CHAPTER 8

Conceptual Questions Based on NCERT Textbook

LIGHT—REFLECTION AND REFRACTION

1. Which one of the following materials cannot be used to make a lens?
   (a) Water (b) Glass
   (c) Plastic (d) Clay
2. The image formed by a concave mirror is observed to be virtual, erect and larger than the object. Where should be the position of the object?
   (a) Between the principal focus and the centre of curvature
   (b) At the centre of curvature
   (c) Beyond the centre of curvature
   (d) Between the pole of the mirror and its principal focus
3. Where should an object be placed in front of a convex lens to get a real image of the size of the object?
   (a) At the principal focus of the lens
   (b) At twice the focal length
   (c) At infinity
   (d) Between the optical centre of the lens and its principal focus.
4. A spherical mirror and a thin spherical lens have each focal length of –15 cm. The mirror and the lens are likely to be:
   (a) both concave
   (b) both convex
   (c) the mirror is concave and the lens is convex
   (d) the mirror is convex, but the lens is concave.
5. No matter how far you stand from a mirror, your image appears erect. The mirror is likely to be (a) plane, (b) concave, (c) convex, (d) either plane or convex.
6. Which of the following lenses would you prefer to use while reading small letters found in a dictionary?
   (a) A convex lens of focal length 50 cm
   (b) A concave lens of focal length 50 cm
   (c) A convex lens of focal length 5 cm
   (d) A concave lens of focal length 5 cm.
7. We wish to obtain an erect image of an object, using a concave mirror of focal length 15 cm. What should be the range of distance of the object from the mirror? What is the nature of the image? Is the image larger or smaller than the object? Draw a ray diagram to show the image formation in this case.
8. Name the type of mirror used in the following situations:
   (a) Headlights of a car, (b) Side/rear-view mirror of a vehicle and (c) Solar furnace. Support your answer with reasons.
9. One-half of a convex lens is covered with a black paper. Will this lens produce a complete image of the object? Verify your answer experimentally. Explain your observations.
10. An objects 5 cm in length is held 25 cm away from a converging lens of focal length 10 cm. Draw a ray diagram and find the position, size and the nature of the image formed.

11. A concave lens of focal length 15 cm forms an image 10 cm from the lens. How far is the object placed from the lens? Draw the ray diagram.
12. An object is placed at a distance of 10 cm from a convex mirror of focal length 15 cm. Find the position and nature of the image.
13. The magnification produced by a plane mirror is +1. What does this mean?
14. An object 5.0 cm in length is placed at a distance of 20 cm in front of a convex mirror of radius of curvature 30 cm. Find the position of the image, its nature and size.
15. An object of size 7.0 cm is placed at 27 cm in front of a concave mirror of focal length 18 cm. At what distance from the mirror should a screen be placed so that a sharp focussed image can be obtained. Find the size and the nature of the image.
16. Find the focal length of a lens of power –2.0 D. What type of lens is this?
17. A doctor has prescribed a corrective lens of power +1.5 D. Find the focal length of the lens. Is the prescribed lens diverging or converging?

Answers

1. Lens is made of a transparent material. Since clay is not transparent, correct choice is (d).
2. (d)
3. (b)
4. (a)
5. (d)
6. (c)
7. In order to obtain an erect image of an object using a concave mirror, the object must be placed between the pole and focus. So, the object should be placed at any distance which is less than 15 cm from the mirror. The image so formed is virtual and larger than the object. The ray diagram is shown in the Fig. 8.1.

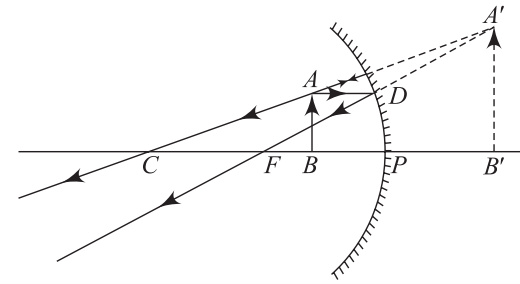


Fig. 8.1

8. (a) Concave mirror
   When an object is placed at the principal focus of a concave mirror, it renders the rays parallel. The bulb of headlight is kept at the focus of concave mirror. The rays reflected from the mirror are in the form of a strong parallel beam. This beam goes straight and makes the distance objects visible for safe driving.
   (b) Convex mirror
   A convex mirror has the largest field of view.
   (c) Concave mirror
   The object required to be heated is kept at the focus of concave mirror. The parallel rays from the sun are incident on the mirror and get reflected at the focus. Therefore, sufficient amount of energy is received from the sun at one point (focus) to heat the object.

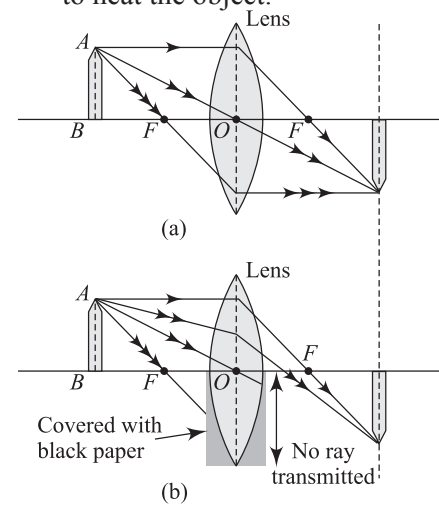


Fig. 8.2

9. When one-half of a convex lens is covered with a black paper, the lens will still produce a complete image.

   Take a live candle and put it in front of a convex lens mounted on an optical bench. Now move the candle along the axis of bench and take its full image on a screen.

   On covering the lower half of lens with a black paper without disturbing the position of candle, lens and screen, you will see that full image of the candle is still observed. This is so because a large number of incident rays on the lens are blocked.

10. Given:

$u = -25$ cm
$f = +10$ cm
$h = 5$ cm
$v = ?$
$h' = ?$

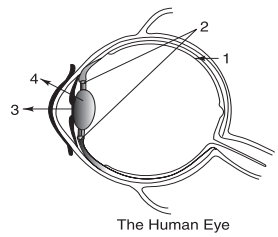


Fig. 8.3

From the lens formula, $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

i.e, $\frac{1}{10} = \frac{1}{v} + \frac{1}{25}$

Solving, we get $v = 16.67$ cm

The image is formed at a distance of 16.67 cm behind the lens.

Magnification, $m = \frac{h'}{h} = \frac{v}{u}$

or $h' = \frac{v}{u} \times h$

$= \frac{16.67}{-25} \times 5$

$= -3.33$ cm

Thus, the image is inverted, real and of size 3.33 cm.

11. Given:

$v = -10$ cm
$f = -15$ cm
$u = ?$

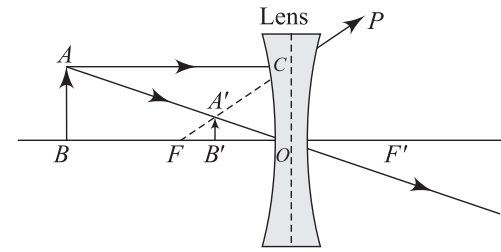


Fig. 8.4

Using the lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$

and putting the given values, we have

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

$= -\frac{1}{10} + \frac{1}{15}$

Solving, we get $u = -30$ cm

Thus, the object is placed at a distance of 30 cm away from the lens.

12. Given:

$u = -10$ cm
$f = 15$ cm
$v = ?$

Using the mirror formula, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$, putting the given values and solving, we get

$\frac{1}{v} = \frac{1}{15} + \frac{1}{10}$

or $v = 6$ cm

Thus, the image is formed at a distance of 6 cm behind the mirror. The image is virtual and erect.

