

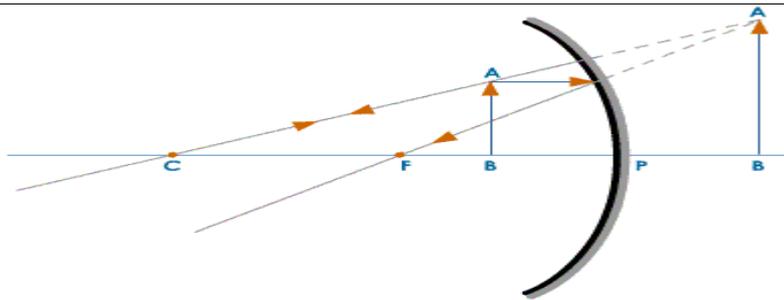
Answer key –Physics

Model exam I

	Two marks questions	
1	<p>(i) List any two factors on which refractive index of a medium depend.</p> <p>(ii) The absolute refractive index of a dense flint glass is 1.65 and for alcohol it is 1.36 with respect to air. Find the refractive index of dense flint glass with respect to alcohol.</p> <p>i)Wavelength of light, Nature of medium through which it is passing</p> <p>ii) alcohol $n_{\text{glass}} = v_{\text{al}} / v_{\text{glass}}$</p> <p style="padding-left: 40px;">= $n_{\text{glass}} / n_{\text{alcohol}}$</p> <p style="padding-left: 40px;">= 1.65 / 1.36</p> <p style="padding-left: 40px;">= 1.21</p>	<p style="text-align: right;">$(\frac{1}{2} + \frac{1}{2})$</p> <p style="text-align: right;">$\frac{1}{2}$</p> <p style="text-align: right;">$\frac{1}{2}$</p>
2	<p>Mention any two advantages and two disadvantages of solar cells.</p> <p>Advantages:</p> <ul style="list-style-type: none"> • Solar cells have no moving parts. • Solar cell panel can be installed in remote and very less populated areas where laying an electrical transmission line is not economically viable. • It's a renewable sources of energy. • It do not cause any environmental pollution. <p>Disadvantages:</p> <ul style="list-style-type: none"> • Special grade required for making solar cells is limited in nature. So its very expensive • Silver used for inter connecting various cells in a solar cell panel is also expensive • The electricity produced in a solar cell panel is in DC. Most of our electrical appliances operate on AC. • Efficiency of energy conversion is low as compared to other methods of generating electricity. 	<p style="text-align: right;">(Any two)</p> <p style="text-align: right;">(Any two)</p> <p style="text-align: right;">(1+1)</p>

3	<p>A 3 cm high candle flame is placed at a distance of 80 cm from the white screen. On placing a converging lens exactly at the mid-point of the candle and the screen, a distant image of the flame is seen on the screen. What is the focal length of the lens and the size of candle flame image formed?</p> <p> $h_o = 3 \text{ cm}$ $F = 40 \text{ cm}$ $V = 40 \text{ cm}$ $U = - 40 \text{ cm}$ </p>  <p> $M = v/u = 40/-40 = -1$ $h_i / h_o = -1$ $h_i = -3 \text{ cm}$ </p>	<p>$(\frac{1}{2})$</p> <p>(1)</p> <p>$(\frac{1}{2})$</p>				
4	<p>Why biogas (gobar gas) is considered to be an excellent fuel for domestic use?</p> <ul style="list-style-type: none"> • The calorific value of biogas is very high • Does not cause any environmental pollution. • It can also be used for illumination purposes • Does not produce any residue like ash while burning 	<p>$\frac{1}{2} \times 4 \text{ point}$ $= 2 \text{ marks}$</p>				
5	<p>i) State Snell's law of refraction.</p> <p>ii) If the refractive index of water for light going from air to water is 1.33, what will be the refractive index of air for light going from water to air?</p> <p>i) The ratio of sine of angle of incidence and sine of angle of refraction is a constant for a light of given colour and given pair of media.</p> <p>$\sin i / \sin r = \text{a constant}$</p> <p>ii) ${}_{\text{air}} n_{\text{water}} = 1.33$ ${}_{\text{water}} n_{\text{air}} = 1 / {}_{\text{air}} n_{\text{water}}$ ${}_{\text{water}} n_{\text{air}} = 1 / 1.33 = 0.7$</p>	<p>(1)</p> <p>$(\frac{1}{2})$</p> <p>$(\frac{1}{2})$</p>				
6	<p>Compare and contrast fossil fuels and the sun as direct source of energy.</p> <table border="0" style="width: 100%;"> <tr> <td style="text-align: center;"><u>Fossil fuel</u></td> <td style="text-align: center;"><u>energy from sun</u></td> </tr> <tr> <td style="text-align: center;">• Non-renewable source of</td> <td style="text-align: center;">Renewable source of energy</td> </tr> </table>	<u>Fossil fuel</u>	<u>energy from sun</u>	• Non-renewable source of	Renewable source of energy	
<u>Fossil fuel</u>	<u>energy from sun</u>					
• Non-renewable source of	Renewable source of energy					

