The Air Force School

Physics Catalyst-Class X

Science (086)
Class X
Sample Question Paper 2022-23

**Max. Marks: 80**   **Time Allowed:3hours**

General Instructions:

i.   This question paper consists of 39 questions in 5 sections.

ii. All questions are compulsory. However, an internal choice is provided in some questions. A student is expected to attempt only one of these questions.

iii. **Section A** consists of 20 objective type questions carrying 1 mark each.

iv. **Section B** consists of 6 Very Short questions carrying 02 marks each. Answers to these questions should in the range of 30 to 50 words.

v. **Section C** consists of 7 Short Answer type questions carrying 03 marks each. Answers to these questions should in the range of 50 to 80 words

vi. **Section D** consists of 3 Long Answer type questions carrying 05 marks each. Answer to these questions should be in the range of 80 to 120 words.

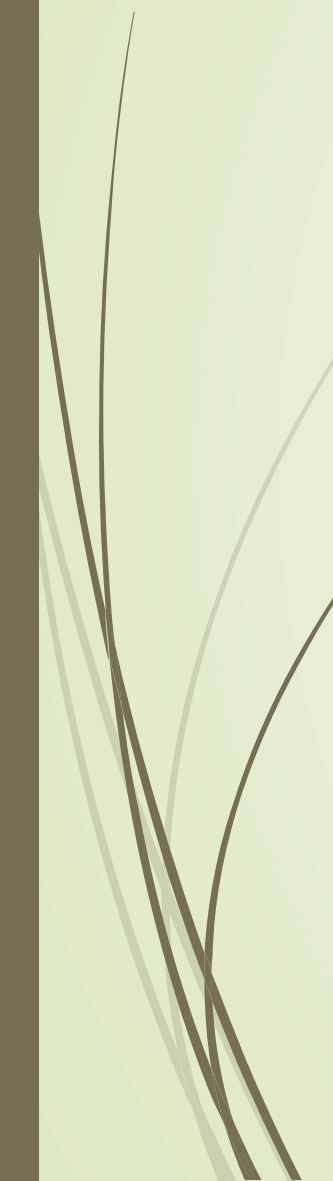vii. Section E consists of 3 source-based/case-based units of assessment of 04 marks each with sub-parts.

PHYSICS(2022-23)
Sample paper analysis
Max marks -25
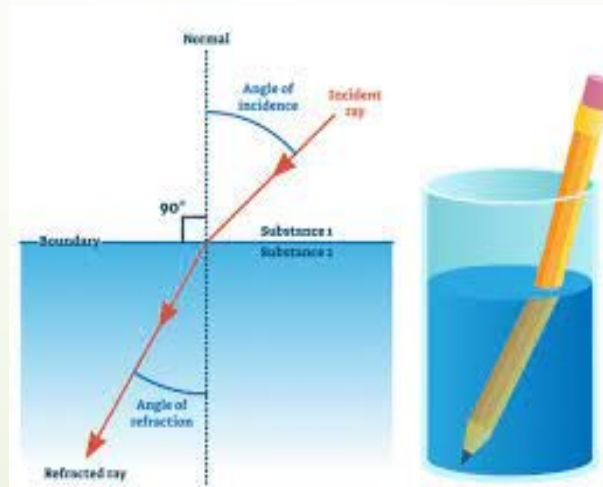
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| Chapter	objective type questions 1 Mark	very short type answer questions 2 Marks	short answer type questions 3 Marks	Long Answer type questions 5 Marks	case - based/data -based questions 4 Marks	Total
Light reflection & refraction		1(2)	1(3)		1(4)	9
Human eye andThe colourful World			1(3)			3
Electicity	2(1)			1(5)		7
Magnetic Effects of current	3(1)		1(3)			6
Total	05	02	09	05	04	25

Electricity

Q13 A complete circuit is left on for several minutes, causing the connecting copper wire to become hot. As the temperature of the wire increases, the electrical resistance of the wire

(a) decreases.

 (b) remains the same.

(c) increases.

