Blast-off : Light Mark Scheme

Page 4: Luminous and Non-Luminous Objects

- Lamp: Luminous
- Table: Non-luminous
- Sun: Luminous
- Torch: Luminous
- Moon: Non-luminous
- Book: Non-luminous

Page 7: Fill in the Blanks

1. Straight
2. Faster
3. 300,000,000
4. Transparent
5. Opaque
6. Luminous
7. Non-luminous
8. Shadows

Material Classification

9. Window: Transparent
10. Mirror: Opaque
11. Sun: Luminous
12. Moon: Non-luminous
13. Air: Transparent
14. Greaseproof paper: Translucent
15. Water: Transparent
16. Carpet: Opaque
17. Aluminium foil: Opaque

Page 12: Mirror Reflection Paragraph

- Plane
- Reflected
- Image
- Equal to
- The same size as
- Incident
- Scattered

Page 10: Incident and Reflected Rays

- a. Incident ray: Label A
- b. Reflected ray: Label B
- c. Mirror: Label C
- d. Normal: Label D

- e. Incident ray (second ray): Label E
- f. Reflected ray (second ray): Label F

Page 11: Reflection Diagram

1. Incident ray: Draw an arrow toward the mirror at 30°.
2. Reflected ray: Draw an arrow away at 30° on the other side of the normal.
3. Label angles of incidence and reflection: Both 30°.

Page 13: Reflection on Two Mirrors

- Angle of incidence on Mirror A: 90° - 40° = 50°
- Angle X: 50°
- Angle Y: 180° - (90° + 50°) = 40°
- Angle of incidence on Mirror B: 90° - 40° = 50°

Page 14: Periscope Diagram

- Label the top mirror as A.
- Label the incident ray as B.
- Label the reflected ray as C.

Explanation:

- The periscope works by reflecting light from one mirror to another, allowing the observer to see objects above the water. The law of reflection ensures the angles of incidence and reflection are equal for both mirrors.

Page 17: Refraction of Light in Water

- Draw a ray bending toward the normal as it enters water.
- Light can travel from **air** to **water**.
- The boundary between two **media** is where light changes **speed**.
- This causes the light to change direction, known as **refraction**.
- Less dense to more dense: **toward** the normal.
- More dense to less dense: **away from** the normal.

Page 18: Refraction in the Tank

- Draw normals at the points where light enters and exits the water.
- Show the rays bending toward the normal as they enter and away from the normal as they exit.

Page 20: Light in a Prism

1. Where light slows down: A
2. Colour refracted most: B (violet)
3. Densest material: A
4. Colour refracted least: F (red)
5. White light: D
6. Where light speeds up: E

Page 23: The Human Eye

Part	Description
Cornea	Transparent front part that is responsible for the refraction of light

Part	Description
Pupil	Space in the iris through which light passes
Iris	Controls the amount of light entering the eye
Lens	Changes shape to refract and focus light onto the retina
Retina	Inner layer where the light-sensitive cells are located
Optic nerve	Contains the neurons that carry the information to the brain

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Page 25: Diverging Lens

1. A convex lens is **thicker** in the center and **thinner** at the edges.
2. A concave lens is **thinner** in the center and **thicker** at the edges.
3. A convex lens is known as a **converging** lens because the rays of light are refracted **closer** together. The point where they meet is called the **focal point**.
4. A concave lens is known as a **diverging** lens because the rays of light are refracted **further** apart, and the rays of light spread out.

Page 27: Properties of Light

Match and Draw

- Opaque: Objects that do not let light pass through them
- Translucent: Objects that allow some light to pass through them
- Transparent: Objects that allow light through them

How We See

1. Light enters the eye through the pupil.
2. The size of the pupil is altered by the iris.
3. The cornea and lens focus light onto the retina.
4. The retina contains two light-sensitive cells called rods and cones. When light hits these cells, chemical reactions produce electrical impulses that travel via the optic nerve to the brain.

Colour

- White mouse: Appears white because it reflects all colours of light.
- Black cat: Appears black because it absorbs all colours of light.

Page 28: Reflection Word Search

Label the parts A, B, C, D, E:

- A = Reflected ray
- B = Incident ray
- C = Surface (mirror)
- D = Normal
- E = Angle of incidence = Angle of reflection
- If the angle of incidence is 40°, the angle of reflection is **40°**.
- If the angle of reflection is 36°, the angle of incidence is **36°**.

Page 29: Reflection and Periscopes

1. Draw arrows to show:
    - Torch to mirror (incident ray).
    - Mirror to reflected direction (reflected ray).
    - Label these as "incident ray" and "reflected ray."

2. Periscope diagram:
    - Light arrows show light reflecting from the top mirror to the bottom mirror, then to the eye.

Page 30: Jenny and the Torch

(a) Correct angle: **45°**.

(b) The light reflects off the mirror at the same angle it hits the mirror.

Page 31: Torch Circuit Symbols

(i)

- Bulb
- Battery
- Switch

(ii) