $R_2 = 20 \Omega$, $R_3 = 20 \Omega$, $V = 12V$

Net resistance : $R_T = R_1 + \left[\frac{1}{R_2} + \frac{1}{R_3} \right]$

$$R_T = 10 \Omega + \left[\frac{1}{20 \Omega} + \frac{1}{20 \Omega} \right] = 10 + \left[\frac{1+1}{20} \right] = 10 + \left[\frac{2}{20} \right] = \left[\frac{1}{10} \right]$$

$$R_T = 10 + 10 = 20 \Omega$$

Total current flowing in the circuit $I = \frac{V}{R} = \frac{12}{20} = 0.6A$

3. The conductor having resistance 4Ω is producing 100J heat for every second. Find the current flowing through the conductor.

Given data : $R = 4\Omega$, $H = 100\text{J}$, $t = 1\text{s}$

Formula : $H = I^2Rt$ OR $I^2 = \frac{H}{Rt}$ OR $I = \sqrt{\frac{H}{Rt}}$

$$I = \sqrt{\frac{100}{4 \times 1}} \quad I = \sqrt{25} = 5\text{A}$$

4. What is an electric current ? Define the unit of current.

Ans : The rate of flow of electric charges is called electric current

Its SI unit is Ampere (A)

The flow of one coulomb of charge per second, that is, 1A

5. Why are coils of electric toasters and electric irons made of an alloy rather than a pure metal?

Ans : (i) the resistivity of an alloy is much higher than that of a pure metal,

(ii) an alloy does not undergo oxidation (or burn) easily even at high temperature, when it is red hot.

6. Will current flow more easily through a thick wire or a thin wire of the same material, when connected to the same source ? Why ?

Ans: The current will flow more easily through a thick wire than a thin wire of the same material.

The area of cross-section of a conductor, is inversely proportional to resistance

Therefore, thick wire has least resistance, so current will flow more easily

7. How can three resistors of resistances 2Ω , 3Ω , and 6Ω be connected to give a total resistance of

(a) 4Ω ,

(b) 1Ω ?

Ans : Let $R_1 = 2\Omega$, $R_2 = 3\Omega$, $R_3 = 6\Omega$.

(i) We can get a total resistance of 4Ω by connecting the 2Ω resistance in series with the parallel combination of 3Ω and 6Ω .

$$\text{Total resistance } R = R_1 + \frac{R_2R_3}{R_2+R_3}$$

$$R = 2 + \frac{3 \times 6}{3+6}$$

$$R = 4\Omega$$

(ii) We can obtain a total resistance of 1Ω by connecting all resistors in parallel.

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{2} + \frac{1}{3} + \frac{1}{6}$$

$$\frac{1}{R} = \frac{3+2+1}{6} = \frac{6}{6}$$

$$R = 1\Omega$$

8. When a 12 V battery is connected across an unknown resistor, there is a current of 2.5 mA in the circuit. Find the value of the resistance of the resistor.

Ans: Here, $V = 12\text{ V}$ and $I = 2.5\text{ mA} = 2.5 \times 10^{-3}\text{ A}$

$$\therefore \text{Resistance, } R = \frac{V}{I} = \frac{12}{2.5 \times 10^{-3}} = 4.8 \times 10^3$$

$$R = 4800\ \Omega$$

9. Let the resistance of an electrical component remains constant while the potential difference across the two ends of the component decreases to half of its former value. What change will occur in the current through it?

Ans: We know that $V = IR$

$$\text{When Potential difference halved } \frac{V}{2} = IR \quad I = \frac{V}{2R} = \frac{1}{2} \times I \quad (\text{because } I = \frac{V}{R})$$

Hence, the current through an electrical component also becomes half of its previous value.

10. What is (i) the highest, (ii) the lowest total resistance that can be secured by combinations of four coils of resistance 4 Ω , 8 Ω , 12 Ω , 24 Ω ?

Ans : (i) Highest resistance can be obtained by connecting the four coils in series.

$$\text{Then, } R = 4\Omega + 8\Omega + 12\Omega + 24\Omega = 48\Omega$$

(ii) Lowest resistance can be obtained by connecting the four coils in parallel.

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} = \frac{1}{4} + \frac{1}{8} + \frac{1}{12} + \frac{1}{24} = \frac{6+3+2+1}{24} = \frac{12}{24} = \frac{1}{2} \quad R = 2\ \Omega$$

11. How many 176 Ω resistors (in parallel) are required to carry 5 A on a 220 V line?

Ans : Suppose 'n' resistors of 176 Ω are connected in parallel.

$$\frac{1}{R} = \frac{n}{176} \quad \text{OR} \quad R = \frac{176}{n}$$

According to Ohm's law $R = \frac{V}{I}$

$$\frac{176}{n} = \frac{220}{5}$$

$$n = \frac{176 \times 5}{220} = 4$$

Thus 4 resistors are needed to be connect.