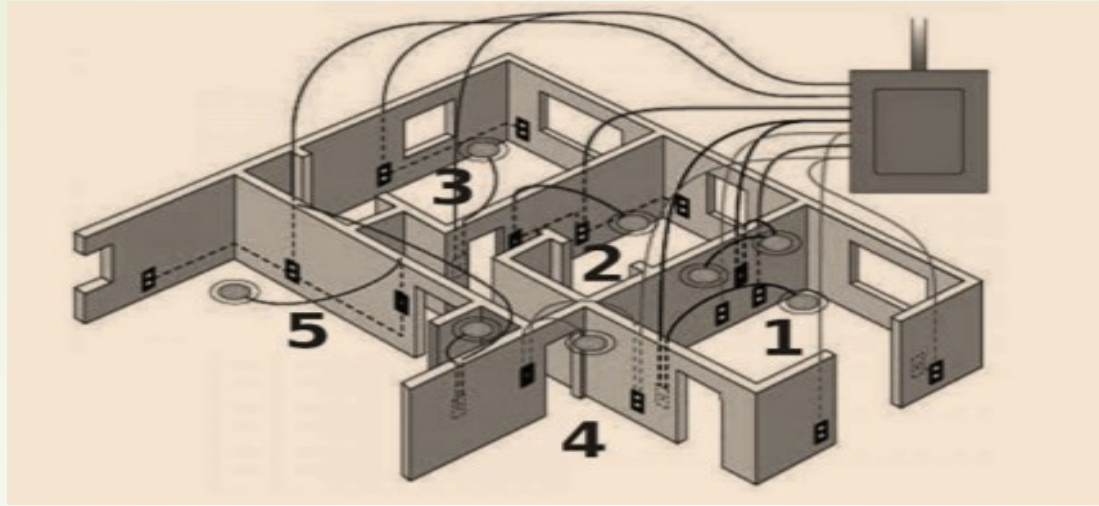 (d) increases for some time and then decreases .

1 Mark

Electricity
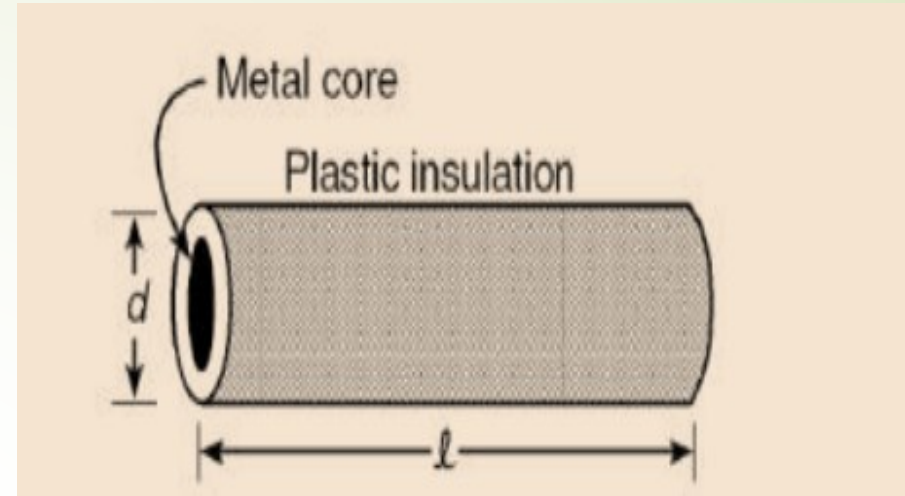
Q15 Plastic insulation surrounds a wire having diameter d and length l as shown above. A decrease in the resistance of the wire would be produced by an increase in the
(a) length l of the wire
(b) diameter d of the wire
(c) temperature of the wire
(d) thickness of the plastic insulation   (1 Mark)

Q36 The diagram above is a schematic diagram of a household circuit. The house shown in the above diagram has 5 usable spaces where electrical connections are made. For this house, the mains have a voltage of 220 V and the net current coming from the mains is 22A. (a) What is the mode of connection to all the spaces in the house from the mains? (b) The spaces 5 and 4 have the same resistance and spaces 3 and 2 have respective resistances of 20Ω and 30Ω. Space 1 has a resistance double that of space 5. What is the net resistance for space 5. (c) What is the current in space 3? (d) What should be placed between the main connection and the rest of the house's electrical appliances to save them from accidental high electric current?   (5 Marks)