	<p>energy</p> <ul style="list-style-type: none"> • Burning of fossil fuels causes environmental pollution • Fossil fuels can provide energy at any time • Conventional source of energy <p>Does not causes any environmental pollution</p> <p>Available only during the day time when the sun shines and when the clouds are not around</p> <p>Non-conventional source of energy</p>	
	<i>Three marks questions</i>	
7	<p>A student has focused the image of a candle flame on a white screen using a concave mirror. The situation is given below.</p> <p>Length of the flame =1.5 cm</p> <p>Focal length of the mirror =12 cm</p> <p>Distance of flame from the mirror =18 cm</p> <p>If the flame is perpendicular to the principal axis of the mirror, then calculate the following</p> <p>(a)Distance of image from the mirror</p> <p>(b)Length of image</p> <p>If the distance between the mirror and the flame is reduced to 10 cm, then what would be observed on the screen? Draw a ray diagram to justify your answer for this situation.</p> <p>$1/f = 1/u + 1/v$</p> <p>$1/-12 = 1/-18 + 1/v$</p> <p>$V = -36$</p> <p>$M = -v/u = h_i/h_o$</p> <p>$H_i = -3 \text{ cm}$</p> <p>If $u = -10$, no distinct image will be formed on screen as it will form a virtual image.</p> <p>Ray diagram</p>	<p>(1/2 +1/2)</p> <p>(1/2)</p> <p>(1/2)</p> <p>(1)</p>



8 A student wants to project the image of a candle flame on the walls of school laboratory by using a lens:

a. Which type of lens should be used? Why?

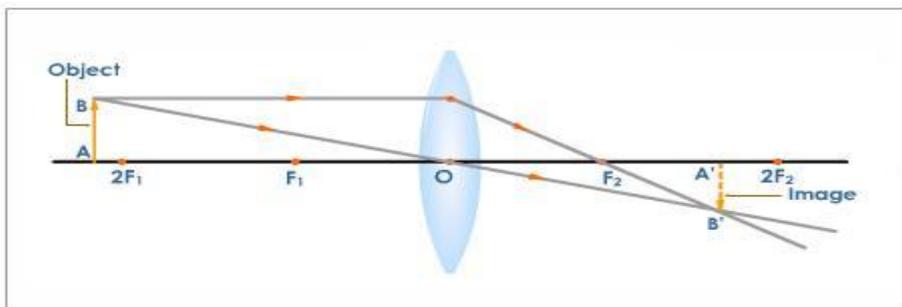
b. At what distance in terms of focal length of the lens should he place the candle flame so as to get (i) a magnified and (ii) a diminished image respectively on the wall? Draw a ray diagram to show the formation of image in case (ii).

a) Convex lens, It can only form a real image.

b) (i) When the object is between $2F_1$ and F_1

(ii) When the object is beyond $2F_1$

Ray diagram



9 A torch bulb is rated 2.5V and 500 mA. Calculate its
 (i) power
 (ii) resistance
 (iii) Energy consumed if this bulb is lighted for 4 hours.

