$7+4+6+5+4 = 26$ M

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— Prelim 1 - Science - Solution —

Class XI

2. (c) The colour at position marked * is ~~traffic signal~~ violet.

6. (a)

$$n_{BA} = \frac{\sin i}{\sin r} \qquad \text{Here } i = 60^\circ,\ r = 45^\circ$$

$$= \frac{\sin 60^\circ}{\sin 45^\circ} = \frac{\sqrt{3}/2}{1/\sqrt{2}} = \frac{\sqrt{3}}{2} \times \frac{\sqrt{2}}{1} = \frac{\sqrt{3}}{\sqrt{2}}.$$

∴ Ans: Option (a)

9. (d) All of these.

11. (b) far point of myopic eye.

14. (a) directly proportional to the current passing in the wire.

16. (d) all of the above.

20 (c) A is true, R is false.

Section B

22. (a) Due to refraction.

(b) convex lens,

$m = -2$, $h' = -ve$., $v = +ve$, $v = 20$ cm.

$$m = \frac{v}{u} \Rightarrow -2 = \frac{20\text{cm}}{u} \Rightarrow u = \frac{20}{-2}\text{cm} = -10\text{cm}$$

$$\boxed{u = -10\text{cm}}$$

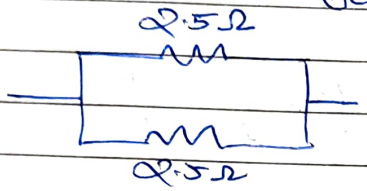
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{20} - \frac{1}{(-10)} = \frac{1}{20} + \frac{1}{10} = \frac{1+2}{20} = \frac{3}{20}$$

$$\boxed{f = \frac{20}{3} = +6.67\text{ cm}}$$

25. Mag. field (B) at the centre of coil
(a) increases if current is increased as $B \propto I$
(b) reverses on reversing the current.

Section C.

32.




$$\frac{1}{R_{eq}} = \frac{1}{R_1} + \frac{1}{R_2} = \frac{1}{2.5} + \frac{1}{2.5}$$

$$\frac{1}{R_{eq}} = \frac{2}{2.5} = \frac{2}{5/2} = \frac{4}{5}$$

$$R_{eq} = \frac{5}{4}\Omega = 1.25\Omega.$$

$$\boxed{R_{eq} = 1.25\Omega}$$

OR.

Resistance of wire A, $R_A = \rho \frac{l}{A} \Rightarrow A = \pi r^2$

$$R_A = \frac{\rho l}{\pi r^2}$$

Resistance of wire B, $l = 2l$, Radius $= 2r$,
Area $= 4\pi r^2$.

$$\therefore R_B = \rho \times \frac{2l}{4\pi r^2} = \frac{\rho l}{2\pi r^2}$$

$\therefore$ Total Resistance

$$\frac{1}{R_P} = \frac{1}{R_A} + \frac{1}{R_B} = \frac{\pi r^2}{\rho l} + \frac{2\pi r^2}{\rho l}$$

$$\frac{1}{R_P} = \frac{3\pi r^2}{\rho l}$$

$$\boxed{R_P = \frac{\rho l}{3\pi r^2}}$$

$$\frac{R_P}{R_A} = \frac{\left(\frac{\rho l}{3\pi r^2}\right)}{\left(\frac{\rho l}{\pi r^2}\right)} = \frac{1}{3}$$

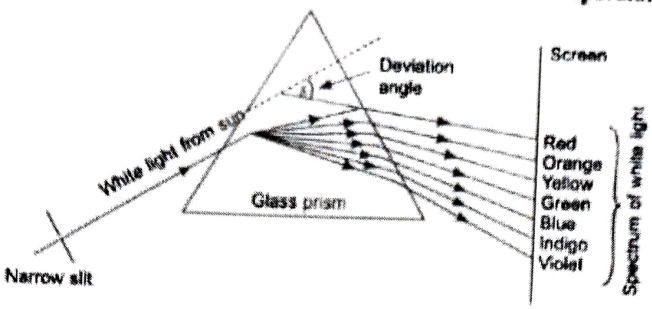
$$\boxed{R_P : R_A = 1 : 3}$$

Section C

Q. 29.

~~32.~~

~~36.~~ (*a*) Splitting of white light into its constituent seven colours is called **dispersion of white light**.