13. Positive magnification shows that the image is virtual and erect. The magnification, m = 1 shows that the image formed is of the same size as the object. Thus, $m = +1$ shows that the image formed in a plane mirror is virtual, erect and of the same size as the object.

14. Radius of curvature of convex mirror (R) = 30 cm

$\therefore$ Focal length of convex mirror,

$$f = \frac{R}{2} = 15 \text{ cm}$$

Given:

$u = -20$
$v = 5$ cm
$v = ?$
$h' = ?$

Using the mirror formula, $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$, we get

$$\frac{1}{v} = \frac{1}{15} - \frac{1}{(-20)}$$

$$= \frac{1}{15} + \frac{1}{20}$$

or $v = 8.6$ cm

Also, $m = \frac{h'}{h} = \frac{-v}{u}$

or $\frac{h'}{5} = \frac{8.6}{20}$

or $h' = 2.15$ cm

Thus, the size of the image is 2.15 cm. The image formed is virtual, erect and diminished.

15. Given:

$u = -27$ cm
$h = 7$ cm
$f = -18$ cm
$v = ?$
$h' = ?$

Using the mirror formula $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$, putting the given values and solving, we get

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

$$= -\frac{1}{18} + \frac{1}{27}$$

or $v = -54$ cm

Negative sign shows that the image if formed on the same side as that of the object. The image is real and inverted.

Also, $m = \frac{h'}{h} = \frac{-v}{u}$ or $h' = -7 \times \frac{(-54)}{(-27)}$

or $h' = -14$ cm

$\therefore$ $m = \frac{-14}{7}$

$= -2$

Thus, the size of the image is 14 cm.

16. Power $P = \frac{1}{f(in\ m)}$

$\therefore$ $-2.0 = \frac{1}{f}$

or $f = 2.0$ m

Since the focal length is negative, the lens is a concave lens.

17. Power $P = \frac{1}{f(\text{in } m)}$

or $+1.5D = \frac{1}{f}$

$\therefore$ $f = \frac{1}{1.5}$m

$= +0.67$ m

Since the focal length is positive, the lens is a convex lens or converging lens.

TEST YOURSELF

1. State whether the image formed by a plane mirror is real or virtual.
2. Can a virtual image be taken on screen?
3. What is the focal length of a plane mirror?
4. What do you mean by laterally inverted image formed by a plane mirror?
5. What type of mirror is used by motor car drivers to see the traffic coming from behind?
6. What type of mirror is used by doctors to examine ear, nose throat and teeth of patients?
7. For what position of an object, diminished image is formed by a concave mirror?
8. What type of mirror should be used to get magnified image of an object?
9. What do you mean by linear magnification?
10. A mirror has very large field of view. Is it concave or convex?
11. How does the image move an object is moving towards a concave mirror?
12. A ray of light is incident on a concave mirror along its principal axis. What will be its angle of reflection?
13. If the object is slowly brought from infinity towards the pole of a convex mirror, how does the size and position of image change?
14. Can you form image of an irregular body by a plane mirror? If so, how?
15. How does the size of image change when object is brought from infinity towards the pole of concave mirror?
16. What type of mirror is used for shaving and make-up purposes and where is the face of person made to lie?
17. Why is a convex mirror preferred to a concave and a plane mirror for seeing the traffic coming behind?
18. Is the image (or picture) seen on T.V. screen real? If not, why?
19. An object is placed at a distance of 15 cm from a convex mirror and image is formed at a distance of 5 cm from mirror. Calculate the radius of curvature of the mirror.
20. A convex mirror used in a car has radius of curvature 3.5 m. If the driver of the car locates a bus at 10 m behind the car, find the position, nature and size of the image of bus.
21. Show that to produce an image with magnification 'm', using a spherical mirror whose focal length is 'f', the object must be placed at a distance 'd' from the mirror, such that $d = \dfrac{(m-1)f}{m}$.
22. A ray of light makes an angle of 45° at air-glass interface as shown in Fig. 8.5, calculate the angle of refraction if ${}^{a}\mu_{g} = 1.5$.

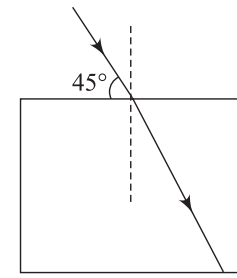
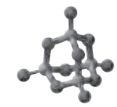


Fig. 8.5

23. A coin is placed at a depth of 15 cm in a water container. Calculate the height through which image of coin is raised $\mu_{\text{water}} = \dfrac{4}{3}$.
24. If a glass slab of 18 cm thickness is placed on a printed page, the words appear 6 cm from the lower surface of the block. Find the refractive index of glass.
25. Calculate the critical angle for diamond when ray of light is travelling from diamond to air. Take $\mu_{\text{diamond}} = 2.42$.
26. Light passes at angle of incidence of 45° from water into air, what is the angle of refraction? Take $\mu_{\text{water}} = 1.33$.

27. Find the distance at which an object should be placed in front of a convex lens of focal length 10 cm to obtain an image of double the size.
28. An object placed 15 cm in front of a lens forms a real image three times magnified. Where is the image formed? What is the focal length of lens?
29. Find the focal length of a concave lens of power –2.5 D.
30. Two thin lenses of power + 6.5 D and –2.5 D are placed in contact. Find the power and focal length of the lens combination.
31. What happens when a ray of light passes from (i) rarer to denser medium (ii) denser to rarer medium?
32. What do you mean by refractive index of a medium?
33. What do you mean by absolute refractive index of a medium?
34. During refraction which of the following quantities does not change?
35. Which lens (i) converges (ii) diverges, the rays if light?
36. What is the nature of image of formed by a concave lens?
37. When is the image formed by a convex lens virtual?
38. Where should the object be placed so that convex lens forms real, inverted and diminished image?
39. For what position of object, image formed by a convex lens is real, inverted and of same size as object?
40. What do you mean by power of a lens?
41. Which lens has (i) positive (ii) negative power?
42. For what nature of image, is the magnification (i) positive (ii) negative?
43. Which of the two lenses, convex or concave, is called a magnifier?
44. Why does a tank of water appear shallower than what it actually is?
45. An object is placed at infinity from a convex lens. Where is the image informed? Give its nature and size.
46. An object of 2 cm height is placed at a distance '$2f$' from a convex lens. What is the position, nature and size of image?
47. Length of day appears to be longer by 4 minutes than what it actually is?
48. Why do the stars appear to twinkle and not planets and the moon?
49. What is mirage phenomenon?
50. What is total internal reflection of light?
51. Give necessary conditions for total internal reflection of light to take place.
52. Give the factors on which lateral displacement in a glass slab depends.
53. Why does a bubble in water appear brighter?
54. Define refractive index of a medium. Give principle of reversibility of light and describe refraction through a glass slab.
55. Derive a relation between real depth, apparent depth and refractive index.
56. Describe refraction through a compound rectangular slab. Derive formula.
57. What is magnification in a lens? Derive the various magnification formulae in terms of u, v and f.
58. What do you mean by power of a lens?



