Important snaps by Team PIS Class- X

SUBJECT: PHYSICS

BOOKS : SCIENCE NCERT

TEACHER: MR. BHUPENDER

CHAPTER -10: LIGHT – REFLECTION AND REFRACTION

- **Q1. Write the laws of refraction**
- **Ans** *According to laws of refraction of light.*
  (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.* This law is also known as Snell's law of refraction.
  If i is the angle of incidence and r is the angle of refraction, then, $\frac{\sin i}{\sin r} = \text{constant}$. This constant value is called the refractive index of the second medium with respect to the first.

CHAPTER -10: LIGHT – REFLECTION AND REFRACTION CONT.

- **Q2.** Name the type of mirror used in the following situations.
  (a) Headlights of a car.
  (b) Side/rear-view mirror of a vehicle.
  (c) Solar furnace.
  Support your answer with reason.
  Ans:
  (a) Concave (b) Convex (c) Concave
  Explanation:
  (a) Concave mirror is used in the headlights of a car. This is because concave mirrors can produce powerful parallel beam of light when the light source is placed at their principal focus.
  (b) Convex mirror is used in side/rear view mirror of a vehicle. Convex mirrors give a virtual, erect, and diminished image of the objects placed in front of it. Because of this, they have a wide field of view. It enables the driver to see most of the traffic behind him/her.
  (c) Concave mirrors are convergent mirrors. That is why they are used to construct solar furnaces. Concave mirrors converge the light incident on them at a single point known as principal focus. Hence, they can be used to produce a large amount of heat at that point.

CHAPTER -10: LIGHT – REFLECTION AND REFRACTION CONT.

- **Q3** 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.

  Ans:

  The convex lens will form complete image of an object, even if its one half is covered with black paper. It can be understood by the following two cases.

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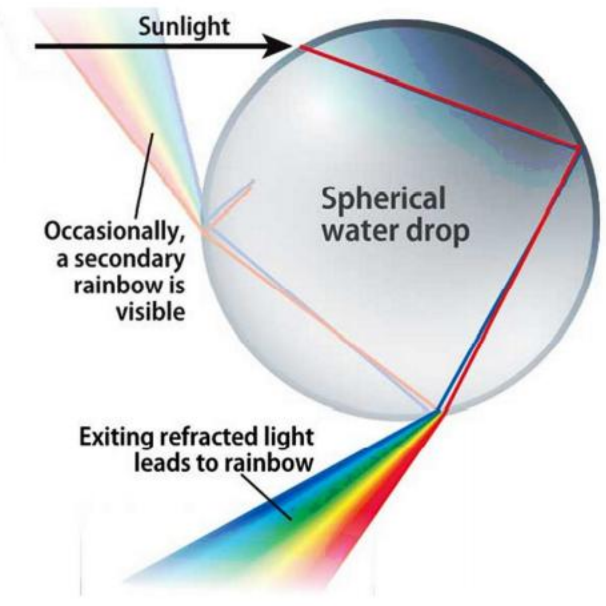
Chapter 11 HUMAN EYE AND COLOURFUL WORLD

- **Q1 Explain how rainbow is formed.**
- **Ans**

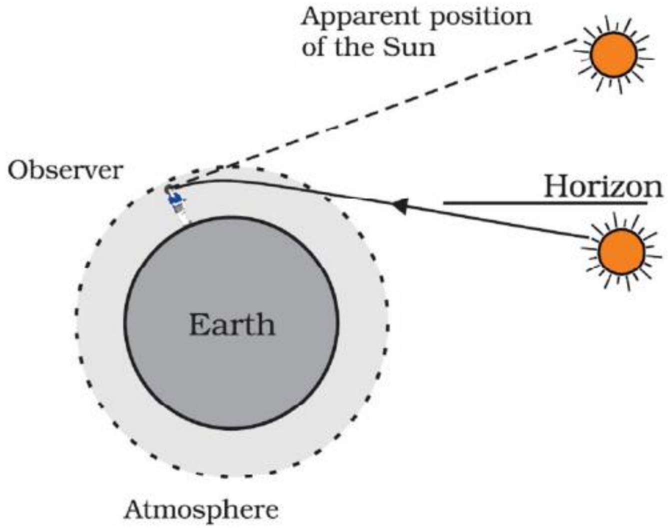
A rainbow is a natural spectrum appearing in the sky after a rain shower. It is caused by dispersion of sunlight by tiny water droplets, present in the atmosphere. A rainbow is always formed in a direction opposite to that of the Sun. The water droplets act like small prisms. They refract and disperse the incident sunlight, then reflect it internally, and finally refract it again when it comes out of the raindrop (see below figure). Due to the dispersion of light and internal reflection, different colours reach the observer's eye.