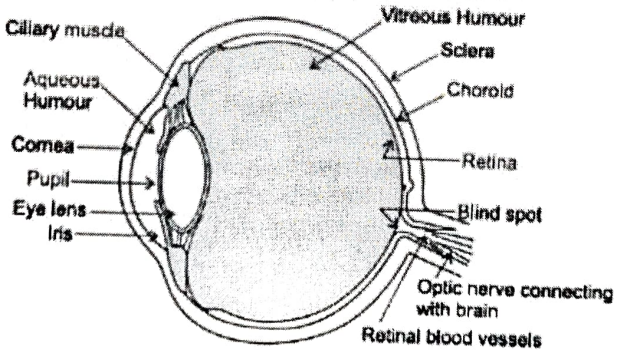

The white light consists of seven colours. The refractive Index of the medium also depends on the wavelength and speed of light. So, when white light enters into the glass prism, the prism material has a different refractive index for the different wavelengths. This causes the different colours to travel with the different velocities inside the glass prism in different directions.

The light is bent or refracted again when it leaves the glass prism and enter into the air. This bending of light separates its colours according to their wavelengths. In this way, we get different colours on the screen.

(*b*) (*i*) Concave lens — Upper part (*ii*) Convex lens — Lower part.

*Or*

**Human Eye:** The natural optical device through which one could see objects around him. It forms an inverted and real image on a light sensitive surface called the retina.




The parts of human eye and its functions:

(*i*) **Cornea:** It is a thin membrane, covering the surface of eyeball, through which light enters. It acts as a primary lens, which provides the refraction for light rays entering the eye.

(*ii*) **Aqueous Humour:** It is a transparent gelatinous fluid, secreted from ciliary muscles and fills the space between the cornea and the eye lens. It provides nutrition to the eye tissues and increases the protection against dust, wind, pollen grains, etc.

(*iii*) **Iris:** It is a dark muscular diaphragm that controls the size of the pupil and is located just behind the cornea in the eye. Iris contracts and dilates involuntarily and changes the size of the pupil.

(*iv*) **Pupil:** The black opening between the aqueous humour and the eye lens. Since light does not get reflected from it, so its appearance is dark. The amount of light entering the eye is controlled by the size of the pupil. In dim light, it opens up completely through the iris, but in bright light, it becomes very small. Pupil allows light to strike the retina.

(*v*) **Ciliary Muscle:** (*a*) It modifies the curvature and thereby the focal length of the eye lens by contracting or relaxing itself to focus the image of an object on the retina according to the distance of the object.

(*b*) It holds the eye lens in position.

(*vi*) **Eye Lens:** It is converging in nature, made by the jelly-like proteinaceous material. The focal length of the eye lens is changed by the ciliary muscles. Its function is to focus the incoming light rays from the object on the retina using its refractive property.

(*vii*) **Vitreous Humour:** It is a transparent, colourless gelatinous mass that fills the space between the eye lens and the retina of the eyeball. It helps to keep retina in place by pressing it against the choroid.

(*viii*) **Retina:** It is a delicate membrane. It acts like a screen on which a real, inverted and diminished image of the object, is formed by the crystalline lens of the eye.

(*ix*) **Rods and Cones:** These are the light sensitive cells present in retina and get activated upon illumination. Rods respond to the intensity of light, whereas cones respond to the colour.

ination

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## Section D. (5M)

34. (a) Laws of refraction of light:

(i) The incident ray, the normal at the point of incidence & the refracted ray, all lie in the same plane. for the two given transparent media.

(ii) The ratio of sine of angle of incidence ($\sin i$) to the sine of angle of refraction ($\sin r$) is always constant, for the light of given colour and for the given pair of media.

$$\frac{\sin i}{\sin r} = \text{constant} = n_{21}$$

↓

RI of med 2 wrt med 1.