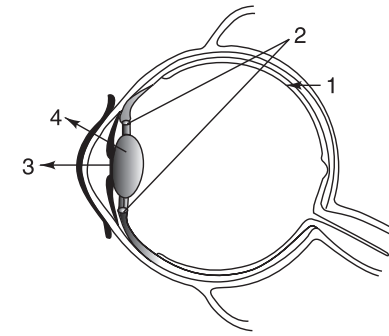
HUMAN EYE AND COLOURFUL WORLD

1. The human eye can focus objects at different distances by adjusting the focal length of the eye lens. This is due to
   (a) presbyopia (b) accommodation
   (c) near-sightedness (d) far-sightedness

2. The human eye forms the image of an object at its
   (a) cornea (b) iris
   (c) pupil (d) retina
3. The least distance of distinct vision for a young adult with normal vision is about
   (a) 25 m (b) 2.5 cm
   (c) 25 cm (d) 2.5 m
4. 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
5. A person needs a lens of power –5.5 diopters for correcting his distant vision. For correcting his near vision he needs a lens of power +1.5 diopter. What is the focal length of the lens required for correcting (i) distant vision, and (ii) near vision?
6. The far point of a myopic person is 80 cm in front of the eye. What is the nature and power of the lens required to correct the problem?
7. Make a diagram to show how hypermetropia is corrected. The near point of a hypermetropic eye is 1 m. What is the power of the lens required to correct this defect? Assume that the near point of the normal eye is 25 cm.
8. Why is a normal eye not able to see clearly the objects placed closer than 25 cm?

   or

   We cannot see an object clearly if it is the placed very close to the eye. Give reason.
9. What happens to the image distance in the eye when we increase the distance of an object from the eye?
10. Why do stars twinkle?
11. Explain why the planets do not twinkle.
12. Why does the sun appear reddish early in the morning?
13. Why does the sky appear dark instead of blue to an astronaut?
14. (a) Label the four parts indicated by question marks and labelled 1, 2, 3 and 4.
    (b) At what place is the image of an object formed?



The Human Eye

Fig. 8.6

15. What is colour-blindness? What kind of retinal cells are lacking in person suffering from this defect?

Answers

1. (b)
2. (d)
3. (c)
4. (c)
5. (i) Power, $P = -5.5$ D
   Focal length, $f = ?$

   We know, $P = \dfrac{1}{f(in\ m)}$

   Putting values and solving, we get

   $$f = \frac{1}{-5.5}$$
   $$= -0.18 \text{ m}$$

   Negative sign indicates that the lens is concave.

   (ii) $P = +1.5$ D
   $f = ?$

   Putting values and solving, we get $f = \dfrac{1}{+1.5}$
   $= + 0.67$ m

   Positive sign indicates that the lens is convex.
6. The far point for the myopic person is 80 cm. Thus, the person can see the distant object (which is kept at infinity) clearly if the image of the object is formed at his far point, i.e., 80 cm. In this case,

$u = \infty$

$v = -80$ cm

$f = ?$

Using the lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$, putting the given values and solving, we get

$$\frac{-1}{80} - \frac{1}{\infty} = \frac{1}{f}$$

or $$-\frac{1}{80} - 0 = \frac{1}{f}$$

$\therefore$ $$f = -0.8 \text{ m}$$

Negative sign shows that the lens is concave.

Power, $P = \frac{1}{-0.8} = -1.25D.$

Thus, the concave lens of power –1.25D is needed to correct the problem.

7. The hypermetropic eye is corrected by using a convex lens of suitable focal length as spectacle in front of the eye. The convex lens so used forms a virtual image at the position of near point of the person so as to enable him to see the image clearly.

Given:

$u = -25$ cm, for normal near point

$v = -1$ m

$= -100$ cm, for near point of defective eye

$f = ?$

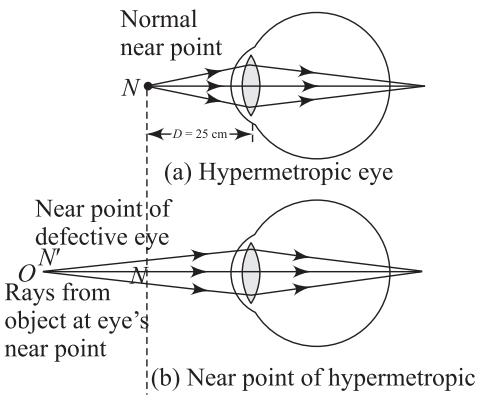


Fig. 8.7

Using the lens formula, $\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$, putting the given values and solving, we get

$$\frac{1}{-100} - \frac{1}{-25} = \frac{1}{f}$$

or $$f = \frac{100}{3} = 33.3 \text{ cm}$$

Therefore, the convex lens of focal length +33.3 cm is required to correct the defect.

Power, $P = \frac{1}{+0.33} = +3.0\text{D}$

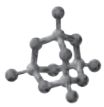
Thus, the convex lens of power +3.0D is required.

8. The maximum accommodation in case of a normal eye is reached when the object is kept at a distance of 25 cm from the eye. The focal length of the eye lens cannot be decreased below this minimum limit. Therefore, an object placed closer than 25 cm cannot be seen clearly by a normal eye.
9. The distance between eye lens and retina is the image distance inside the eye. Since the image distance is fixed, therefore, when we increase the distance of an object from the eye, there is no change in the image distance inside the eye.
10. The twinkling of a star is because of atmospheric refraction of light from the star. The atmospheric refraction occurs in a medium of gradually changing refractive index.
11. The planets are relatively closer to the earth than the stars. Thus, the planets are seen as extended sources. If we regard a planet as a collection of large number of point-sized sources of light, then the total variation in the amount of light entering the eye from all the individual point sources will average out to zero, thus nullifying the twinkling effect.
12. At the time of sunrise, when the sun is near the horizon, the sunlight travels the longest distance through the atmosphere to reach us. During this long journey, most of the blue

colour and shorter wavelength present in it is scattered out. So, the light reaching us directly from the rising sun comprises mainly of longer wavelength red colour due to which the sun appears reddish early in the morning.

13. The sky appears dark instead of blue to an astronaut because there is no atmosphere comprising air in the outer space to scatter the sunlight.
14. (a) 1. Retina
    2. Ciliary muscles
    3. Pupil
    4. Crystalline lens

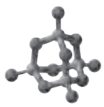
    (b) Retina
15. The defect of the eye due to which a person is unable to distinguish between certain colours is called colour blindness. Cone shaped retina cells are responsible for enabling a person to distinguish between the different colours. The colour blind persons do not posses cone cells that correspond to certain colours.



TEST YOURSELF

1. Which part of eye is called window of human eye?
2. Which part of eye controls the intensity of light entering the eye?
3. What holds the eye lens in position?
4. What is far point of a normal eye?
5. What is near point of a normal eye?
6. What do you mean by power of accommodation of eye?
7. What is least distance of distinct vision of human eye?
8. What is persistence of vision of a human eye?
9. Which lens is used to rectify long sightedness?
10. What is the cause of long sightedness?
11. How many lenses are used in a simple microscope?
12. What is magnifying power of a microscope?
13. Why a simple microscope is called magnifier?
14. On what factors does magnifying power of a simple microscope depend?
15. What is the function of a telescope?
16. What is short sightedness and how is it rectified?
17. What is short sightedness and how is it removed?
18. If power of spectacles used is –2D, what is the distance of far point of the eye?
19. If the near point of a person is 1 m, what will be power of lens used? And name the defect.
20. Derive expression of magnifying power of simple microscope.
21. A jeweller uses a magnifying lens of magnification 50. Find the focal length of the lens.
22. A man whose distance of distinct vision is 25 cm uses a convex lens of focal length 5 cm as a magnifying glass. Where must the object be placed and what is its magnification?
23. A watch maker uses a convex lens of focal length 5 cm to examine the parts of a watch. How much is the magnification produced by the lens? Given, least distance of distinct vision = 25 cm.
24. A person's near point is 37.5 cm and far point is 270 cm. What spectacles will he require (a) for reading purpose and (b) for seeing distance objects? Least distance of distinct vision is 25 cm.
25. The near point of a hypermetropic eye is 50 cm. Find the power of convex lens used in his spectacles.
26. A long sighted person whose nearest distance of distinct vision is 100 cm, finds that he can clearly see objects lying at a distance of 20 cm by using spectacles. Find the nature, focal length and power of the lens used.
27. A man's shortest distance of distinct vision is 3 metres. What will be type and power of the spectacles lenses which he would require to enable him to read a book at a distance of 25 cm?
28. Write down the seven colours of visible spectrum in order.
29. What do you mean by dispersion of light?
30. What is pure spectrum?

