

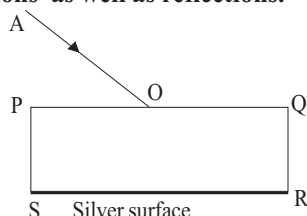
CHAPTER - 10

**LIGHT - REFLECTION AND REFRACTION**

1. The face of a person is 24 cm long and 20 cm wide. What is the minimum size of the mirror required to see the full face?

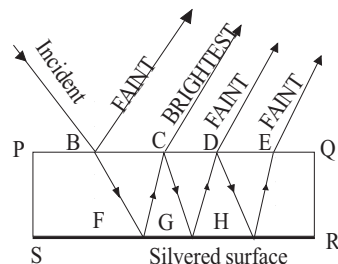
The size of the mirror required to see full face should be half the size of the face. Hence mirror should be  $24/2 = 12$  cm long and  $20/2 = 10$  cm wide. The mirror should be placed with longer side vertical and eyes kept at proper height.

2. In the figure, a ray of light AO is incident on a glass black silvered on one surface. The ray suffers refractions as well as reflections.

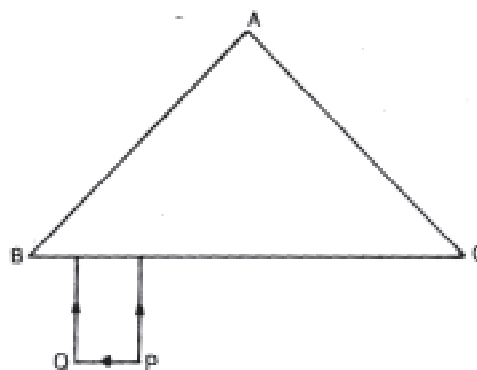


- (i) Copy the diagram and trace out the path of refracted and reflected ray. Show at least 2 rays emerging out from surface PQ.
- (ii) How many images are formed in the above case? Which image is the brightest?

This is a case of both refraction as well as reflection. The ray suffers a number of reflections and refractions at B, C, D, E and also reflection at SR. First image formed due to reflection only at B will be faint. A major portion of light at B is refracted striking SR at F. It gets reflected from here and strikes PQ at C. Major portion refracts and forming the brightest image shown in figure. Small portion of light is reflected towards CG. The process continues forming a large number of faint images. Theoretically there will be infinite images but practically, we shall have one faint image before the brightest image and 3-4 on the other side of brightest image. Remaining will be too faint to be visible.

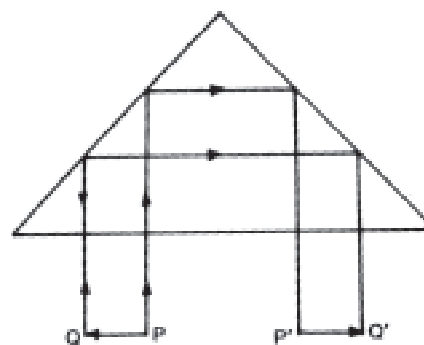


3. Diagram shows a right angled prism of refractive index 1.5. An object PQ is placed in front of its base BC. Copy the diagram.



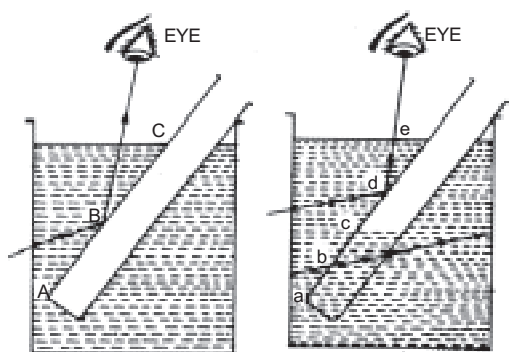
- (i) Complete the diagram showing the image produced by the prism.
- (ii) Name the instrument in which such a prism is used.

The complete diagram is given below. Such a prism is used in prism binoculars and periscopes. Image gets inverted.