(a) All spaces are connected in parallel. (1mark)
(b) Let Resistance of Space 5 and 4 be R ohms respectively (2marks)
   Resistance of Space 1 = 2 R ohms
   Resistance of Space 2 = 30 ohms
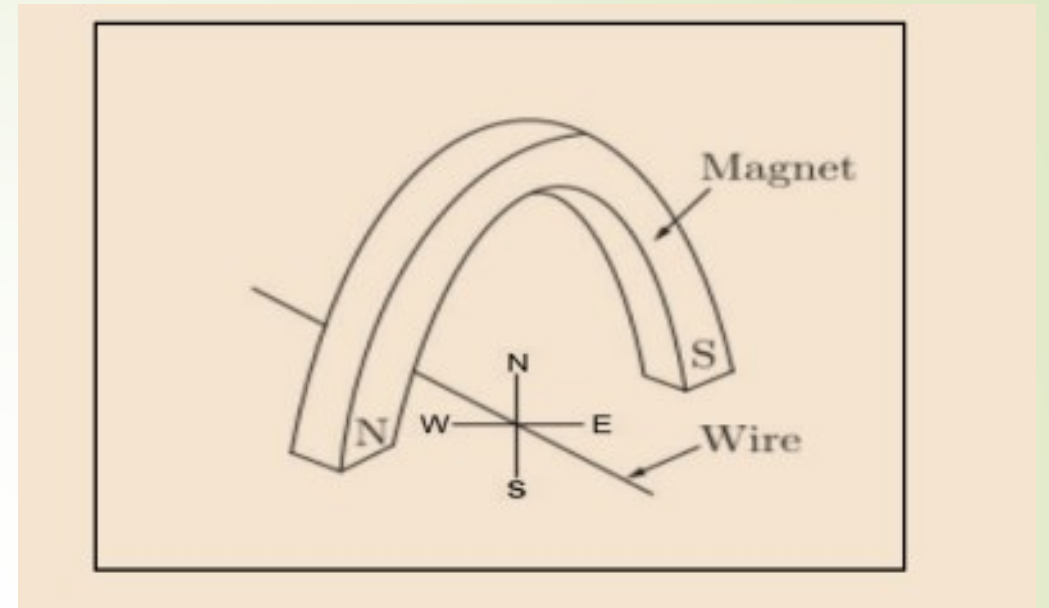   Resistance of Space 3 = 20 ohms
   Current = 22 A
   V= 220 V
   Total Resistance= V/I

$$\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \frac{1}{R_4} + \frac{1}{R_6} = \frac{1}{R_{eq}}$$

$$\frac{1}{2R} + \frac{1}{30} + \frac{1}{20} + \frac{1}{R} + \frac{1}{R} = \frac{1}{R_{eq}}$$

$$\frac{30 + 2R + 3R + 60 + 60}{60R} = \frac{1}{R_{eq}}$$

$$\frac{150 + 5R}{60R} = \frac{1}{R_{eq}}$$

$$R_{eq} = \frac{60R}{150 + 5R} = \frac{220}{22} \quad 10$$

$$60R = 10(150 + 5R)$$
$$60R = 1500 + 50R$$
$$10R = 1500$$
$$R = 150 \,\Omega$$

Magnetic Effects of Current

Q14 A copper wire is held between the poles of a magnet. 1 The current in the wire can be reversed. The pole of the magnet can also be changed over. In how many of the four directions shown can the force act on the wire

(a) 1

(b) 2

(c) 3

(d) 4

Magnetic effects of current

Q16 Which of the following pattern correctly describes the magnetic field around a long straight wire carrying current?

(a) straight lines perpendicular to the wire.

(b) straight lines parallel to the wire.

(c) radial lines originating from the wire.

(d) concentric circles centred around the wire

(1 Mark)

Magnetic effects of current

Q 20 Assertion: On freely suspending a current – carrying solenoid, it comes to rest in Geographical N-S direction.

Reason : One end of current carrying straight solenoid behaves as a North pole and the other end as a South pole, just like a bar magnet.   (**1 Mark)**

Q32 A student fixes a white sheet of paper on a drawing board. He places a bar magnet in the centre and sprinkles some iron filings uniformly around the bar magnet. Then he taps gently and observes that iron filings arrange themselves in a certain pattern. (a) Why do iron filings arrange themselves in a particular pattern? (b) Which physical quantity is indicated by the pattern of field lines around the bar magnet? (c) State any two properties of magnetic field lines.

OR

A compass needle is placed near a current carrying wire. State your observations for the following cases and give reasons for the same in each case- (a) Magnitude of electric current in wire is increased. (b) The compass needle is displaced away from the wire.

(3 Marks)

(a) When iron filings are placed in a magnetic field around a bar magnet, they behave like tiny magnets. The magnetic force experienced by these tiny magnets make them rotate and align themselves along the direction of field lines. (1 mark)

(b) The physical property indicated by this arrangement is the magnetic field produced by the bar magnet. (1 mark)

(c) Magnetic field lines never intersect, magnetic field lines are closed curves.

(1mark)

OR

(a) The deflection in the compass needle increases as Magnetic field of the current carrying conductor is directly proportional to current flowing through it.