$$P = VI$$

$$I = 500 \text{ mA} = 500/1000 = 0.5 \text{ A}$$

$$P = 2.5 \times 0.5 = 1.25 \text{ W}$$

$$R = V/I = 2.5/0.5 = 5\Omega$$

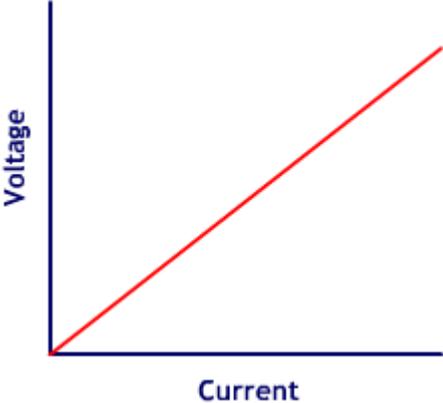
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(1/2)

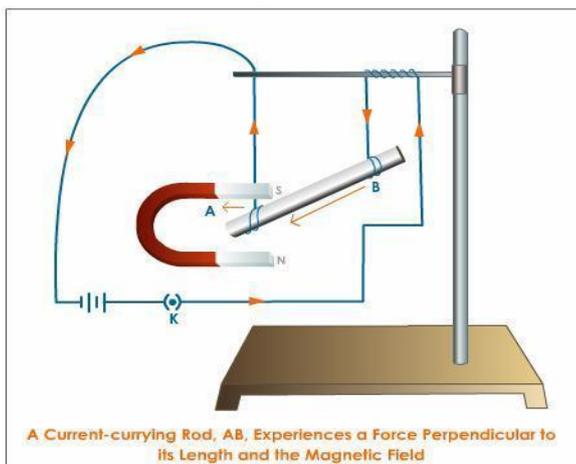
(1/2)

(1/2)

	<p>$E = pt$ $= 1.25 \text{ W} \times 4 \text{ Hr}$ $= 5 \text{ Wh}$</p>	<p>(1/2)</p> <p>(1/2)</p>
10	<p>i) Draw magnetic field lines produced around a current carrying straight conductor. How will the strength of magnetic field change, when the point where the magnetic field is to be determined is moved away from the straight wire carrying current?</p> <p>(ii) When a current carrying conductor is kept in a magnetic field, it experiences a force. State the two factors on which the direction of this force depends.</p> <p>(i)</p> <div data-bbox="379 817 981 1377" data-label="Diagram"> </div> <p>It will decrease</p> <p>iii) Direction of magnetic fields, Direction of current passing through</p>	<p>(1+ 1/2)</p> <p>(1/2)</p> <p>(1)</p>
11	<p>i) State Ohm's law. Draw a graph between potential difference and current for a metallic conductor.</p> <p>ii) An electric lamp whose resistance is 20Ω and a resistor of 4Ω are connected in series to a 6V battery. Calculate the potential difference across the electric lamp.</p> <p>i) The potential difference across a current carrying conductor is directly proportional</p>	

	<p>to the current passing through it, provided temperature remains constant</p>  <p>$I = V/R = 6/24 = 0.25A$ $V = 0.25 \times 20 = 5V$</p>	<p>(1)</p> <p>(1)</p> <p>(1/2)</p> <p>+(1/2)</p>
12	<p>Explain an activity to show that a current carrying conductor experiences a force when placed in a magnetic field and also state the rule which gives the direction of force acting on the conductor.</p> <p>If a current carrying conductor produces a magnetic field and exerts a force on a magnet, then a magnet should also exerts a force on a current carrying conductor.</p> <p>If an aluminium rod is suspended horizontally by a wire between the poles of a horse shoe and current is passed through the wire, then the aluminium rod is displaced. If the direction of current is reversed, the direction of displacement is also reversed. The force exerted is maximum if the conductor is perpendicular to the magnetic field.</p> <p>if a current carrying conductor produces a magnetic field and exerts a force on a magnet, then a magnet should also exerts a force on a current carrying conductor.</p> <p>Eg :- If an aluminium rod is suspended horizontally by a wire between the poles of a horse shoe and current is passed through the wire, then the aluminium rod is displaced. If the direction of current is reversed, the direction</p>	(1)

of displacement is also reversed. The force exerted is maximum if the conductor is perpendicular to the magnetic field.