31. What is monochromatic light?
32. What is demonstrated by Newton's colour disc?
33. What is the cause of dispersion of white light?
34. Arrange the various colours of white light in order of (i) increasing wavelength (ii) increasing frequency.
35. Why deep clear water in a river appears blue?
36. A glass prism disposes white light into seven colours but a rectangular glass slab is unable to do so, why?
37. Define dispersion of light. Give its causes and an experiment to show that white light is a constituent of seven colours.



ELECTRICITY

1. A piece of wire of resistance R is cut into five equal parts. These parts are then connected in parallel. If the equivalent resistance of this combination is R', then the ratio $\frac{R}{R'}$ is:
   (a) $\frac{1}{25}$ (b) $\frac{1}{5}$
   (c) 5 (d) 25
2. Which of the following terms does not represent electrical power in a circuit?
   (a) I^2R (b) IR^2
   (c) VI (d) $\frac{V^2}{R}$
3. An electric bulb is rated 220 V and 100 W. When it is operated on 110 V, the power consumed will be:
   (a) 100 W (b) 75 W
   (c) 50 W (d) 25 W
4. Two conducting wires of the same material and of equal lengths and equal diameters are first connected in series and then parallel in a circuit across the same potential difference. The ratio of heat produced in series and parallel combination would be:
   (a) 1 : 2 (b) 2 : 1
   (c) 1 : 4 (d) 4 : 1
5. How is a voltmeter connected in the circuit to measure the potential difference between two points?
6. A copper wire has diameter 0.5 mm and resistivity of 1.6×10^{-8} Ωm. What will be the length of this wire to make its resistance 10 Ω. How much does the resistance change if the diameter is doubled?
7. The value of current I flowing in a given resistor for the corresponding values of potential difference V across the resistor are given below:

I (amperes)	0.5	1.0	2.0	3.0	4.0
V volts	1.6	3.4	6.7	10.2	13.2

   Plot a graph between V and I and calculate the resistance of that resistor.
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.
9. A battery of 9 V is connected in series with resistors of 0.2 Ω, 0.3 Ω, 0.4 Ω, 0.5 Ω and 12 Ω respectively. How much current would flow through the 12 Ω resistor?
10. How many 176 Ω resistors (in parallel) are required to carry 5 A on a 220 V line?
11. Show how you would connect three resistors, each of resistance 6 Ω, so that the combination has a resistance of (i) 9 Ω (ii) 4 Ω.
12. Several electric bulbs designed to be used on a 220 V electric supply line, are rated 10 W. How many lamps can be connected in parallel with each other across the two wires of 220 V line if the maximum allowable current is 5 A?
13. A hot plate of an electric oven connected to a 220 V line has two resistance coils A and B, each of 24 Ω resistance, which may be used separately, in series or in parallel. What are the currents in the three cases?

14. Compare the power used in the 2 Ω resistor in each of the following circuits:
(i) a 6 V battery in series with 1 Ω and 2 Ω resistors, and (ii) a 4 V battery in parallel with 12 Ω and 2 Ω resistors.
15. Two lamps, one rated 100 W at 220 V, and the other 60 W at 220 V, are connected in parallel to electric mains supply. What current is drawn from the line if the supply voltage is 220 V?
16. Which uses more energy, a 250 W TV set in 1 h or a 1200 W toaster in 10 minutes?
17. An electric heater of resistance 8 Ω draws 15 A from the service mains 2 hours. Calculate the rate at which heat is developed in the heater.
18. Explain the following:
(i) Why is the tungsten used almost exclusively for filament of electric lamp?
(ii) Why are the conductors of electric heating devices, such as bread-toasters and electric irons, made of an alloy rather than a pure metal?
(iii) Why is the series arrangement not used for domestic circuits?
(iv) How does the resistance of a wire vary with its area of cross-section?
(v) Why are copper and aluminium wires usually employed for electricity transmission?

Answers

1. Resistance of the wire, $R = \rho\frac{l}{A}$

Resistance of a piece of length $\frac{l}{5} = \rho\frac{l}{5A} = \frac{R}{5}$

The equivalent resistance of the 5 wires in parallel, say R', is given by,

$$\frac{1}{R'} = \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R} + \frac{5}{R}$$

$$= \frac{25}{R}$$

or $$R' = \frac{R}{25}$$

$$\therefore \quad \frac{R}{R'} = 25$$

So, the correct answer is (d).

2. (b)

3. We know, $P = \frac{V^2}{R}$

or $$100 = \frac{(220)^2}{R}$$

When operated on 110 V, let the power consumed be P'

$$\therefore \quad P' = \frac{(110)^2}{R}$$

Also, $$\frac{P'}{100} = \left(\frac{110}{220}\right)^2$$

or $$P' = \frac{1}{4} \times 100$$

$$= 25 \text{ W}$$

So, the correct answer is (d).

4. Let R be the resistance of each wire.
The equivalent resistance of the series combination,

$$R_s = 2R$$

Heat produced in time t, $H_1 = \frac{V^2}{R}t$ …(i)

The equivalent resistance of the parallel combination,

$$R_p = \frac{R \times R}{R + R} = \frac{R}{2}$$

Heat produced in this case, $H_2 = \frac{2V^2t}{R}$ …(ii)

From (i) and (ii), we get $\frac{H_1}{H_2} = \frac{1}{4}$

So, the correct answer is (c).

5. A voltmeter is connected in parallel in the circuit to measure the potential difference between two points.

6. (i) Radius $r = \frac{0.5}{2} = 0.25$ mm

$= 0.25 \times 10^{-3}$ m

Area of cross-section, $A = \pi r^2$

$= \frac{22}{7} \times (0.25 \times 10^{-3})^2$

$\simeq 0.1964 \times 10^{-6}$ m^2

Resistance, $R = 10\ \Omega$

Resistivity, $\rho = 1.6 \times 10^{-8}\ \Omega$m

Length, l = ?

Using $R = \frac{\rho l}{A}$ we have, $l = \frac{RA}{}$

Putting values and simplifying, we get

$$l = \frac{10 \times 0.1964 \times 10^{-6}}{1.6 \times 10^{-8}} \simeq 122.75 \text{ m}$$

(ii) $A_1 = \frac{\pi d^2}{4}$ and $R_1 = \frac{4\rho l}{\pi d^2}$ …(i)

$A_2 = p\left(\frac{2d}{2}\right)^2 = \pi d^2$

and $R_2 = \frac{\rho l}{\pi d^2}$ (ii)

From (i) and (ii), we get

$$\frac{R_2}{R_1} = \frac{\rho l}{\pi d^2} \times \frac{\pi d^2}{4\rho l} = \frac{1}{4}$$

or $R_2 = \frac{R_1}{4}$

So, on doubling the diameter, the area of cross-section becomes 4 times and the resistance becomes one-fourth.