4. An empty test tube is placed slanting in water and viewed from above, what will you observe? What difference will it make when the tube is partially filled with water?

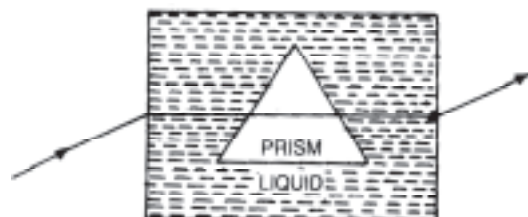
Portion of tube within water will appear to be silvery (like a mirror) due to total internal reflection. If the tube is partially filled with water only portion **ce** will appear silvery. The lower portion **ad** will not be silvery since total internal reflection takes only if there is an optically rarer medium also.



(a) empty tube  
Empty tube appears silvery when placed in water and seen from top.

(b) partially filled tube  
When partially filled tube is put only water upper portion appears silvery.

5. A glass prism is kept immersed in a liquid as shown in figure. A ray of light passes through the prism undeviated, what do you infer about the refractive index of the liquid as compared to that of glass?



The ray goes undeviated through the prism without any refraction. This is possible only if the refractive index of the liquid is the same as that of glass.

6. Refractive index of media A, B, C and D are

A	1.33
B	1.52
C	1.44
D	1.65

In which of the four media is the speed of light (i) maximum (ii) minimum.?

- (i) The speed of light is maximum in the medium A.
- (ii) The speed of light is minimum in the medium D.

### CHAPTER - 11

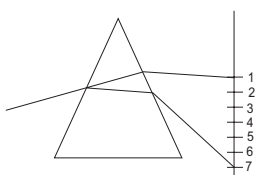
## HUMAN EYE AND COLOURFUL WORLD

1. Why stars are twinkling, while the planets do not?

Different layers of atmosphere have different refractive indices. Even in a particular layer refractive index varies periodically due to atmospheric winds. These variations of atmospheric refraction are the causes of twinkling. In the case of stars these variations are seen because they are at large distance from the earth and hence their angular size is very small. Planets are near to the earth and their angular size is much larger. Hence variations of atmospheric refraction are not observable.

2. A beam of white light falling on a glass prism gets split up into seven colours marked 1 to 7 as shown in the diagram.

A student observed the spectrum on the screen and make the following statements about it.



a) The colours at positions marked 3 and 5 are similar to the colour of the sky and to the core of a hard boiled egg

respectively.

Is the above statement made by the student correct or incorrect? Justify.

b) Which two positions correspond closely to the colour of

- (i) a solution of potassium permanganate?
- (ii) 'danger' or stop signal lights?

(a) The statement made by the student is incorrect. The white light splits into seven colours when passed through the prism and the colours at positions marked 3 and 5 are yellow and blue respectively which is just opposite to the given statement.

(b) (i) The position 7 corresponds to a solution of potassium permanganate.

(ii) The position 1 corresponds to danger or stop signal lights.

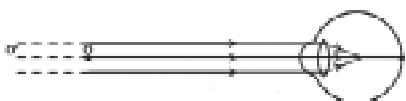
3. A student finds the writing on the blackboard as blurred and unclear when sitting on the last desk in the classroom. He however, sees it clearly when sitting on the front desk at an approximate distance of 2m from the blackboard.

Draw ray diagrams to illustrate the formation of

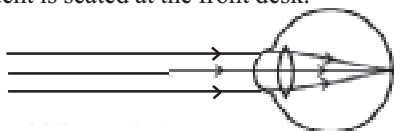
## HOTS (Higher Order Thinking skills)

image of the blackboard writing by his eye-lens when he is seated at the (i) last desk (ii) front desk. Name the kind of lens that would help him to see clearly even when he is seated at the last desk. Draw a ray diagram to illustrate how this lens helps him to see clearly.