12. An electric iron of resistance 20 Ω takes a current of 5 A. Calculate the heat developed in 30 s.

Ans:

Here, $R = 20 \Omega$, $i = 5 \text{ A}$, $t = 30\text{s}$

Heat developed, $H = I^2 R t$

$$= 5^2 \times 20 \times 30 = 25 \times 20 \times 30$$

$$= 15,000 \text{ J} \quad \text{OR} \quad 1.5 \times 10^4 \text{ J}$$

13. An electric motor takes 5 A from a 220 V line. Determine the power of the motor and the energy consumed in 2 h.

Ans: Given $I = 5 \text{ A}$, $V = 220 \text{ V}$, $t = 2 \text{ h}$

Power, $P = VI = 220 \times 5$

$$= 1100 \text{ W}$$

Energy consumed = $P \times t$

$$= 1100 \times 2 = 2200 \text{ Wh}$$

14. A piece of metallic wire has resistance 6Ω . If this wire is cut in to three equal parts, then what would be the total resistance when they are connected (i) in series and (ii) in parallel

Ans : When wire cut in to three equal parts the resistance of each piece will be $\frac{6\Omega}{3} = 2\Omega$,

(i) If they are connected in series

$$\text{Total resistance } R_s = R_1 + R_2 + R_3$$

$$R_s = 2 \Omega + 2 \Omega + 2 \Omega = 6 \Omega$$

(ii) If they are connected in parallel

$$\text{Total resistance } \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} = \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = \frac{1+1+1}{2} = \frac{3}{2}$$

$$R = \frac{2}{3} = 0.66 \Omega$$

15. What would be the rating of the fuse for an electric kettle which is operated at 220V and consumes 500 W power?

Ans : Given data $P = 500 \text{ W}$, $V = 220 \text{ V}$

We know that $P = V \times I$

$$\text{So, } I = \frac{P}{V} = \frac{500}{220} = 2.27 \text{ A}$$

Hence, the rating of the fuse should be 3A,

16. A bulb is rated at 220V- 100W. What is its resistance?

Ans : Given data $P = 100 \text{ W}$, $V = 220 \text{ V}$

We know that $P = \frac{V^2}{R}$ OR $R = \frac{V^2}{P}$

$$R = \frac{220^2}{100} = 484 \Omega$$

17. How does the resistance of wire change when 1) Its length is doubled 2) Area is doubled?

Ans :

- Resistance of a wire is directly proportional to its length. Hence , its resistance will be doubled
- Resistance of wire is inversely proportional to its area of cross section. Hence, its resistance was halved

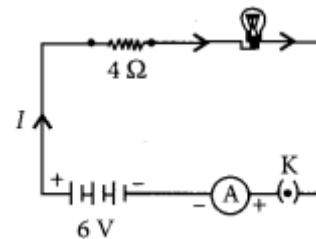
18. Write the relation between resistance (R) of filament of a bulb, its power (P) and a constant voltage V applied across it.

$$\text{Ans : } P = \frac{V^2}{R}$$

19. An electric lamp of resistance 20Ω and a conductor of resistance 4Ω . are connected to a 6 V battery as shown in the circuit. Calculate.

(a) the total resistance of the circuit

(b) the current through the circuit,



(a) the total resistance of the circuit $R = 4 \Omega + 20 \Omega = 24 \Omega$

(b) the current through the circuit, $I = \frac{V}{R} = \frac{6}{24} = \frac{1}{4} = 0.25 \text{ A}$

20. Prove that the equivalent resistance of three resistors R_1 , R_2 and R_3 in series is $R_1 + R_2 + R_3$

Since, the total potential difference across a combination of resistors in series is equal to the sum of potential difference across the individual resistors.

$$\therefore V = V_1 + V_2 + V_3 \dots \text{(i)}$$

In series current through each resistor is same.

$$\text{Applying Ohm's law } V_1 = IR_1 \quad , \quad V_2 = IR_2 \quad \text{and} \quad V_3 = IR_3 \dots \text{(ii)}$$

$$\text{If } R_s \text{ is the equivalent resistance of the circuit, then } V = IR_s \dots \text{(iii)}$$

$$\text{From equation (i) , (ii) and (iii) we can write } IR_s = IR_1 + IR_2 + IR_3$$

$$\text{OR } R_s = R_1 + R_2 + R_3$$

Magnetic Effects of Electric current

Previous questions from SSLC Board



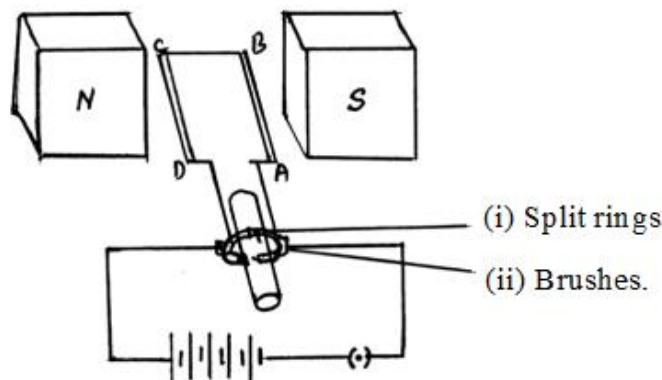
April 2019

1. Draw the diagram of a simple electric motor. Label the following parts : (2Marks)

(i) Split rings

(ii) Brushes.