7. R = slope of V-I graph

$$= \frac{\Delta V}{\Delta I} = \frac{BM}{AM} = \frac{10.2 - 3.4}{3.0 - 1.0}$$

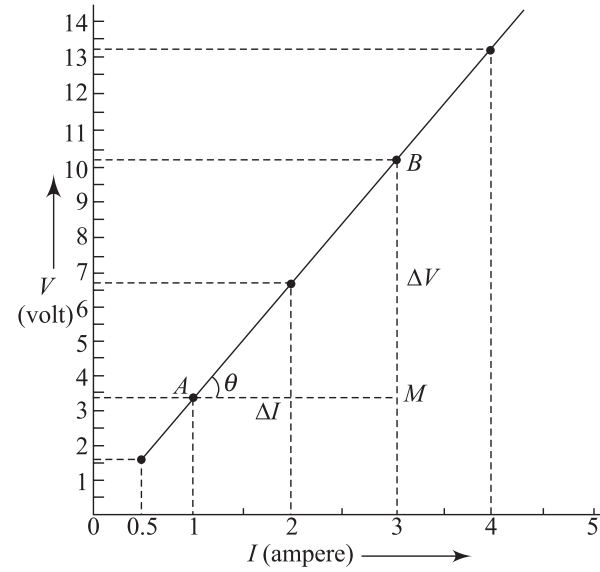


Fig. 8.8

or $R = \frac{6.8}{2.0} = 3.4\ \Omega$

8. Given: $V = 12$ volts

$I = 2.5$ mA

$= 2.5 \times 10^{-3}$ A

We know, $V = IR$

or $R = \frac{V}{I} = \frac{12}{2.5 \times 10^{-3}}$

$= 4.8 \times 10^3\ \Omega$.

9. Since resistors are connected in series, equivalent resistance (R) is given by,

$R = 0.2\ \Omega + 0.3\ \Omega + 0.4\ \Omega + 0.5\ \Omega + 12\ \Omega$

$= 13.4\ \Omega$

$\therefore \quad I = \frac{9}{13.4}$

$= 0.67$ A

10. Given: $I = 5$ A

$V = 220$ volts

$R = \frac{220}{5} = 44\ \Omega$

Suppose number of resistors = n

In parallel, $\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \cdots n$ times

or $$\frac{1}{44} = \frac{1}{176} + \frac{1}{176} + \cdots n \text{ times}$$

or $$\frac{1}{44} = \frac{n}{176}$$

or $$n = \frac{176}{44} = 4$$

11. (i) We can connect the resistors in the following ways. Resistance between B and C is given by,

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

or $R = 3\ \Omega$

$\therefore$ Resistance of the combination

$= 6\ \Omega + 3\ \Omega$

$= 9\ \Omega$

(ii) We can also connect two resistors in series and third in parallel. Resistors AB and BC are in series, so

$$R_s = 6\ \Omega = 6\ \Omega = 12\ \Omega$$

Next, R_s is in parallel with 6 Ω.

$\therefore$ Equivalent resistance (R_p) is given by,

$$\frac{1}{R_p} = \frac{1}{6} + \frac{1}{12} = \frac{3}{12}$$

or $R_p = 4\ \Omega$

12. $V = 220$ volts

$P = 10$ W

Resistance of each bulb, $R = \frac{V^2}{P}$

$$= \frac{220 \times 220}{10}$$

$= 4840\ \Omega$

Total resistance in the circuit, $R_1 = \frac{V}{I}$

$$= \frac{220}{5} = 44\ \Omega$$

Suppose n bulbs are to be connected in parallel to obtain R_1, therefore,

$$\frac{1}{R_1} = \frac{1}{R} + \frac{1}{R} + \cdots n \text{ times}$$

or $$\frac{1}{R'} = \frac{n}{R}$$

or $$n = \frac{R}{R'} = \frac{4840}{44}$$

$= 110.$

13. **Case I:** When the coils A and B are used separately, the current through each coil,

$$I = \frac{V}{I} = \frac{22.0}{24} = 9.2\ \text{A}$$

Case II: When the coils are connected in series, the equivalent resistance (R_s) = 48 Ω

$\therefore$ $$I = \frac{220}{48} = 4.6\ \text{A}$$

Case III: When the coils A and B are connected in parallel, the equivalent resistance (R_p) is given by,

$$\frac{1}{R_p} = \frac{1}{24} + \frac{1}{24}$$

$$= \frac{1}{12}$$

or $R_p = 12\ \Omega$

$\therefore$ $$I = \frac{220}{12}$$

$= 18.3$ A.

14. (i) $R_s = 1\ \Omega + 2\ \Omega$

$= 3\ \Omega$

Potential difference = 6 V

$\therefore$ $$I = \frac{6}{3} = 2\text{A}$$

Since the current in series circuit is same, the current through 2 Ω resistor = 2 A

Also, power in 2 Ω = I^2R

or $P = (2)^2 \times 2$

$= 8$ W

(ii) Potential difference across 2 Ω = 4 V

Power, $P' = \frac{V^2}{R} = \frac{(4)^2}{2}$

$= 8$ W

$P : P' = 8\text{W} : 8\text{W}$

$= 1 : 1.$

15. We know, $P = \frac{V^2}{R}$ or $R = \frac{V^2}{P}$

Resistance of first lamp, $R_1 = \frac{220 \times 220}{100}$

$= 484\ \Omega$

Resistance of second lamp, $R_2 = \frac{220 \times 220}{60}$

$= \frac{2420}{3}\ \Omega$

Since the two lamps are connected in parallel, equivalent resistance is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

$$= \frac{1}{484} + \frac{3}{2420}$$

or $R = \frac{2420}{8}\ \Omega$

Also, current drawn from the line,

$$I = \frac{V}{R} = \frac{220 \times 8}{2420}$$

$= 0.73$ A.

16. Energy used by TV, $E_1 = P \times t$

$= 250\ \text{W} \times 1\ \text{h}$

$= 250$ Wh

Energy used by toaster, $E_2 = P \times t$

$= 1200 \times \frac{10}{60}$

$= 1200$ Wh

So, TV in one hour uses more energy than the toaster uses in 10 minutes.

17. Given: $I = 15$ A

$R = 8\ \Omega$

$t = 2h = 2 \times 60 \times 60$ s

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

$= (15)^2 \times 8 \times 2 \times 60 \times 60$ J

Rate at which heat is developed or Power

$$= \frac{\text{Heat developed}}{\text{Time taken}}$$

$$= \frac{15 \times 15 \times 8 \times 2 \times 60 \times 60}{2 \times 60 \times 60}$$

$= 1800$ W.

18. (i) Pure tungsten has a high resistivity and a high melting point (nearly 3000°C). When some electric current is passed through the filament, the electric energy gets converted into heat and light energy due to the heating of the filament. However, due to the high melting point of tungsten, the filament does not melt.

(ii) The resistivity of an alloy is generally higher than that of its constituent metals. Alloys do not oxidise readily at higher temperatures. Therefore, the conductors of electric heating devices, such as toasters and electric irons, are made of an alloy rather than pure metal.

(iii) The series arrangement is not used for domestic circuits because:

(a) when connected in series total resistances will increase. Therefore, current through the circuit will be low.

(b) in case one appliance is switched off or gets damaged then all other appliances will also stop working because their main electricity supply will be cut off.

(iv) The resistance of a wire is inversely proportional to its cross-sectional area. Therefore, a thick wire has less resistance and a thin wire has more resistance.

(v) Copper and aluminium wires are usually employed for electricity transmission because both the metals have very low resistivities.