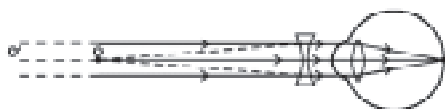
(i) Formation of image of the black board writing when the student is seated at the last desk.



(ii) Formation of image of the black board writing when the student is seated at the front desk.



A concave lens of suitable power would help him to see clearly even when he is seated at the last desk.



4. Give reasons for the following:

(i) The sky appears to be blue during day time to

a person on earth.

(ii) The sky near the horizon appears to have a reddish hue at the time of sunset and sunrise.

(iii) The sky appears dark instead of blue to an astronaut.

(i) When sunlight passes through the atmospheric air, it is scattered by the suspended particles and molecules of air. The colour having shorter wavelength gets scattered the most. Scattering takes place in all directions and a portion of the scattered light reaches our eyes from all parts of the sky. The combined effect of the scattered colours is blue. Hence the sky appears blue.

(ii) Light from the sun near the horizon passes through thicker layers of air and larger distance in the earth's atmosphere before reaching our eyes. During sunrise, most of the blue light and shorter wavelengths are scattered away by the particles. Therefore, the light that reaches our eye is of longer wavelengths. This gives rise to the reddish appearance of the sun.

(iii) There is no atmosphere at such heights and so scattering is not prominent. Then, the sky seems to be dark for an astronaut.

## CHAPTER - 12

# ELECTRICITY

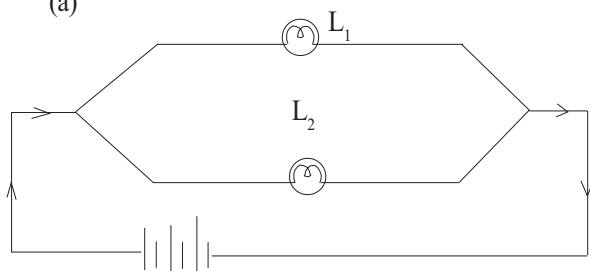
1. Two lamps, one rated 40 W at 220 V and the other 60 W at 220 V, are connected in parallel to the electric supply at 220 V.

(a) Draw a circuit diagram to show the connections.

(b) Calculate the current drawn from the electric supply.

(c) Calculate the total energy consumed by the two lamps together when they operate for one hour.

(a)



$$\begin{aligned} \text{(b) } P &= VI \\ \text{watt} &= \text{volt} \times \text{ampere} \\ 40 \text{ W} &= 220 I_1 \end{aligned} \quad \left| \begin{array}{l} P = 40 \text{ W} \\ V = 220 \text{ V} \\ I = ? \end{array} \right.$$

$$I_1 = \frac{40}{220} = 0.1818 \text{ A through } 40 \text{ W lamp.}$$

$$I_2 = \frac{60}{220} = 0.273 \text{ A through } 60 \text{ W lamp}$$

$$\text{Total current } I = I_1 + I_2 = 0.1818 + 0.273 = 0.4548 \text{ A}$$

(c) Energy consumed by 40 W bulb

$$= \frac{\text{Wattage of bulb} \times \text{hours}}{1000}$$

$$= \frac{40 \times 1 \text{ hour}}{1000} = 0.04 \text{ kWh}$$

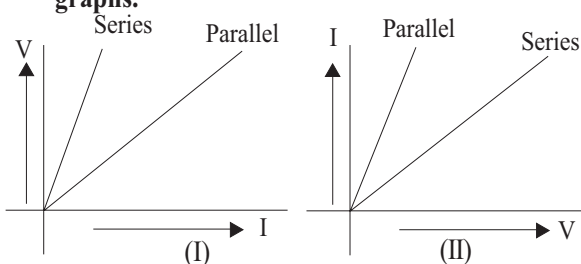
## Physics

Energy consumed by 60 W bulb

$$= \frac{60 \times 1 \text{ hour}}{1000} = 0.06 \text{ kWh}$$

Total energy consumed =  $0.04 + 0.06 = 0.1 \text{ kWh}$ .