Ans. :



2. (i) How does overload and short-circuit occur in an electric circuit ? Explain. What is the function of fuse during this situation ?

(ii) Mention two properties of magnetic field lines. (3Marks)

Ans : (i)

- Overloading can occur when the live wire and the neutral wire come into direct contact.
- This occurs when the insulation of wires is damaged or there is a fault in the appliance or When many electrical appliances are connected to one circuit simultaneously.
- In such a situation, the current in the circuit abruptly increases and short circuit occurs.
- The joule heating that takes place in the fuse melts it to break the electric circuit, and prevents the electric appliances from possible damage

(ii) *Properties of magnetic field lines :*

- No two field lines are found to cross each other.
- The density of the magnetic field lines are more in their poles.
- The magnetic field lines emerge from north pole and merge at 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. (any two)

June 2019

1. The names of devices are given in **Column-A** and corresponding functions are given in **Column-B**. Match them and write the answer along with its letters : (4Marks)

Column - A

- (A) Commutator
- (B) Fuse
- (C) Galvanometer
- (D) Electric generator

Column - B

- (i) detects the presence of electric current in a circuit
- (ii) converts mechanical energy into electrical energy
- (iii) measures the potential difference
- (iv) shows the direction of the motion of the conductor
- (v) protects the electrical appliances
- (vi) reverses the direction of current
- (vii) converts electrical energy into mechanical energy

Ans. :

- (A) — (vi) reverses the direction of current
- (B) — (v) protects the electrical appliances
- (C) — (i) detects the presence of electric current in a circuit
- (D) — (ii) converts mechanical energy into electrical energy

(There is no Match the following type question in present question paper pattern)

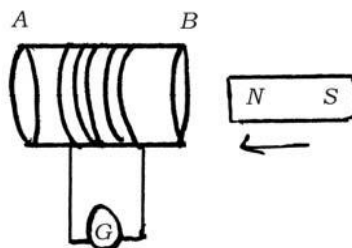
2. Draw the diagram of a simple electric motor. Label the following parts : (2Marks)

- (i) Brushes
- (ii) Battery.

(refer April-2019 Qno-1)

April 2020

1. Observe the given figure.



What type of current is induced in the coil by doing the experiment related to this figure ? Give reason for your answer.

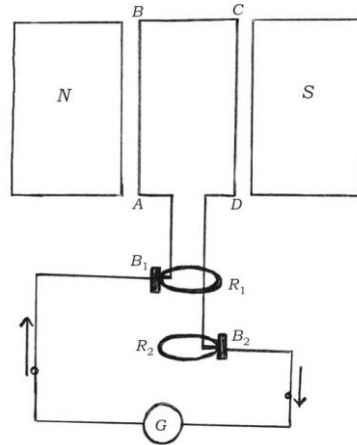
Ans. :

- Alternating current
- Because , galvanometer deflections are in opposite directions

2. Draw the diagram of a simple electric generator. Label the following parts :
(2Marks)

- i) Brushes
- ii) Rings.

Ans:



B_1, B_2 — brushes , R_1, R_2 — rings

3. How do you trace the magnetic field lines around a bar magnet using compass needle ? Explain. Write the properties of magnetic field lines. (3Marks)

Ans. :

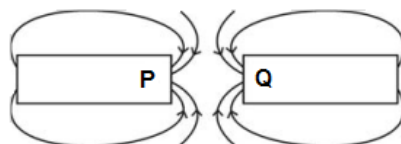
- Take a small compass and a bar magnet. Place a magnet on a sheet of white paper fixed on a drawing board.
- Place the compass near the north pole of the magnet mark the position of two ends of the needle.
- Now move the needle to a new position such that the south pole occupies the position previously occupied by its north pole.
- In this way proceed step by step till we reach the south pole of the magnet. Join the points marked on the paper by a smooth curve. This represents field line.
- Repeating above procedure we can draw as many lines as possible.

Properties of magnetic field lines :

- Field lines emerge from north pole and merge at the south pole.
- At the poles field lines are crowded.
- No two field lines are intersect each other.

September 2020

1. Observe the diagram.



The magnetic poles represented by P and Q respectively are

(A) south (S) and south (S)

(B) north (N) and south (S)

(C) north (N) and north (N)

(D) south (S) and north (N).

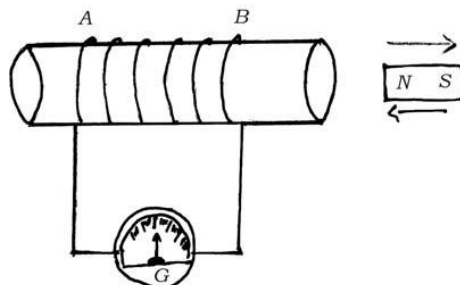
2. Suggest any two measures to avoid overloading in domestic circuits. (1Mark)

Ans. :

- Live and neutral wires should not come into direct contact.
- Too many appliances should not be connected to a single socket.