Fleming's left hand rule.

If we hold the thumb, fore finger and middle finger of the left hand perpendicular to each other such that the fore finger points in the direction of magnetic field, the middle finger points in the direction of current, then the thumb shows the direction of force (motion) of the conductor

(1)

(1)

Five marks questions

13 Explain the construction and working of an ac generator with the help of a neat labeled diagram.

An electric generator converts mechanical energy into electrical energy.

Pinciple

Electromagnetic induction

Construction

Armature coil: It consist of a single loop of an insulated copper wire in the form of a rectangle.

Strong field magnet: Armature coil is placed between 2 pole pieces of a strong magnet which provide strong magnetic field.

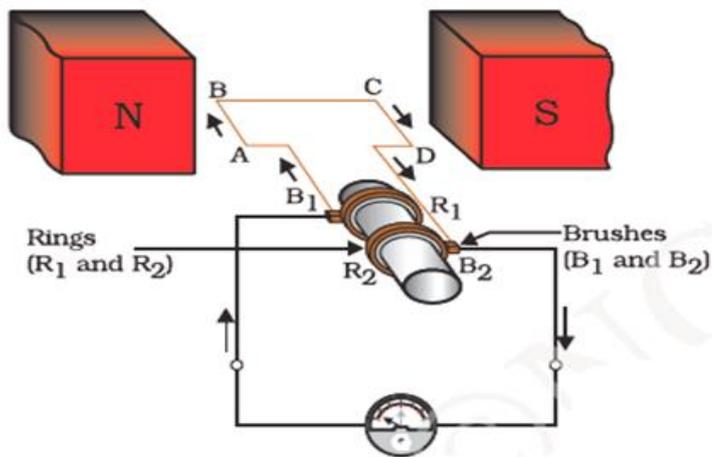
Slip Rings: Two circular rings called slip rings R1 and R2 are internally attached to the Axle. Ends of the coil are connected to R1 and R2.

Brushes: Two carbon brushes B_1 and B_2 attached to slip rings.

Axle: The rings are placed on the axle which is made to rotate freely from an external source.

Galvanometer: To measure current. The outer ends of the brushes are connected to the galvanometer to detect the presence of current

(1½)



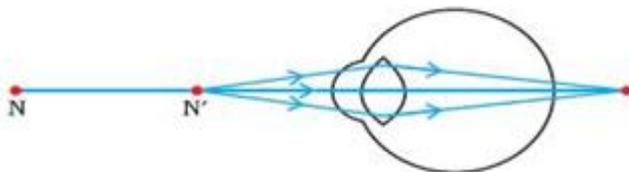
Working

When the axle attached to the two rings is rotated, the arm AB moves up and hence the coil ABCD moves in the clock wise direction. By applying Fleming's right hand rule, induced currents are set up in these arms along the direction ABCD. After half rotation arm CD moves up and AB moves down. As a result the direction of induced current in both the arms changes giving rise to the net induced current along DCBA. Thus every half rotation the polarity of the current changes. Such current which changes its direction after equal intervals of time is called alternating current.

(1½)

(2)

14 (i) Study the diagram given below and answer the following questions.



(a) Name the defect of vision depicted in the diagram.

(b) List two causes of the defect.

(c) Draw a ray diagram for the correction of the above defect using an appropriate lens.

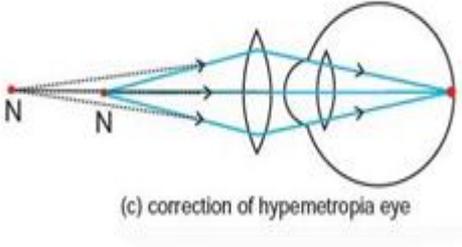
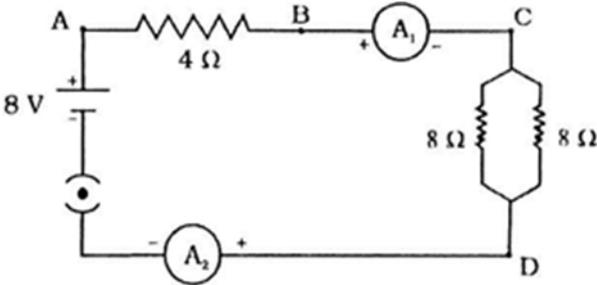
(ii) A person cannot see objects beyond 2m distinctly. State the defect of vision and the nature of corrective lens to be used and also find its power.