2. Two students perform the experiments on series and parallel combinations of two given resistors  $R_1$  and  $R_2$  and plot the following V-I graphs.



Which of the graphs is (are) correctly labelled in terms of the words 'series' and 'parallel'. Justify your answer.

Graph (II) is correctly labelled because

- (i) The voltage can be varied directly and corresponding variation in current can be plotted.
  - (ii) When resistors are connected in parallel the effective resistance decreases and current increases as shown in graph (II).
3. A student performs an experiment to study the magnetic effect of current around a current carrying straight conductor. He reports that
- (i) the direction of deflection of the north pole of a compass needle kept at a given point near the conductor remains unaffected even when the terminals of the battery sending current in the wire are interchanged.
  - (ii) for a given battery, the degree of deflection of a N-pole decreases when the compass is kept at a point farther away from the conductor.

Which of the above observations of the student is incorrect and why?

The observation (i) is incorrect. When the terminals of the battery sending current in the circuit are interchanged, the direction of current changes and as a result the compass needle will be deflected in the opposite direction.

4. A bird sitting on 11,000V wire not hurt while a person touching 220V wire dies. Why?

Death is caused not due to potential but due to flow

of current through the body. The current through a body flows due to potential difference and not due to potential. When a bird is sitting on 11,000 V cable, whole of its body is at 11,000 V. No current flows through it, since there is no potential difference. When a man standing on earth at (0V) touches a line wire at 220V, the current flows due to potential difference between line wire (220V) and his body (0V).

5. In a household electric circuit different appliances are connected in parallel to one another. Give two reasons. An electrician puts a fuse of rating 5A in that part of domestic electrical circuit in which an electrical heater of rating 1.5kW, 220V is operating. What is likely to happen in this case and why? What change, if any, needs to be made?

In a household electric circuit different appliances are connected in parallel because,

- (i) In parallel connection if one of the appliances is switched off or gets fused, there is no effect on the other appliances and they keep on operating.
- (ii) The same voltage of the mains line is available for all the electrical appliances.

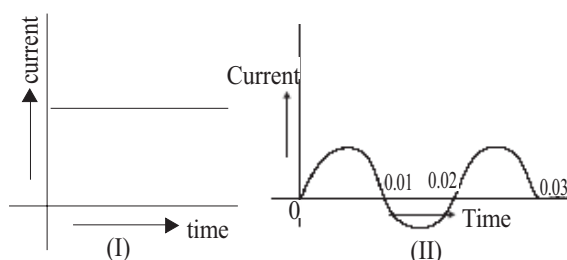
$$\text{Power} = 1.5 \text{ kW} = 1.5 \times 1000 \text{ W} = 1500 \text{ W}$$

$$V = 220 \text{ V} \quad \text{Current drawn } I = ?$$

$$P = V \times I \quad \therefore I = \frac{P}{V} = \frac{1500}{220} = 6.8 \text{ A}$$

ie, the current drawn by the electric heater is 6.8 amperes which is very high. But the fuse in this circuit is only of 5 ampere capacity. So when a high current of 6.8 A flows through the 5A fuse, the fuse wire will get heated too much, melt and break the circuit, cutting of the power supply. So the fuse of 5A is to be replaced with a rating more than 7A.

6. You are given following current-time graphs from two different sources:



## HOTS (Higher Order Thinking skills)

- (i) Name the type of current in two cases.  
 (ii) Identify any one source for each type of these currents.  
 (iii) What is the frequency of current in case II in India?  
 (iv) Use above graphs to write two difference between the current in two cases.

- (i) In case I it is direct current  
 In case II it is alternating current  
 (ii) Alternating current - AC generator  
 Direct current - DC generator  
 (iii) The frequency of current in case II in India is 50 Hz.  
 (iv) Two differences between AC and DC:  
 (i) Direct current always flows in one direction. An alternating current flows periodically in alternate directions in the circuit.

- (ii) A direct current has a constant value where as the value of alternating current varies from instant to instant.