3. Observe the given diagram. Explain the experiment related to this diagram. What conclusions can be drawn from this experiment ?

(4Marks)



Ans. :

- The ends of the copper coil (AB) are connected to a galvanometer. The north pole of the bar magnet (NS) is moved inside the coil. The needle of the galvanometer shows momentary deflection in one direction.
- When the north pole of the magnet is withdrawn from the coil, the needle of the galvanometer is deflected in the opposite direction.
- When the magnet is held stationary inside the coil, the deflection of the galvanometer is zero.
- When the magnet is moved inside the coil with greater force, galvanometer shows greater deflection and when the magnet is moved with smaller force, the galvanometer shows smaller deflection.

Conclusions that can be drawn from this experiment :

- Motion of the magnet with respect to the coil produces an induced electric current in the circuit.
- The direction of the induced current depends on the direction of the movement of the magnet inside the coil.
- The amount of induced current is directly proportional to the force with which the magnet is moved into or withdrawn from the coil.

July 2021 (MCQ based exam)

1. The device that works on the principle of electromagnetic induction is

(A) electric generator

(B) electric heater

(C) electric motor

(D) electric fan

2. A rectangular coil of copper wire 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

3. The magnetic field lines inside a solenoid are in the form of parallel straight lines. The reason for this is, the magnetic field inside the solenoid is

- (A) very high **(B) uniform**
(C) zero (D) produced by electric current

4. The device that converts electrical energy into mechanical energy is

- (A) electric generator (B) solar cell
(C) dry cell **(D) electric motor**

Sept 2021 (MCQ based exam)

1. Which of the following is 'NOT' a property of magnetic field lines ?

- (A) Magnetic field lines are dense near the poles
(B) Magnetic field lines are closed loops
(C) Magnetic field lines intersect each other
(D) Magnetic field lines emerge from north pole and merge at the south pole

2. In Fleming's right-hand rule, the middle finger indicates the direction of

- (A) electric current induced in conductor** (B) magnetic field
(C) movement of conductor (D) force

3. A device that reverses the direction of flow of current in an electric circuit is

- (A) Ammeter **(B) Commutator** (C) Voltmeter (D) Galvanometer

4. The function of fuse in an electric circuit is that, it

- (A) reverses the direction of an electric current
(B) shows the direction of motion of the electric current
(C) measures the potential difference
(D) protects the electrical appliances

April - 2022

1. The device used to produce electricity is -

- (A) Galvanometer **(B) Electric generator**
(C) Ammeter (D) Electric motor.

2. In Fleming's right hand rule, the middle finger indicates the direction of

- (A) induced electric current** (B) magnetic field
(C) motion of the conductor (D) mechanical force.

3. Magnetic field lines do not intersect each other. Why ?

Ans. : At the point of intersection the compass needle would point towards two directions which is not possible.

4. What are the functions of an earth wire ? It is necessary to connect the electric appliances having metallic body to earth wire in domestic electric circuit. Why ? Explain.

Ans. : Functions of the earth wire :

- This is used as a safety measure for appliances have metallic body in domestic circuit
- This provides a low resistance conducting path for the current
- Any leakage of current in the appliances keeps its potential to that of the earth and the user may not get a severe electric shock.

5. Explain Faraday's experiment related to electromagnetic induction. Mention the difference between direct and alternate current.

Ans. : Faraday's Experiment :

- Take a coil of copper wire having a large number of turns connect the ends of the coil to a galvanometer
- Take a strong magnet and move its one pole into the coil
- There is a deflection in the needle of the galvanometer. This indicates the presence of a current in the coil
- Likewise, when the magnet is withdrawn back then also the needle of galvanometer deflects and this indicates the presence of electric current.

Direct current	Alternate current
Direct current flows in one direction	Periodically alternating current reverse its direction

June - 2022

1. What are the reasons for occurring overload in an electric circuit ?

Ans. :

- Accidental hike in the supply voltage
- Connecting too many appliances to a single socket
- When live wire and neutral wire come into direct contact.

2. Draw the diagram of a simple electric motor and label 'Split rings' ?

3. List the properties of the magnetic field due to the flow of electric current in a solenoid. What are the two methods of increasing magnetic field in a solenoid ?

Ans. :

- The magnetic field in a current carrying solenoid is similar to that of magnetic field produced in a bar magnet.
- _ The magnetic field is uniform inside the solenoid.

The two methods to increase magnetic field in a solenoid.

- i) By increasing the number of turns of the coil.
- ii) By increasing the current flowing through solenoid.

April 2023

1. What does the thumb indicate in the right hand thumb rule ?

Ans. : Direction of current

2. What is solenoid ? Write the properties of the magnetic field lines formed around a current carrying solenoid.

- A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid.
- At the ends/poles of a solenoid, the magnetic field lines appear in the form of concentric circles.
- At the centre / inside the solenoid the magnetic field lines appear in the form of parallel straight lines.