(1.5marks)

(b) The deflection in the needle decreases as the magnetic field is inversely proportional to the perpendicular distance from the wire. (1.5marks)

radiation from the Sun

prism

yellow light

blue light
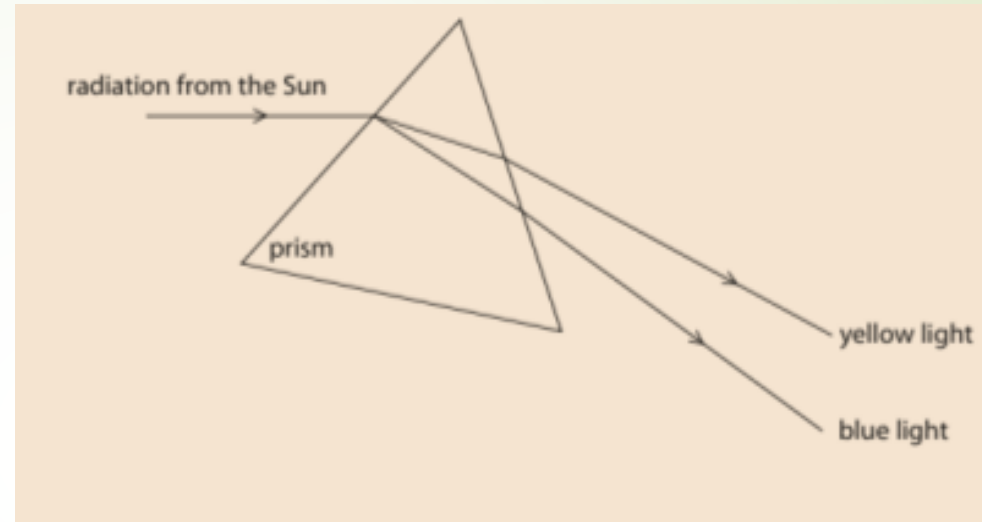
Q25 State the phenomena observed in the above diagram. Explain with reference to the diagram, which of the two lights mentioned above will have the higher wavelength?

OR

How will you use two identical prisms so that a narrow beam of white light incident on one prism emerges out of the second prism as white light? Draw the diagram.

(2 Marks)

Dispersion- The splitting of white light into seven colours on passing through a prism. (1 mark)
 Velocity is directly proportional to wavelength given constant frequency. So yellow will have greater wavelength than blue as the velocity of yellow light is greater than blue. (0.5 + 0.5 mark)

Or

Angle of deflections of the two prisms need to be equal and opposite. While the first prism splits the light in the seven colours due to different angles of deflection, the second prism combines the spectrum along a single ray and the colours again combine to give white light as the emergent light. (1mark)
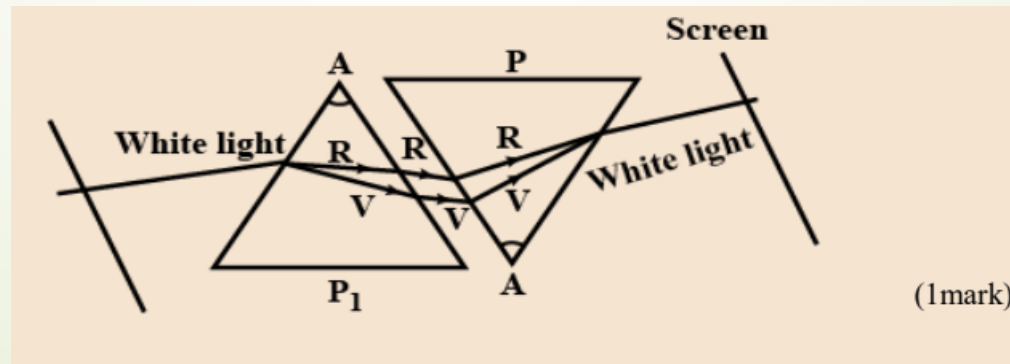
Q30 Rohit wants to have an erect image of an object using a converging mirror of focal length 40 cm. (a) Specify the range of distance where the object can be placed in front of the mirror. Justify.
(b) Draw a ray diagram to show image formation in this case.
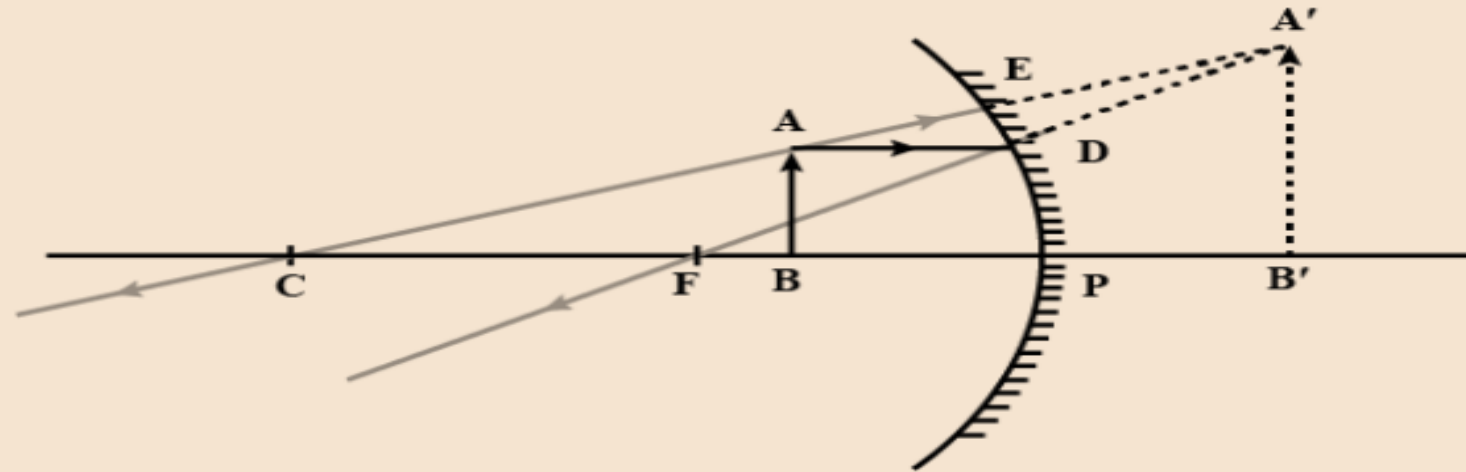(c) State one use of the mirror based on the above kind of image formation.