TEST YOURSELF

1. How is an ammeter connected in a circuit?
2. How is a voltmeter connected in a circuit?
3. What do you mean by specific resistance? Give its SI unit.
4. How are number of resistances connected to increase resistance?
5. How are resistances connected to decrease the resultant resistance?
6. How are resistances connected to decrease the resultant resistance?
7. Give conditions of Ohm's law to hold good.
8. What do you mean by resistance of a conductor?
9. Define ohm's law. What is an electric current?
10. What do you mean by electric current?
11. Is potential a scalar or a vector quantity?
12. What do you mean by electric potential difference?
13. With which quantity can potential be compared in heat?
14. What do you mean by electric potential of a body?
15. Is there any difference between kilowatt and kilowatt hour?
16. How many Joules are there in 1 kWh of energy?
17. What is the unit of electric power?
18. Define electric power.
19. Why is negligible heat produced in connected wires of Cu?
20. How does the amount of heat produced in a resistor depend upon current?
21. How is an ammeter connected in a circuit and why?
22. How is a voltmeter connected in a circuit and why?
23. What type of filament is used in electric bulb?
24. Why constant and mangenin are used for making standard resistance coils?
25. Why does the resistance of a conductor increase with temperature?
26. Define the resistance of a conductor and give its cause.
27. What is the difference between electron current and conventional current?
28. State law of resistance "in series" and "in parallel". How will you connect various resistances to increase and decrease it?
29. Why is heat produced in a resistor when current is passed through it? Derive expression for heat produced in a conductor carrying current. Give its uses.
30. Define electric energy, electric power and write their SI units and commercial units.
31. Calculate the resistance of 1 metre of copper wire that has a cross-sectional area of 2 cm^2, when the value of resistivity of copper, $\rho = 1.6 \times 10^8$ Ωm.
32. A copper wire is pulled so that its length increases by 10%. Find the new resistance in terms of original resistance.
33. Aluminium wire of resistance R is folded into three equal parts. Find the resistance between its new ends.
34. A battery of 6 V is connected in series with three resistors 2 Ω, 4 Ω and 6 Ω. Calculate the current passing through each resistor and potential difference across each resistor. Draw the circuit diagram.
35. The value of current I flowing in a given resistor for the corresponding values of potential difference V across the resistor are given below:

I (amperes)	0.2 A	0.3 A	0.4 A	0.5 A	0.6 A
V volts	2.5 A	3.5 A	5.0 A	6.0 A	7 V

Plot a graph between V and I and calculate the resistance of the resistor.

36. Find the amount of current flowing through a heater connected to 220 V electric supply. The resistance of heater coil is 40 Ω, when it is switched on.
37. How many electrons pass through a conductor in 0.2 sec if the current passing through it is 0.5 A?

38. Find the effective resistance between the points P and Q of the circuit shown in Fig. 8.9.

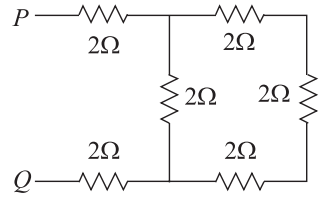


Fig. 8.9

39. Three resistors having resistances of 5 Ω, 10 Ω and 30 Ω respectively are connected in parallel. A 12 V battery with a key is connected across the above combination. Calculate: (a) total circuit resistance (b) total current in the circuit and (c) current through each resistor. Draw circuit diagram.
40. What is the equivalent resistance between the terminals P and Q in the following Fig. 8.10?

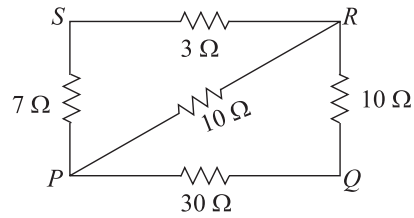
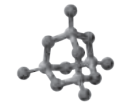


Fig. 8.10

41. An electric heater is rated at 1500 W. Calculate the heat produced per hour.
42. A house wiring supplied with a 220 V supply line is protected by a fuse of 9 A. Find the maximum number of bulbs (60 W each) connected in parallel that can be turned on.
43. Three lamps 100 W, 60 W and 40 W respectively are connected in parallel to a power supply of 220 V. Calculate (a) total energy consumed (b) total resistance of arrangement (c) cost of keeping them lighted for 6 hours daily for 30 days, if cost of electricity per unit is ₹ 2.80.
44. Calculate the energy consumed when a current of 5A flows through a resistor of 2 ohm for 30 minutes.
45. An electric iron of resistance 750 Ω is connected across a mains supply of 250 V. Commute the current through the element and the amount of heat produced in joule in 10 minutes.



MAGNETIC EFFECTS OF ELECTRIC CURRENT

Read questions 1 to 3 and write true or false:

1. (i) Like magnetic poles attract each other; unlike poles repel.
   (ii) If you strike a sharp edge of a metallic knife against the north pole of a bar magnet, it will induce a north pole.
   (iii) The magnetic field produced by a current in a straight wire has no poles.
   (iv) An electric generator is a device that converts electric energy into mechanical energy.
2. The phenomenon of electromagnetic induction is:
   (i) the process of charging a body.
   (ii) the process of generating magnetic field due to a current passing through the coil.
   (iii) producing induced current in a coil by the relative motion between the magnet and coil.
   (iv) the process of rotating the coil of an electric motor.
3. The device used for producing current is called a:
   (i) generator
   (ii) voltmeter
   (iii) ammeter
   (iv) galvanometer
4. What are magnetic field lines? How is the direction of a magnetic field at a point determined? Mention two important properties of magnetic field lines.
5. Draw a rough sketch of pattern of field lines due to:
   (a) current flowing into a circular coil.
   (b) solenoid carrying current.

6. State the rule to determine the direction of a:
   (i) magnetic field around a current carrying conductor.
   (ii) force experienced by a straight conductor carrying current placed in a magnetic field, which is perpendicular to it.
   (iii) Current induced in a circuit by changing magnetic flux due to the motion of a magnet.
7. On what factors does the force experienced by a current carrying conductor placed in a uniform magnetic field depends?
8. A coil of copper wire is connected to a galvanometer. What would happen, is a bar magnet is
   (a) pushed into the coil with its north pole entering first
   (b) pull out of the coil?
   (c) held stationary inside the coil?
9. What is the function of an earth wire? Why is it necessary to earth the metallic appliances?
10. Explain what is short circuit and overloading in an electric supply.
11. Describe an experiment to illustrate the action of an electric fuse.
12. Consider a circular loop of wire in the plane of a table. Let the current pass through the loop clockwise. Apply the right hand thumb rule to find out the direction of magnetic field inside and outside the loop.
13. Apply the Fleming's right hand rule to find the direction of momentary current flowing in the aluminium rod (shown in Fig. 8.11) when the aluminium rod is quickly released to penetrate the magnetic field of a horse-shoe magnet.

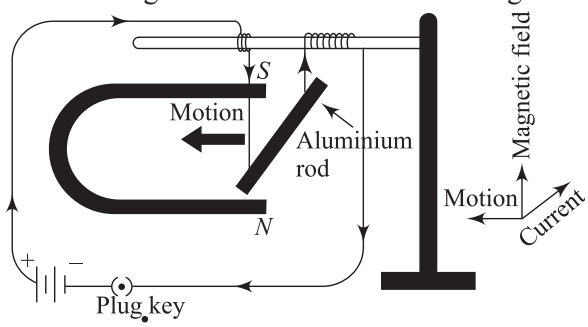


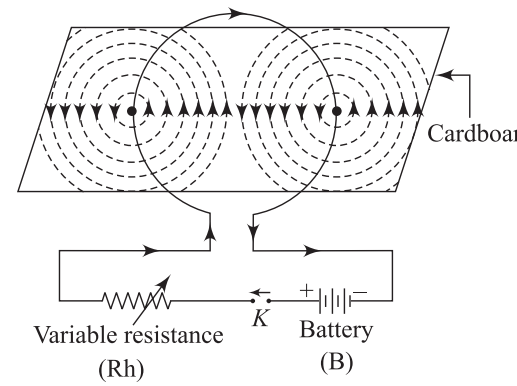
Fig. 8.11

Answers

1. (i) False (ii) False (iii) True (iv) False
2. (i) False (ii) False (iii) True (iv) False
3. (i) True (ii) False (iii) False (iv) False
4. It refers to the path along which the north pole of a magnet will move if free to do so in a magnetic field. The direction of magnetic field line is determined by a tracing compass. The direction in which the north pole of the tracing needle points, will give the direction of magnetic field line.