3. What is alternating current ? Electric appliances having metallic body are connected to earth wire, why ?

- The current that changes direction after equal intervals of time is called an alternating current.
- The metallic body is connected to the earth wire provides a low resistance conducting path for the current.
- Thus, it ensures that any leakage of current to the metallic body of the appliance keeps its potential to that of the earth and the user may not get a severe electric shock.

June 2023

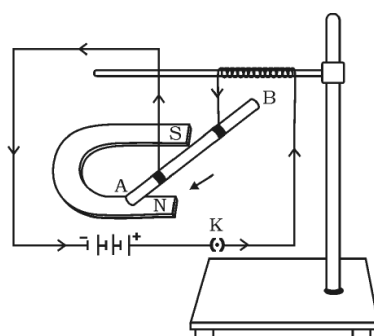
1. A device that converts electrical energy into mechanical energy is

- (A) Electric generator **(B) Electric motor**
(C) Galvanometer (D) Voltmeter.

2. Imagine, you are holding a straight current carrying conductor as per the right hand thumb rule. If the thumb is upward, then the direction of the field lines of the magnetic field is

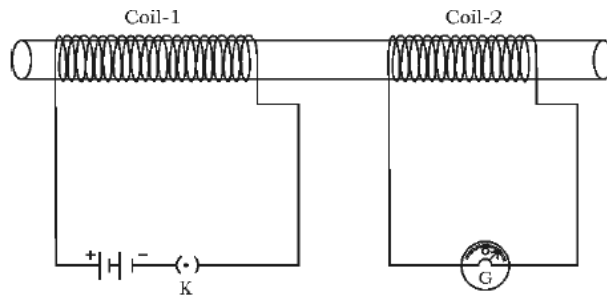
- (A) downward (B) upward **(C) anti-clockwise** (D) clockwise.

3. Observe the figure and mention the direction of the force acting on the current carrying conductor **AB**. Name the rule that helped you to find the direction of the force.



- Towards left OR Towards the north pole of the magnet
- Fleming's left hand rule

4. Observe the given diagram :



Explain the experiment related to this diagram. What conclusions can be drawn from this experiment ?

- Take two different coils of copper wire say 100 and 50 turns respectively. Insert them over a non-conducting cylindrical roll.
- Connect the Coil-1 in series with a battery and plug key, Coil-2 with galvanometer
- When the key is plugged in, needle of the galvanometer deflects and returns to zero. This indicates the presence of current in the Coil-2
- Disconnect Coil-1 from battery. Needle of the galvanometer deflects in the opposite direction and returns to zero. This indicates the opposite direction of the current.

Conclusions :

Changing electric current in Coil-1 induces current in Coil-2. This is **electromagnetic induction**. This is due to the change in the magnetic field.

MOST LIKELY QUESTIONS FOR 2024 (Including previous year questions)

1. Why two magnetic field lines do not intersect each other?

Ans : At the point of intersection needle has to show two direction , which is not possible practically.

2. 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,
- This allow the armature coil to rotate continuously in the same direction.

3. Name two safety measures commonly used in electric circuits and appliances.

Answer: (i) Earthing (ii) Electric fuse.

4. Explain different ways to induce current in a coil. When is the induced current is highest ? State the rule to find the direction of induced current.

Answer: Different ways to induce current in a coil are :

1. moving a magnet towards or away from the coil or vice-versa, and
2. changing current in the neighbouring coil.

Induced current is highest when -

- the rate of movement of magnet is increased
- number turns of coil is increased
- by increasing the amount of current in neighbouring coil

Fleming's right hand rule states the direction of current

5. What precautions should be taken to avoid the overloading of domestic electric circuits ?

- Ans : (i) The wires used in the circuit must be coated with good insulating materials
- (ii) The circuit must be divided into different sections and a safety fuse must be used in each section.
- (iii) High power appliances like air-conditioner, refrigerator, a water heater, etc. should not be used simultaneously.

6. 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

$$I = \frac{P}{V} = \frac{2 \text{ kW}}{220 \text{ V}} = \frac{2000 \text{ W}}{220 \text{ V}} = 9.09 \text{ A}$$

Thus the electric oven draws current much more than the current rating 5 A. That is the circuit is overloaded. Due to excessive current, the fuse wire will blow and the circuit will break.

7. A coil of insulated copper wire is connected to a galvanometer. What will happen if a bar magnet is

(i) pushed into the coil (ii) withdrawn from inside the coil (iii) held stationary inside the coil

- Ans: (i) As a bar magnet is pushed into the coil, a momentary deflection is observed in the galvanometer indicating the production of a momentary current in the coil.
- (ii) When the bar magnet is withdrawn from the coil, the deflection of galvanometer is in opposite direction showing the production of an opposite current.
- (iii) When the bar magnet is held stationary inside the coil, there is no deflection in galvanometer indicating that no current is produced in the coil.