(b). $u = -36\,cm$, $v = 72\,cm$,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} = \frac{1}{72} - \frac{1}{(-36)} = \frac{3}{72}$$

$$f = \frac{72}{3} = +24\,cm. \Rightarrow \text{Lens is Convex lens}$$

$$m = \frac{h'}{h} = \frac{v}{u} \Rightarrow \frac{v}{u} \times h = h'$$

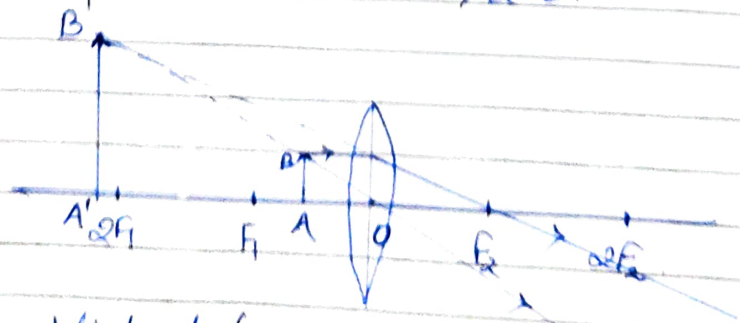
$$\frac{72}{-36} \times 2{\cdot}5 = h'$$

$$-5\,cm = h'.$$

$\therefore$ Image is inverted, & $h' = -5\,cm$

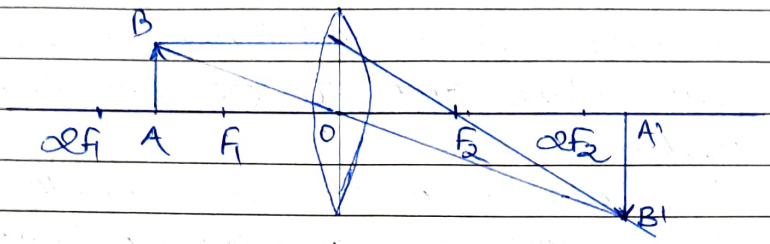
OR

(a) (i) Object is placed betn $F_1$ & O.




ered, a Virtual Image is formed beyond 2F highly magnified &.

(ii) Object is placed between $F_1$ & $2F_1$




Real, Inverted & magnified Image is formed beyond $2F_2$.

(b) Whatever be the position of an object given in case (i) & (ii), the image formed by concave lens is always virtual, erect & diminished. The image is formed on the same size of the object.

(c) $f = -15\,cm$, $V = -10\,cm$.

$$\frac{1}{f} = \frac{1}{V} - \frac{1}{u} \Rightarrow \frac{1}{u} = \frac{1}{V} - \frac{1}{f}$$

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

$$\boxed{u = -30\,cm}$$

Object should placed at distance 30cm from lens.

(39. (a) 220 V

(b). To have same potential difference
Total resistance in parallel ckt is decreased.

(c) $I = 5A$, $P = 2\ kW$, $V = 220\ V$.

$$I = \frac{P}{V} = \frac{2000}{220} = 9.09\ A$$

Thus fuse will blow off & ckt will break.
Thus 10 A or 15 A fuse is needed to operate electric kettle of 2 kW.

(d) Total energy consumed by appliances in one day
$= (400 \times 24) + (2 \times 80 \times 8) + (3 \times 18 \times 8)$
$= 11312\ Wh.$
$= 11312 \times 10^{-3}\ kWh$ $\left(1W = \frac{1}{1000}\ kW\right)$.
$= 11.312\ kWh$

TE consumed in one month,
$11.312 \times 30 = 339.36\ KWh.$

Cost of 1 unit = ₹ 4
Cost of 339.36 units = $339.36 \times 4$
cost = 1357.44/-

OR.

(a) Force acting on a current carrying conductor placed in magnetic field will
(i) act in opp. direct$^n$ to that of previous direct$^n$
(ii) act in opp. direct$^n$ to that of previous direction
(iii) remains the same direction.

(b) The divergence of magnetic field lines near the ends of a current carrying straight solenoid indicate the decrease in strength of mag. field near & beyond the ends of solenoid.