Chapter 11 HUMAN EYE AND COLOURFUL WORLD CONT.

- **Q2 What do you understand by advance sunrise and delayed sunset?**
- **Ans**

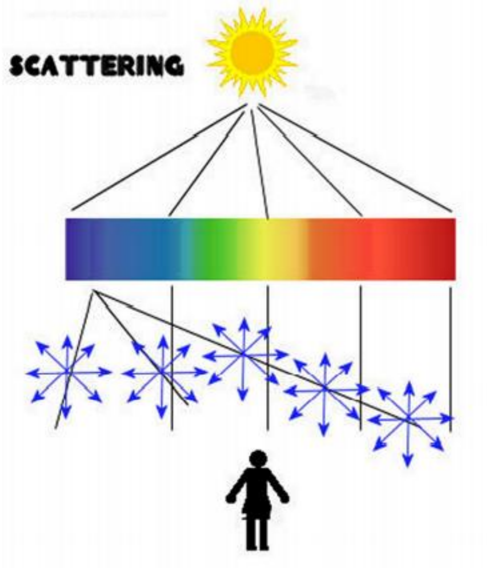
The Sun is visible to us about 2 minutes before the actual sunrise, and about 2 minutes after the actual sunset because of atmospheric refraction. By actual sunrise, we mean the actual crossing of the horizon by the Sun. The below figure shows the actual and apparent positions of the Sun with respect 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.



Chapter 11 HUMAN EYE AND COLOURFUL WORLD CONT.

- **Q3 Why colour of sky appears blue?**
- **Ans**

The molecules of air and other fine particles in the atmosphere have size smaller than the wavelength of visible light. These are more effective in scattering light of shorter wavelengths at the blue end than light of longer wavelengths at the red end. The red light has a wavelength about 1.8 times greater than blue light. Thus, when sunlight passes through the atmosphere, the fine particles in air scatter the blue colour (shorter wavelengths) more strongly than red. The scattered blue light enters our eyes. If the earth had no atmosphere, there would not have been any scattering. Then, the sky would have looked dark. The sky appears dark to passengers flying at very high altitudes, as scattering is not prominent at such heights.



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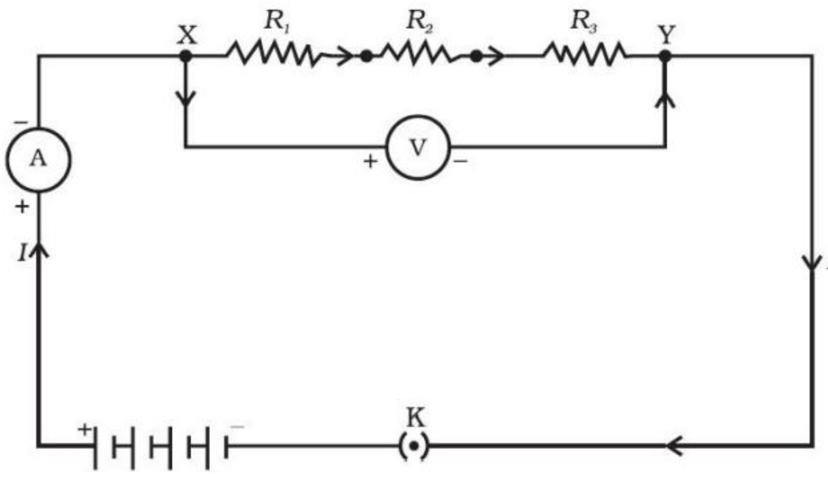
Chapter 12 ELECTRICITY

- **Q1 Derive the formula for equivalent resistance of series and parallel combination of resistors.**
- Ans

In a series circuit
(a) the current I is the same in all parts of the circuit, and
(b) the sum of the voltages V_1, V_2 and V_3 is equal to the total applied voltage, V, i.e.

$$\mathbf{V = V_1 + V_2 + V_3}$$

From Ohm's law:
$V_1 = IR_1$,
$V_2 = IR_2$,
$V_3 = IR_3$
and $V = IR$
where R is the total circuit resistance.
Since $\mathbf{V = V_1 + V_2 + V_3}$
then $IR = IR_1 + IR_2 + IR_3$
Dividing throughout by I gives
$\mathbf{R = R_1 + R_2 + R_3}$
Thus for a series circuit, the total resistance is obtained by adding together the values of the separate resistances.



Chapter 12 ELECTRICITY CONT.

RESISTORS IN PARALLEL

In a parallel circuit:

(a) the sum of the currents I_1, I_2 and I_3 is equal to the total circuit current, I, i.e. $\mathbf{I = I_1 + I_2 + I_3}$, and

(b) the source p.d., V volts, is the same across each of the resistors.