8. Two circular coils A and B are placed closed to each other. If the current in the coil A is changed, will some current be induced in the coil B ? Give reason.

Ans: Yes, some current will be induced in the coil B.

When the current in coil A is changed, some current is induced in the coil B.

Due to change in current in coil A, the magnetic field lines linked with coil A and with coil B get changed.

This sets up induced current in coil B.

9. What is the function of an earth wire ? Why is it necessary to earth metallic appliances ?

Ans: Earth wire is a safety measure that controls the sudden hike in electric potential (Voltage)

It ensures that if there is any current leakage in the metallic cover, the potential of the appliance becomes equal to that of the earth.

It is necessary to earth metallic appliances because, the person handling the appliance will not get an electric shock.

10. What is solenoid ? Can you compare it with magnet ? Justify your answer.

Ans : A coil of many circular turns of insulated copper wire wrapped closely in the shape of a cylinder is called a solenoid.

A solenoid behaves like a magnet in the following ways.

- The magnetic field produced by a current carrying solenoid is very much similar to that of a bar magnet.
- Like a bar magnet, one end of the solenoid has N-polarity while the other end has S-polarity.

11. How are commercial motors different from simple electric motor.?

Ans : 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.

13. Which rule helps to find the force on a current carrying conductor in a magnetic field ? State the rule and name the three factors on which the force on the current carrying conductor depend.

Ans : Fleming's left hand rule gives the directions of the force on a conductor when it carries a current in a magnetic field.

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 index 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 motion of the conductor.

Factors on which the force acting on current carrying conductor depends

Strength of Magnetic Field. ...

Strength of electric field. ...

Length of conductor.

12. Explain the following with reference to the magnetic field around a straight conductor carrying current.

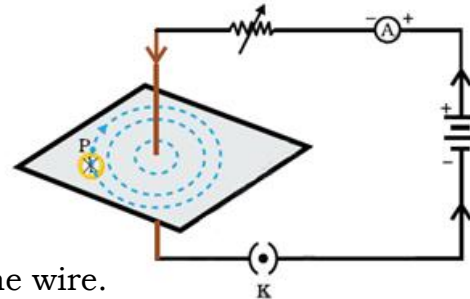
- (i) Tracing the pattern of magnetic field
- (ii) increasing the intensity of magnetic field
- (iii) Reversing the direction of electric current.

Ans : (i) Tracing the pattern of magnetic field

Set the instruments as shown in figure .

Place some iron filings on card board.

Then close the key so that current flows through the wire.



Gently tap the card board , then we will find that the iron filings align themselves showing a pattern of concentric circles around the wire

- (ii) increasing the intensity of magnetic field

If we change the intensity of current by using variable rheostat , the intensity of magnetic field also changes.

- (iii) Reversing the direction of electric current.

If the direction of current through the straight wire is reversed the direction of magnetic field lines also get reversed

14. What does the direction of thumb indicate in the right hand thumb rule ? In what way this rule is differ form Flemings left hand rule.

Ans : According to right hand thumb rule , the direction of thumb indicates the direction of current

According to Flemings left hand rule , the direction of the thumb indicates the direction of force applied on the current carrying conductor when it was kept in magnetic field.

15. A compass needle is placed near a current carrying straight conductor. State your observation for the following cases and give reasons for the same in each case.

- (a) Magnitude of electric current is increased.
- (b) The compass needle is displaced away from the conductor.
- (c) reversing the direction of flow of current in the conductor?

(a) As the amount of magnetic field strength is directly proportional to the amount of current, so the deflection of compass needle increases.

(b) Since magnetic field strength at a point is inversely proportional to the distance from the wire. Hence deflection of compass decreases when it is displaced away from the conductor.

(c) If the direction of current is reversed, the direction of the needle deflection also get reversed.

16. State three factors on which the strength of magnetic field produced by a current carrying solenoid depends.

Strength of magnetic field produced by a current carrying solenoid depends upon the following factors:

- number of turns in the coil
- amount of current flowing through it
- radius of coil
- Material of core of the solenoid.

17. Give reason for the following :

The burnt out fuse should be replaced by another fuse of identical rating.

- If a fuse of higher rating is used then it may not melt and cut off the supply during overloading.
- Similarly a fuse of lower rating may melt frequently even for a normal flow of current. This results in decreasing the efficiency of the circuit.

18. List two distinguishing features between the magnetic field produced by a current carrying solenoid and a bar magnet.

- A bar magnet is a permanent magnet whereas solenoid is an electromagnet, therefore field produced by solenoid is temporary and stay till current flows through it.
- Magnetic field produced by solenoid is more stronger than magnetic field of a bar magnet.

19. Alternating current has a frequency of 50 Hz. What is meant by this statement? How many times does it change its direction in one second?

This means, A.C. completes 50 cycles in one second.

In each cycle it changes its direction twice

Thus, A.C. changes direction $2 \times 50 = 100$ times in one second.

