

FIRST TERM MODEL QUESTION PAPER 2024 WITH ANSWER KEY SET 3

PHYSICS - Standard IX

Time: 1.5 hours

Max. Marks: 40

(Prepared by www.educationobserver.com)

1. 15 minutes is given as cool-off time.
2. This time is to be used for reading the question paper.
3. You are not supposed to write anything during the cool-off time.
4. Attempt the questions according to the instructions.

Section A: Multiple Choice Questions (MCQs) [1 mark each]

1. Which of the following mediums has the lowest speed of light?
 - a) Air
 - b) Water
 - c) Glass
 - d) Diamond
 2. The phenomenon of light bending when passing from one medium to another is called:
 - a) Reflection
 - b) Refraction
 - c) Diffusion
 - d) Dispersion
 3. The optical density of a medium is related to:
 - a) Material density
 - b) Speed of light
 - c) Color of the medium
 - d) Wavelength of light
 4. Total internal reflection occurs when light passes from:
 - a) Air to water
 - b) Water to air
 - c) Glass to air
 - d) Air to glass
 5. The unit of acceleration is:
 - a) m/s
 - b) m/s^2
 - c) m
 - d) s^2
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Section B: Short Answer Questions (Answer any 4 out of 5) [2 marks each]

1. Define refractive index. How is it related to the speed of light in different mediums?
 2. What happens to the speed and direction of light when it passes from a rarer medium to a denser medium?
 3. Explain why stars twinkle at night using the concept of atmospheric refraction.
 4. Describe how a periscope works using the concept of total internal reflection.
 5. What is the significance of the critical angle in total internal reflection?
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Section C: Descriptive Questions (Answer any 4 out of 5) [3 marks each]

1. Draw and explain the ray diagram for light passing through a glass slab, showing refraction at both surfaces.
 2. Explain the experiment involving a coin in a vessel and how it demonstrates refraction.
 3. Describe the difference between uniform velocity and non-uniform velocity with examples.
 4. Discuss the factors affecting the optical density of a medium and its impact on the speed of light.
 5. Explain the concept of acceleration and give an example where acceleration is negative (retardation).
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Section D: Application Level Questions (Answer any 4 out of 5) [3 or 4 marks each]

1. An experiment involves a laser beam passing through water and air in a trough. Describe the observation when the laser light is shone perpendicular and obliquely. Draw the ray diagram and explain.
 2. A toy car moves from a smooth surface to a rough surface. Explain the change in speed and direction using the concept of refraction and friction.
 3. Design an experiment to find the critical angle of water. Describe the materials, procedure, and expected results.
 4. A ray of light passes from glycerine to sunflower oil. Explain whether the light will deviate towards or away from the normal, justifying your answer.
 5. A train accelerates uniformly from rest to a speed of 30 m/s in 10 seconds. Calculate the distance traveled during this time and describe the acceleration.
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Answer Key

Section A: MCQs

1. d) Diamond
2. b) Refraction
3. b) Speed of light
4. b) Water to air
5. b) m/s^2

Section B: Short Answer Questions

1. The refractive index (n) is the ratio of the speed of light in a vacuum (c) to the speed of light in a medium (v).
$$n = \frac{c}{v}$$
2. When light passes from a rarer to a denser medium, its speed decreases, and it bends towards the normal.
3. Stars twinkle due to irregular refraction caused by changing atmospheric layers with varying optical densities.
4. A periscope uses prisms to reflect light internally, allowing the viewer to see objects that are not directly in their line of sight.
5. The critical angle is the angle of incidence above which total internal reflection occurs when light passes from a denser to a rarer medium.

Section C: Descriptive Questions

1. (Diagram and explanation of light refracting at both surfaces of a glass slab).
2. (Description of how refraction makes the coin visible again when water is added).
3. Uniform velocity: A car moving at constant speed. Non-uniform velocity: A car slowing down due to a red light.
4. Higher optical density leads to a lower speed of light. Materials with closely packed molecules have higher optical density.
5. Acceleration refers to the rate of change of velocity. Negative acceleration (retardation) occurs when a vehicle slows down.

Section D: Application Level Questions

1. (Description of the experiment with diagrams showing light refracting when passing from water to air).
2. (Explanation of reduced speed due to increased friction and change in direction similar to refraction).
3. (Outline of experiment with a semi-circular glass slab and laser light to find the critical angle of water).

4. Light will deviate towards the normal because glycerine and sunflower oil have nearly similar refractive indices.
- 5.

$$s = ut + \frac{1}{2}at^2$$

$$s = 0 + \frac{1}{2}(3 \text{ m/s}^2)(10 \text{ s})^2 = 150 \text{ m}$$

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