From Ohm's law:

$$I_1 = \frac{V}{R_1}, \quad I_2 = \frac{V}{R_2}, \quad I_3 = \frac{V}{R_3} \quad and \quad I = \frac{V}{R}$$

where R is the total resistance of the circuit.

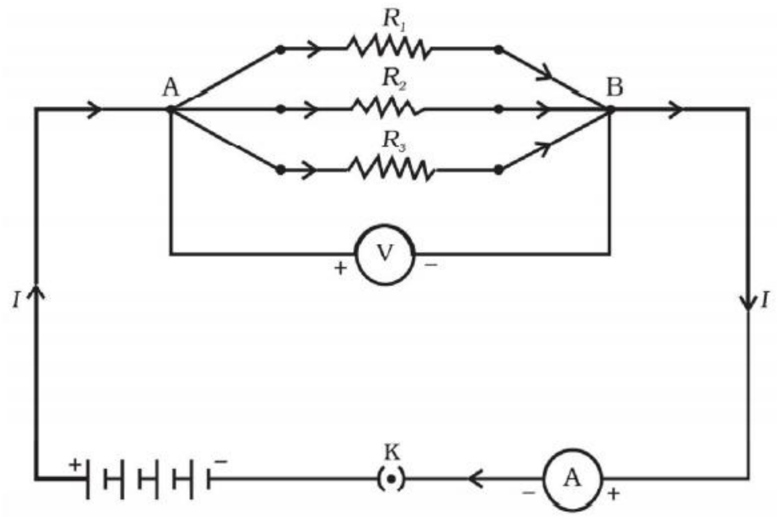
Since $\mathbf{I = I_1 + I_2 + I_3}$

then $\frac{V}{R} = \frac{V}{R_1} + \frac{V}{R_2} + \frac{V}{R_3}$

dividing throughout by V, we get

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

This equation must be used when finding the total resistance R of a parallel circuit. Thus the reciprocal of the equivalent resistance of a group of resistance joined in parallel is equal to the sum of the reciprocals of the individual resistance.



Chapter 12 ELECTRICITY CONT.

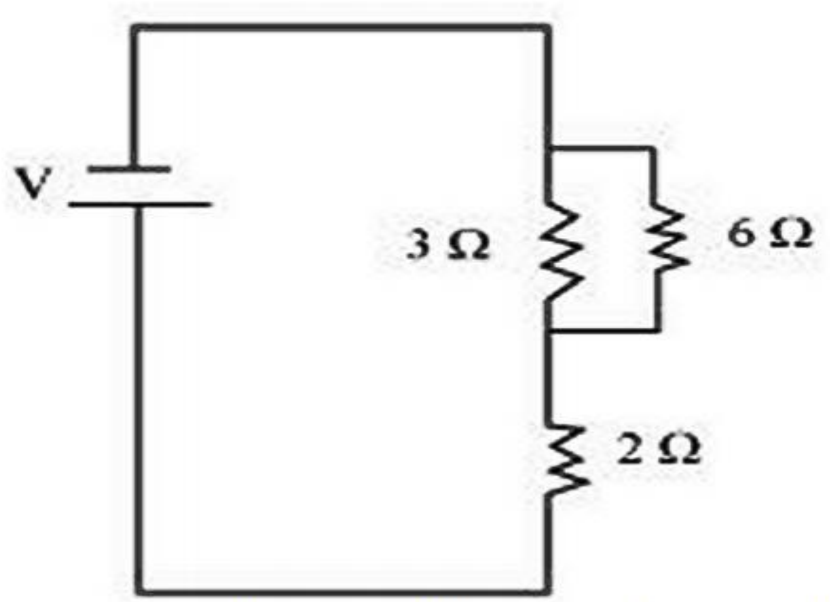
- Q2 **How can three resistors of resistances 2 Ω, 3 Ω and 6 Ω be connected to give a total resistance of (a) 4 Ω, (b) 1 Ω?**

  Ans. There are three resistors of resistances 2 Ω, 3 Ω, and 6 Ω respectively.
  (a) The following circuit diagram shows the connection of the three resistors.
  Here, 6 Ω and 3 Ω resistors are connected in parallel.
  Therefore, their equivalent resistance will be given by

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

  This equivalent resistor of resistance 2 Ω is connected to a 2 Ω resistor in series.
  Therefore, equivalent resistance of the circuit = 2 Ω + 2 Ω = 4 Ω
  Hence, the total resistance of the circuit is 4 Ω
  The following circuit diagram shows the connection of the three resistors.

Chapter 12 ELECTRICITY CONT.