i) (a) hypermetropia

(b)

This defect is due to:

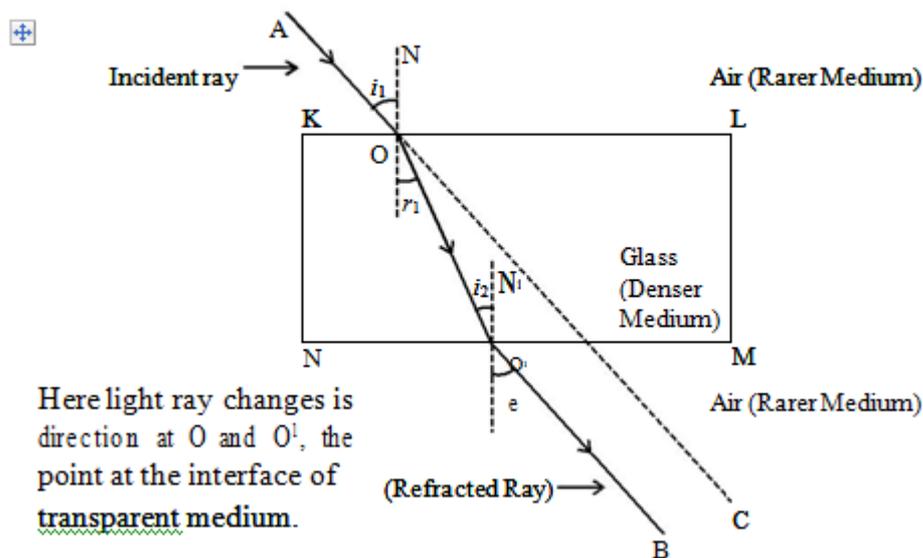
i) Increase in the focal length of the eye lens.

	<p>ii) The eyeball becomes too small.</p> <p>(c)</p>  <p>ii) $u = -\infty$ $v = -2 \text{ m}$ $1/f = 1/u + 1/v$ $f = -2 \text{ m}$ $P = -0.5 \text{ D}$ Defect: Myopia Correction : By using concave lens</p>	<p>(3)</p> <p>(2)</p>
	Section B	
15	<p>Find out the following in the electric circuit given in Figure.</p> <p>a) Difference in ammeter readings, if any, of A1 and A2.</p> <p>b) Power dissipated in 4Ω resistor</p>  <p>a) No difference in reading b) $P = I^2 R$ $R = \frac{8}{2} \Omega + 4\Omega = 8\Omega$ $I = \frac{8\text{V}}{8\Omega} = 1\text{A}$ So $P = I^2 \times 4\Omega = 4\text{W}$</p>	<p>(1/2)</p> <p>(1/2)</p> <p>(1/2)</p> <p>(1/2)</p> <p>(1/2)</p>
16	Draw a path of light ray passing through a rectangular glass slab and label the	

following.

(i) Angle of incidence (ii) angle of refraction (iii) angle of emergence (iv) lateral displacement

Refraction through a Rectangular Glass Slab



17 Analyse the following observation table showing the variation of image distance (v) with object distance (u) in case of convex lens and answer the following questions without doing any calculations.

Serial number	Object distance (u) in cm	Image distance (v) in cm
1	-60	12
2	-30	15
3	-20	20
4	-15	30

5	-12	60
6	-9	90

a) What is the focal length of the convex lens? State reason for your answer.

b) For which object distance (u), the corresponding image distance (v) is not correct? How did you arrive at this conclusion?

a) 10 cm,

When the object is at $2F_1$ image is also at $2F_2$

As $2F = 20$ (From observation 3)

$$F = 20/2 = 10 \text{ cm}$$

c) Observation 6: $u = -9$

At the distance $u = -9$, the object will be between O and F, At this position a virtual image will be formed. (image will not be formed on a screen)

(1)

(1)