   The magnetic field line (i) originate from the north pole and end on the south pole, and (ii) do not intersect each other.

5. (i)



(ii)

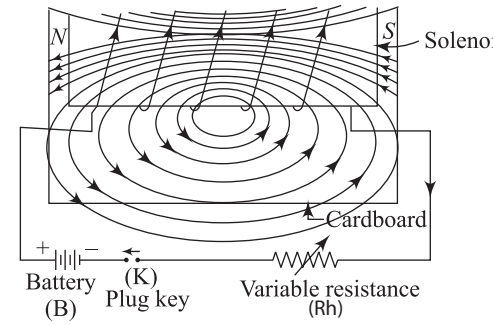


Fig. 8.12

6. (i) Right hand palm rule or right hand thumb rule

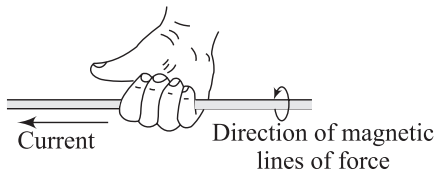


Fig. 8.13

(ii) Fleming's left hand rule

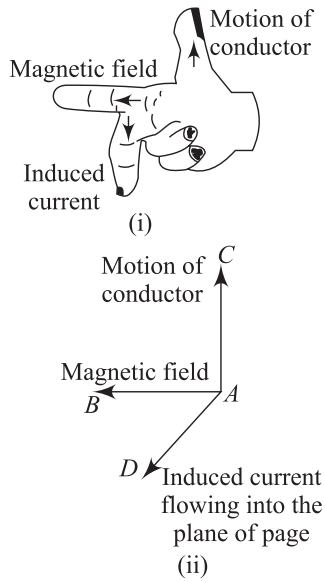


Fig. 8.14

(iii) Fleming's right hand rule

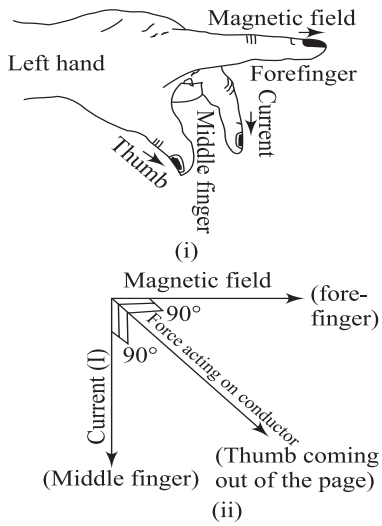


Fig. 8.15

7. (i) The force experienced by the conductor is directly proportional to the magnitude of current flowing through it.
   (ii) The force experienced by the conductor is directly proportional to the strength of uniform magnetic field.
   (iii) The force experienced by the conductor is directly proportional to the length of the conductor.
8. (i) The galvanometer needle suddenly jerks to one side, say towards left and then comes back to the central zero position.
   (ii) The galvanometer needle jerks in the direction opposite to the direction in (i) and then quickly comes back to the central zero position.
   (iii) The galvanometer needle does not show any deflection.
9. It provides a low resistance conducting path for the current.

   If the current leaks into the metallic body of an electric appliance, it will flow down to the earth. Thus, the electric appliance gets short circuited and the fuse wire in the circuit melts. This completely stops the supply of electric energy to the electric appliance. It is most essential to earth the metallic appliances, otherwise the user will get a severe electric shock, which might prove fatal.
10. Short circuiting refers to the sudden flow of very large current due to direct contact of live wire with the neutral wire.

    When more current flows in a circuit than it is designed for the circuit, the circuit is said to be overloaded. In an overloaded circuit, the insulation of connecting wires can melt, which would cause short circuiting and electric fire.
11. Connect a 4V bulb (B) through a thin fuse wire (F) to a 4 V battery and a plug key (k_1). Connect another plug key (k_2) to the terminals of the bulb and remove the plug of key k_2.

    Now insert the plug of key k_1. You will find that the bulb glows very brightly. Next insert the plug of key k_2. You notice that

the bulb goes off as the fuse wire melts. It happens because insertion of the plug of key k_2 results in short circuiting of the circuit which increases the current in the circuit and melts the fuse wire. This in turn stops the flow of current in the circuit.

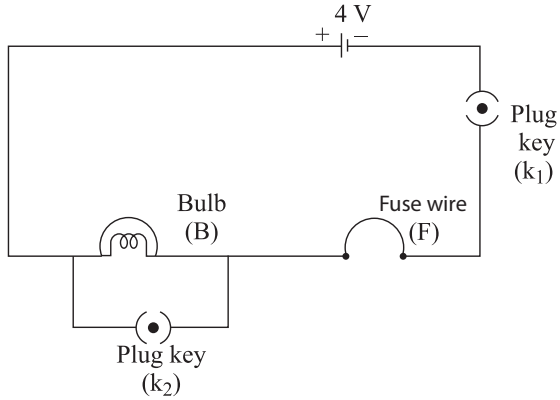


Fig. 8.16

12. Figure 8.17 shows the direction of magnetic field inside and outside the coil.

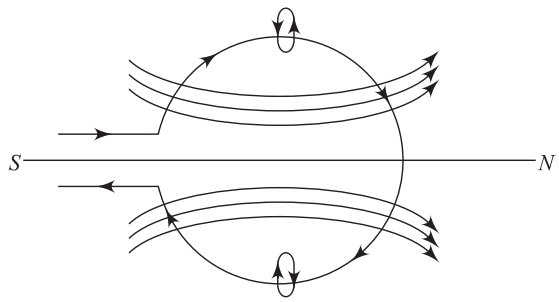


Fig. 8.17

13. The induced current flows from *P* to *Q* (using Fleming's right hand rule) as the aluminium rod moves into the magnetic field of the horse-shoe magnet.

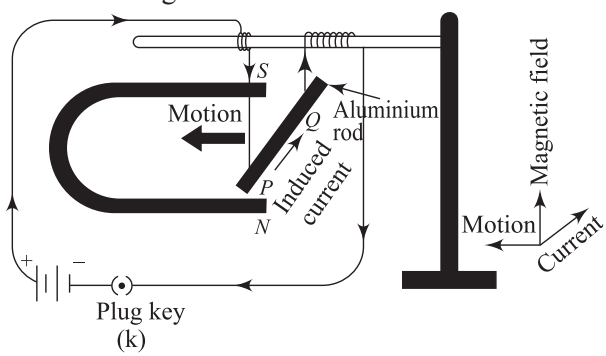
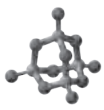


Fig. 8.18

TEST YOURSELF

1. At what angle do magnetic lines of force lie w.r.t. a bar magnet?
2. In which direction does magnetic field at a point acts?
3. What do you mean by magnetic lines of force?
4. Why is strength of attraction maximum at ends and minimum at the centre of a bar magnet?
5. What do you mean by electromagnetism?
6. What type of magnetic lines of force exist around a straight conductor carrying current?
7. Define right hand thumb rule to find the direction of magnetic lines of force due to a straight conductor carrying current.
8. What type of magnetic lines of force exist (i) at the centre (ii) inside and (iii) outside the circular coil carrying current.
9. At what frequency is AC used in India?
10. Why is earth wire used?
11. What do you mean by overloading of a circuit?
12. What do you mean by a fuse?
13. Which material is preferred for fuse wire and why?
14. If a person comes in contact with power line, how would you save him?
15. What is the difference between DC and AC?
16. Give two advantages of AC and DC.
17. Name the device which converts mechanical energy into electrical energy.
18. On which factors does the strength of induced current in a coil depends?
19. What do you mean by electromagnetic induction?
20. What is an electric motor?
21. Which rules gives the direction of force on a current carrying wire placed in a magnetic field?
22. What type of material is suitable for permanent magnets?