All the resistors are connected in series. Therefore, their equivalent resistance will be given as

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

Therefore, the total resistance of the circuit is 1 Ω

Chapter 12 ELECTRICITY CONT.

- **Q3** The values 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.

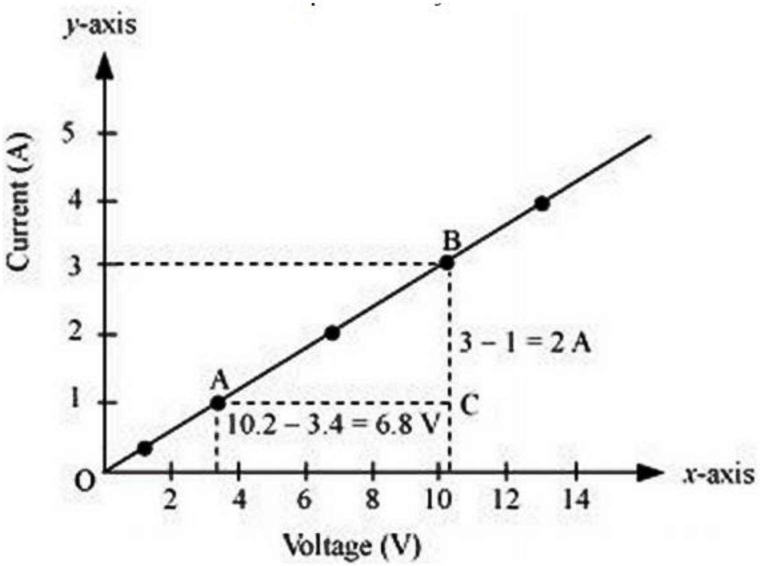
Ans. The plot between voltage and current is called IV characteristic. The voltage is plotted on x-axis and current is plotted on y-axis.

Chapter 12 ELECTRICITY CONT.

The slope of the line gives the value of resistance (R) as,

$$Slope = \frac{1}{R} = \frac{BC}{AC} = \frac{2}{6.8} \Rightarrow R = \frac{6.8}{2} = 3.4\Omega$$

Therefore, the resistance of the resistor is 3.4Ω



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CHAPTER -13 MAGNETIC EFFECT OF CURRENT

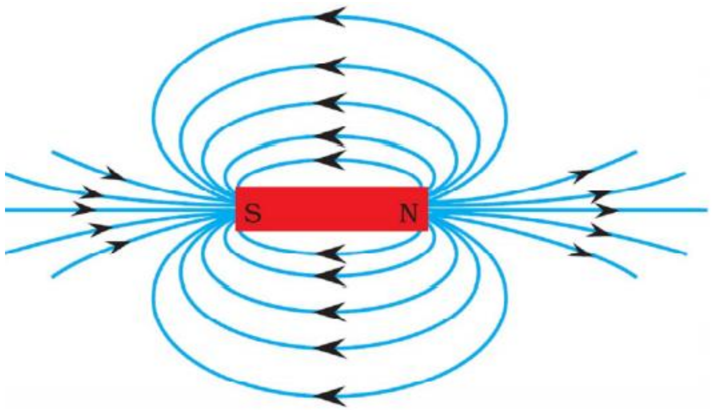
- **Q1 What are magnetic field lines. Write properties of magnetic field lines.**
- Ans

MAGNETIC FIELD LINES

The magnetic field lines are the lines drawn in a magnetic field along which a north magnetic pole would move. These are also known as magnetic lines of forces.

PROPERTIES OF MAGNETIC FIELD LINES

1. A magnetic field lines originate from north pole and end at its south pole.
2. A magnetic field line is a closed and continuous curve.
3. The magnetic field lines are closer near the poles of a magnet where the magnetic field is strong and farther apart where the magnetic field is weak.
4. The magnetic field lines never intersect each other.
5. A uniform magnetic field is represented by parallel and equidistant field lines.



CHAPTER -13 MAGNETIC EFFECT OF CURRENT CONT.

- **Q2** Imagine that you are sitting in a chamber with your back to one wall. An electron beam, moving horizontally from back wall towards the front wall, is deflected by a strong magnetic field to your right side. What is the direction of magnetic field?
  Ans. The direction of magnetic field is given by Fleming's left hand rule. Magnetic field inside the chamber will be perpendicular to the direction of current (opposite to the direction of electron) and direction of deflection/force i.e., either upward or downward. The direction of current is from the front wall to the back wall because negatively charged electrons are moving from back wall to the front wall. The direction of magnetic force is rightward. Hence, using Fleming's left hand rule, it can be concluded that the direction of magnetic field inside the chamber is downward.

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