**7. Tap water conducts electricity whereas distilled water does not. Why?**

Tap water conducts electricity due to the presence of ions in it. But distilled water which is ion free does not conduct electricity.

**8. An electric geyser has the ratings 2000W, 220V marked on it. What should be the minimum rating, in whole number of a fuse wire, that may be required for safe use with this geyser?**

$$\text{Power } P = 2000 \text{ W, } V = 220 \text{ V}$$

$$\text{Current drawn } I = ?$$

$$P = VI \quad I = P/V = 9 \text{ A}$$

Minimum rating of required fuse wire is 9 A

**9. The electric power consumed by a device may be calculated by using either of the two expressions  $P = I^2R$  or  $P = \frac{V^2}{R}$ . The first expression indicates that it is directly proportional to R whereas the second expression indicates inverse proportionality.**

**How can the seemingly different dependence of P on R in these expressions be explained?**

**b) Explain the following:**

**(i) Why is tungsten used almost exclusively for filament of electric lamps?**

**(ii) Why are copper and aluminium wires usually used for electricity transmission?**

When the resistors are connected in series, the current is constant and then power is directly proportional to the resistance R ie  $P = I^2R$ . But when resistors are connected in parallel, voltage remains constant and power is inversely proportional to R

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

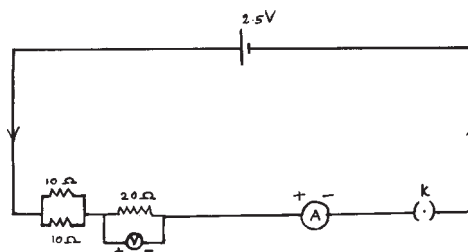
- (b) (i) Tungsten is used almost exclusively for filament of incandescent lamps because:

- (a) Tungsten is a metal having very high resistance.  
 (b) Its melting point is very high (3410°C).  
 (c) It can be drawn into very thin wires.  
 (d) When current flows through it, it immediately becomes hot and emits light.

- (ii) Copper and aluminium wires have very low resistance. Due to this, very little heat is produced

and power loss is less. ie  $P = \frac{V^2}{R}$ . So they are usually used for electrical transmission lines.

**10. You are given three resistors of 10 Ω, 10 Ω and 20 Ω, a battery of emf 2.5V, a key, an ammeter and a voltmeter. Draw a circuit diagram showing the correct connections of all given components such that the voltmeter gives a reading of 2.0V.**



$$\text{Total resistance} = 20 + 5 = 25 \Omega$$

$$I = \frac{V}{R} = \frac{2.5}{25} = 0.1$$

$$\text{p.d across } 20 \Omega \text{ resistance} = IR = 0.1 \times 20 = 2V$$

## Physics

11. A household uses the following electric appliances:

- Refrigerator of rating 400W for ten hours each day.
- Two electric fans of rating 80W each for twelve hours each day.
- Six electric tubes of rating 18W each for 6 hours each day.

Calculate the electricity bill of the household for the month of June if the cost per unit of electric energy is Rs. 3.00.

Energy consumed by 400 W refrigerator =  $P \times t$

$$= \frac{400 \times 10 \times 30}{1000} = 120 \text{ kWh}$$

Energy consumed by two electric fans of rating 80 W

$$= \frac{2 \times 80 \times 12 \times 30}{1000} = 57.6 \text{ kWh}$$

Energy consumed by six electric tubes of rating 18 W

$$= \frac{6 \times 18 \times 6 \times 30}{1000} = 19.44 \text{ kWh}$$

$$\begin{aligned} \text{Total energy consumed} &= 120 + 57.6 + 19.44 \\ &= 197.04 \text{ kWh} \end{aligned}$$

$\therefore$  Electric bill of the household for the month of June =  $197.04 \times 3 = \text{Rs. } 591$

12. What is the meaning of the term 'frequency' of an alternating current? What is its value in India?

Why is an alternating current considered to be advantageous over direct current for long range transmission of electric energy?