23. What is an electromagnet?
24. On what factors does magnetic field of a current carrying straight conductor depends?
25. On what factors does magnetic field of a current carrying circular conductor depends?
26. Sketch the magnetic field lines in and around a solenoid carrying current and give factors on which its magnetic field depends.
27. Sketch the magnetic lines around a straight conductor carrying current and give a rule to find the direction of magnetic lines of force.
28. Current is flowing anticlockwise in a circular coil lying in the plane of a table. Explain the rule and find the direction of magnetic field inside and outside the coil.
29. Why can't two magnetic lines of force ever cross each other?
30. Does Lenz's law violate the law of conservation of energy?
31. What is the cause of induced e.m.f. in a circuit?
32. What is the principle of a DC motor?
33. Why does a freely suspended magnet always point N–S direction?
34. What is short-circuiting and overloading in electric circuits?
35. On which factors does magnetic force on a current carrying conductor, placed inside a magnetic field, depend? How is it used in the working of a DC motor?
36. Explain Oersted experiment and give rules to find direction of magnetic field near a straight conductor carrying current. Give nature of magnetic field in and around a circular coil carrying current.



SOURCES OF ENERGY

1. A solar water heater cannot be used to get hot water on:
   (a) a sunny day (b) a cloudy day
   (c) a hot day (d) a windy day
2. Which of the following is not an example of bio-mass energy source?
   (a) wood (b) gobar gas
   (c) nuclear energy (d) coal
3. Most of the sources of energy we use represent stored solar energy. Which of the following is not ultimately derived from the Sun's energy?
   (a) Geothermal energy
   (b) Wind energy
   (c) Fossil fuel
   (d) Biomass
4. Compare and contrast fossil fuels and the Sun as direct sources of energy.
5. Compare and contrast bio-mass and hydro-electricity as sources of energy.
6. What are the limitations of extracting energy from:
   (i) the wind? (ii) waves? (iii) tides?
7. On what basis would you classify energy sources as:
   (i) renewable and non-renewable?
   (ii) exhaustible and inexhaustible?
   Are the options given in (i) and (ii) the same?
8. What are the qualities of an ideal source of energy?
9. What are the advantages and disadvantages of using a solar cooker? Are there places where solar cookers would have limited utility?
10. What are the environmental consequences of the increasing demand for energy? What steps would you suggest to reduce energy consumption?

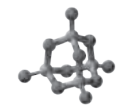
Answers

1. (b)
2. (c)
3. (a)
4. (i) Fossil fuels cause pollution on burning whereas solar energy causes no pollution.
   (ii) Fossil fuels can give energy at any required time whereas solar energy is unavailable when the sky is covered with clouds.
   (iii) Fossil fuels can provide limited energy whereas solar energy is always available in abundance.

5. (i) Energy from bio-mass can be obtained by using a 'chulha' or a gobar-gas plant whereas hydro-electricity requires construction of dams on rivers.
   (ii) Bio-mass is a renewable source of energy only if we plant trees in a systematic manner which is not so in case of hydro- electricity.
   (iii) Bio-mass gives pollution-free energy only when converted into biogas whereas hydro-electricity is fully pollution-free.
6. (i) It requires very large area of land and is not available at all times. Also, it is not possible to have a wind mill everywhere because the minimum wind speed required is 15 km/s.
   (ii) Wave energy is possible only where waves are sufficiently strong. Moreover, the devices required to trap wave energy are very costly.
   (iii) The rise and fall of tides happens only twice in a day and it is not possible to generate electricity continuously. Moreover, there are very few sea coasts in the world which are suitable for the purpose of harnessing tidal energy.
7. Renewable sources of energy are inexhaustible whereas non-renewable sources of energy are exhaustible. So, the options in (i) and (ii) are the same.
8. An ideal source of energy has the following qualities:
   (i) It should give more heat per unit mass.
   (ii) It should be cheap and easily available.
   (iii) It should not cause air pollution.
   (iv) It should be safe to transport and easy to handle.
9. The solar cookers have limited utility at places which remain cloudy
   (i) *Advantages of using solar cookers*: The solar cookers can cook food without causing any air pollution. The use of solar cookers is very economical. Moreover, the handling of solar cookers is very easy and safe. While using a solar cooker, the food hardly loses its nutrients.
   (ii) *Disadvantages of using solar cookers*: The solar cookers cannot be used during cloudy days and at night. While using solar cookers more time is needed to cook food. The direction of solar cookers has to be continuously kept towards the sun. Moreover, solar energy is not available uniformly all the time and at all the places.
10. (i) Construction of dams on rivers to produce hydro electricity destroys large ecosystem which are eventually submerged under water in the dams. Also, large amount of methane is also produced.
    (ii) Burning of fossil fuels causes air pollution.

Steps needed to reduce energy consumption:

(i) We should preferably use fuel saving devices such as pressure cookers etc.
(ii) Fossil fuels should be used with lot of care and caution to extract maximum benefit from them.
(iii) Energy sources should be periodically serviced and maintained to ensure their optimum efficiency.
(iv) We should be economical in energy consumption as energy saved is energy produced.



TEST YOURSELF

1. What is a good source of energy?
2. If you could use any source of energy for heating your food, which one would you use and why?
3. Is biogas a good fuel?
4. What percentage of methane does a Biogas contain?
5. Which country is called the country of winds?
6. Which country ranks first in the world in harnessing wind energy for the production of electricity?

7. Where is the largest wind energy farm established in India?
8. Which motion of the windmill is used to turn the turbine of the electric generator?
9. What is wind energy farm?
10. Why are we looking at alternate sources of energy?
11. How has the traditional use of wind and water energy been modified for our convenience?
12. The energy potential from the sea (tidal energy, wave energy and ocean thermal energy) is quite large, but efficient commercial exploitation is difficult. Comment on this statement.
13. Is wave energy same as ocean thermal energy?
14. What is geothermal energy? What are 'hot spots'?
15. Can any source of energy be pollution-free?
16. Hydrogen has been used as a rocket fuel. Would you consider it a cleaner fuel than CNG?
17. Name two energy sources that you would consider to be renewable. Give reasons for your choices.
18. Give the names of two energy sources that you would consider to be exhaustible. Give reasons for your choices.
19. What are the advantages of nuclear energy?
20. What kind of mirror—concave, convex or plain would be best suited for use in a solar cooker? Why?
21. What is the major hazard of nuclear power generation?
22. What are the limitations of the energy that can be obtained from the oceans?
23. Is tidal energy same as wave energy?
24. What is the main advantage of getting energy from a solar cell?
25. What are the disadvantages of using a solar cooker? Are there places where solar cookers would have limited utility?