20. List three characteristic features of the electric current used in our homes.

(i) The electric current which we receive in our homes are alternating current with a frequency of 50 Hz.

(ii) There are mainly two wires used in the power supply provided to us. The one usually with a red insulation is called the live wire (or positive wire) and the one with black insulation is called the neutral wire (or negative wire). The potential difference between these wires is 220 V.

(iii) Often, there are two separate circuits used in our homes, one of 15 A current rating for appliances with higher power rating and the other circuit of 5 A rating for appliances such as fans, bulbs, etc.

Sources of Energy

Previous questions from SSLC Board

April 2019



1. (i) Name the major constituent of biogas. Write the properties of biogas which make it a good fuel.
(ii) Name the two devices that work using heat energy of the sun.

Ans : (i) The major constituent of biogas is - Methane / CH₄ .

Properties of biogas which make it a good fuel.-

- Leaves no residue like ash.
- It burns without smoke / eco friendly.
- Its heating capacity is high.

(ii) Devices that work using heat energy of the sun

- Solar water heater
- Solar cooker.
- Solar furnace

2. (i) Write the advantages of solar cells.

(ii) Write any two hazards of nuclear power generation.

Ans : (i) The advantages of solar cells :

- They have no moving parts.
- Require little maintenance and work quite satisfactorily without the use of any focusing device
- They can be set up in remote and inaccessible hamlets or
- Very sparsely inhabited areas in which laying of a power transmission line may be expensive and not commercially viable.

(ii) Improper nuclear waste storage and disposal result in environmental contamination

There is a risk of accidental leakage of nuclear radiation.

June 2019

1. Which of the following is ecofriendly ?

(1Mark)

(A) Thermal power plant

(B) Hydropower plant

(C) Biogas plant

(D) Nuclear power station.

2. List the characteristics of a good source of energy.

(2Marks)

Ans. : (i) It would do a large amount of work per unit volume or mass.

(ii) It should be easily available.

(iii) It should be easy to store.

(iv) It should be easy to transport.

(v) It should be economical.

April 2020

1. The inner surface of solar cooker is coated with black paint to (1Mark)

- (A) absorb more heat (B) reflect light
(C) prevent rusting (D) converge the light rays.

2. The power plant in which natural source of energy is directly used to rotate turbines is (1Mark)

- (A) thermal power plant (B) hydro-electric power plant
(C) nuclear power plant (D) solar power plant.

3. "Biogas plant is a boon to farmers." Why? (1Mark)

Ans. :

- The slurry left behind is used as excellent manure, rich in nitrogen and phosphorous
- It provides a safe and efficient method of waste disposal besides supplying energy and manure.

September 2020

1. a) Explain how is nuclear energy generated in power reactors. How is electricity produced from nuclear energy ?

b) Mention two hazards of nuclear power reactor. (3Marks)

Ans : a)

- Nuclear fission reaction is carried out in nuclear power reactors. The nucleus of heavy atom (such as uranium, plutonium or thorium) when bombarded with low-energy neutrons, can be split apart into lighter nuclei.
- When this is done, a tremendous amount of energy is released at a controlled rate.
- The released energy is used to produce steam and further generate electricity.

b) Hazards of nuclear power reactor :

- Improper / unscientific storage and disposal of spent or used fuels.
- Accidental leakage of nuclear radiations.
- High cost of installation of nuclear power reactor.
- Limited availability of uranium.
- High risk of environmental contamination (Any two points)

2. a) Explain why we are looking at the alternative sources of energy.

b) Mention the advantages and disadvantages associated with solar cells.

Ans : a) The reasons for our looking at alternative sources of energy are ;

- The conventional sources of energy like fossil fuels are in danger of getting exhausted soon.
- Unlimited use of conventional sources of energy has led to the problem of energy crisis
- Uncontrolled use of conventional sources of energy has created many problems of environmental pollution.

b) *Advantages associated with solar cells :*

- They have no moving parts
- They require little maintenance
- They can be set up in remote and inaccessible hamlets

Disadvantages associated with solar cells :

- Availability of special grade silicon for making solar cells is limited.
- The process of manufacture of solar cells is very expensive.
- Their efficiency is low.

July 2021 (MCQ based exam)

1. The inner wall of the solar cooker is painted black because this

- (A) reflects light (B) converges solar radiations
(C) prevents from rusting **(D) absorbs more heat**

2. The source of energy in nuclear power reactor is

- (A) nuclear fission reaction
(B) controlled nuclear fission chain reaction
(C) exothermic reaction
(D) nuclear fusion reaction

Sept 2021 (MCQ based exam)

1. The major component of bio-gas is

- (A) propane (B) butane **(C) methane** (D) ethane

2. The power plant that uses the natural source of energy directly to rotate the turbines is

- (A) Thermal power plant **(B) Hydro-electric power plant**
(C) Nuclear power plant (D) Solar power plant

April - 2022

1. Which is the major component of biogas ? Write four characteristics of a good source of energy.

Ans. : Methane / CH₄ (refer June-2019 Qno-2)

2. Which element is used in making solar cell ? Write any four advantages of solar cells.

Ans. : An element used in making solar cell is - Silicon / Si

The advantages of solar cells :

- They have no moving parts
- Little maintenance
- Work quite satisfactorily without the use of any focusing device
- Can be set up in remote areas where people cannot reach easily
- Can set up in those areas too, where laying of power transmission lines is not possible.