Alternating current changes its direction periodically. The no. of times it changes per second is meant by the term 'frequency'.

In India frequency of AC is 50 Hz. Alternating current is considered to be advantageous over direct current for long range transmission of electric energy because electric power can be transmitted over long distances without much loss of energy.

## CHAPTER - 13

# MAGNETIC EFFECTS OF ELECTRIC CURRENT

1. A student performs an experiment to study the magnetic effect of current around a current carrying straight conductor. He reports that

- the direction of deflection of the north pole of a compass needle kept at a given point near the conductor remains unaffected even when the terminals of the battery sending current in the wire are interchanged.
- for a given battery, the degree of deflection of a N-pole decreases when the compass is kept at a point farther away from the conductor.

Which of the above observations of the student is incorrect and why?

The observation (i) is incorrect. When the terminals of the battery sending current in the circuit are

interchanged, the direction of current changes and as a result the compass needle will be deflected in the opposite direction.

2. Explain the meaning of the word 'electromagnetic' and 'induction' in the term electromagnetic induction. On what factors does the value of induced current produced in a circuit depend? Name and state the rule used for determination of direction of induced current. State one practical application of this phenomenon in everyday life.

The word 'electromagnetic' means that electricity is produced from magnetism. The word 'induction' means there is no physical connection between the magnetic field and the conductor. Thus the production of electricity from magnetism is called electromagnetic induction.

### HOTS (Higher Order Thinking skills)

The magnitude of induced current depends on

- (i) the nature of the core material of the solenoid.
- (ii) the number of turns in the coil
- (iii) strength of the magnet.
- (iv) The speed of rotation of coil .

**Fleming's right hand rule**-Hold the thumb, fore-

finger and the central finger of your right hand at right angles to one another. Adjust your right hand in such a way that the forefinger points in the direction of magnetic field; the thumb in the direction of motion of the conductor, then the direction in which the central finger points, gives the direction of induced current in the conductor.

Application - Electric generator.

## CHAPTER - 14

# SOURCES OF ENERGY

1. **Which way of using cow-dung as fuel for domestic use is better: use of cow-dung cakes or use of cow-dung in a biogas plant? Give three reasons in support of your answer.**

When cow-dung burns, it produces a lot of smoke, which causes air pollution as well as loss of very useful elements. However, the use of cow-dung in biogas plant is better because of the following reasons:

- (i) biogas burns without smoke
  - (ii) biogas produces a large amount of heat.
  - (iii) the residue (slurry) left in the plant is rich in nitrogenous and phosphorus compounds and can be used as manure.
2. **Classify the following as renewable and non-renewable sources of energy.**

Wind energy, biogas, solar energy, firewood, cow-dung cakes, Naphtha, coal, kerosene, LPG, petrol, natural gas, diesel, tidal energy, ocean thermal energy, geothermal theory, biomass.

Renewable sources	Non-Renewable sources
• Wind energy	• Kerosene
• solar energy	• LPG
• firewood	• petrol
• cow-dung cakes	• natural gas
• biogas	• diesel
• tidal energy	• naphtha
• ocean thermal energy	• coal
• biomass	
• geothermal energy	

3. **Find the situations where solar panels are made use of. What are the drawbacks of solar panel? Find out and list them.**

- (i) To light street lamps (ii) To work TV, radio etc. at places where electric power is not available (iii) activate solar lamps taken to sea (iv) to operate traffic signal lights (v) to operate electronic watches and calculators.

#### Drawbacks

- (i) In order to store electric power, a battery is required.
- (ii) There must be an arrangement to convert DC into AC.
- (iii) All these cause great expense. That is the total cost increases.

4. **Hydrogen is a combustible gas. When it burns, it releases a lot of heat. No poisonous gas is produced when it burns. Then why is hydrogen not used as fuel in our daily life?**

Hydrogen, when burns in air, there is the possibility of an explosion. Moreover it is not easy to store hydrogen safely. So hydrogen is not used as a fuel in our day to day life.