(3 Marks)

Solution

(a) The object has to be placed at a distance between 0 – 40 cm. This is because image is virtual, erect and magnified when the object is placed between F and P. (1mark)

(b)

(1mark)

(c) Used as shaving mirror or used by dentists to get enlarged image of teeth (any one use) (1mark)

The above images are that of a specialized slide projector. Slides are small transparencies mounted in sturdy frames ideally suited to magnification and projection, since they have a very high resolution and a high image quality. There is a tray where the slides are to be put into a particular orientation so that the viewers can see the enlarged erect images of the transparent slides. This means that the slides will have to be inserted upside down in the projector tray.

To show her students the images of insects that she investigated in the lab, Mrs. Iyer brought a slide projector. Her slide projector produced a 500 times enlarged and inverted image of a slide on a screen 10 m away.

Q39 (a)Based on the text and data given in the above paragraph, what kind of lens must the slide projector have?

(b) If v is the symbol used for image distance and u for object distance then with one reason state what will be the sign for v u in the given case?

(c) A slide projector has a convex lens with a focal length of 20 cm. The slide is placed upside down 21 cm from the lens. How far away should the screen be placed from the slide projector's lens so that the slide is in focus?

OR

(c)When a slide is placed 15 cm behind the lens in the projector, an image is formed 3 m in front of the lens. If the focal length of the lens is 14 cm, draw a ray diagram to show image formation. (not to scale)

(4 Marks)

Q31 (a) A lens of focal length 5 cm is being used by Debashree in the laboratory as a magnifying glass. Her least distance of distinct vision is 25 cm. (i) What is the magnification obtained by using the glass? (ii) She keeps a book at a distance 10 cm from her eyes and tries to read. She is unable to read. What is the reason for this? (b) Ravi kept a book at a distance of 10 cm from the eyes of his friend Hari. Hari is not able to read anything written in the book. Give reasons for this? (3 Marks)

Answer to Ques No 31

(a)
Given, image distance = v = -25 cm, focal length = f = 5 cm, magnification = m = ?

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

$\dfrac{1}{u} = \dfrac{1}{-25} - \dfrac{1}{5} = \dfrac{-1-5}{25} = \dfrac{-6}{25}$

Object distance $= u = \dfrac{-25}{6} cm.$

We know that, $m = \dfrac{v}{u} = \dfrac{-25 \times 6}{-25} = 6.$

(2 marks)
(b) This is because the least distance of distinct vision is 25 cm.   (1 mark)

(a) Convex Lens (1mark)
(b) Negative as the image is real and inverted. (1mark)
(c) $1/f = 1/v - 1/u$

$1/20 = 1/v - 1/-20$

$1/v = 1/20 - 1/21$

$= (21 - 20)/420$

$= 1/420$

$v = 420$ cm   (2 marks)

OR

(c)