June - 2022

1. What is a solar cell ?

Ans. : The device that converts solar energy into electrical energy.

2. Write any two limitations of producing electricity from wind energy.

Ans. : i) Wind energy farms (wind mills) cannot be established everywhere.

ii) The wind speed should be higher than 15 km/h to maintain the required speed of the turbine.

iii) Wind energy farms require large area of land.

iv) The initial cost of establishment of the farm is quite high.

April - 2023

1. The inner wall of the solar cooker is painted black. Because black colour

(A) reflects light

(B) converges solar rays

(C) prevents from rusting

(D) absorbs more heat

2. Name the major constituent of biogas and write the properties of biogas.

Ans. : Methane / CH₄

- When burnt leaves no residue like ash
- It burns without smoke
- Its heating capacity is high

3. List the hazards of nuclear power generation.

- Improper nuclear-waste storage and disposal result in environmental contamination
- There is a risk of accidental leakage of nuclear radiation

April - 2023

1. The power plant that generates electricity without using the turbines is

- (A) Thermal power plant (B) Hydro power plant
(C) **Solar power plant** (D) Nuclear power plant.

2. Name any two fossil fuels and mention any two disadvantages of using fossil fuels.

Ans. : Coal , Natural gas , Petroleum (Any two)

Disadvantages of using fossil fuels :

- Air pollution
- Acid rain
- Greenhouse effect
- Pollutes water and land
- Global warming (any suitable answer) (Any two)

MOST LIKELY QUESTIONS FOR 2024 (Including previous year questions)

1. Energy from various sources is considered to have been derived from the sun. Do you agree? Justify your answer.

Ans : Yes, sun is the ultimate source of energy. Directly or indirectly, all the forms of energy are derived from solar energy.

(i) Clouds are formed when water in lakes, rivers, seas etc. evaporates due to solar energy. They bring rainfall This flowing water can be used for getting hydroelectricity.

(ii) Wind energy arises due to uneven heating of the earth's surface by the sun. Due to this, wind possesses kinetic energy.

(iii) Plants in the process of photosynthesis converts the solar energy into food (chemical energy). This food is consumed by animals. Thus, the animal wastes and remains of the plants constitute biomass which can be utilised as a source of energy.

2. There is a need to harness non-conventional sources of energy. Give two main reasons.

Ans.: There is a need to harness non-conventional sources of energy because:

(i) Our demand for energy is increasing to improve quality of life and growth of population.

(ii) fossil fuels are limited sources and are depleting fast.

(iii) burning of fossil fuels causes a lot of pollution.

3. What are the limitations in obtaining energy from Solar cell ?

Ans :

- Solar energy is not available in night or when the sun is hidden under clouds.
- The domestic use of solar cells for production of electricity is not possible due to high cost.

4. There are many limitations associated with the setting up of wind energy farms to harness energy. Ramesh wants to generate electricity by using wind mill in his parental village in Karnataka.

(i) Is it advisable to set up such wind energy farms in his village? Give reason for your answer.

(ii) Write any two limitations associated with the wind energy farms.

Ans : (i) No, it is not advisable to set up such wind energy farms in his village because wind energy farms can be established only at those places where wind blows for the greater part of a year. The wind speed should also be higher than 15 km/h to maintain the required speed of the turbine.

(ii) Limitation of wind energy:

(a) Initial cost of establishment of the farm is quite high.

(b) The tower and blades need a high level of maintenance.

5. Can any source of energy be pollution-free? Why or why not?

Ans :

- Some energy sources like wind energy , solar energy are pollution free
- Some energy sources like fossil fuels , biomass are cause pollution

6. What is the role of a plane mirror and a glass sheet in a solar cooker ?

Ans :

- Plane mirror reflects the sunlight inside the solar cooker
- A solar cooker covered by a plane glass slab will be more efficient. This is because glass slab does not allow the heat radiation to escape from the solar cooker and hence the temperature of the solar cooker covered with glass slab increases more than the temperature of the solar cooker which is left open.

7. What steps would you suggest to minimise environmental pollution caused by burning of fossil fuel ?

Ans :

- By using public transport instead of private vehicles
- Growing more and more trees,
- Using smokeless chulahs and
- Using smokeless chimneys in thermal power plants.

8. How is hydropower harnessed?

Potential energy of water stored in a dam is converted into kinetic energy of falling water and then, this kinetic energy is converted into electrical energy.

9. "Burning fossil fuels may lead to intense global warming." Justify this statement.

Burning of fossil fuels produces carbon dioxide and excess carbon dioxide in the atmosphere causes the greenhouse effect, leading to intense global warming.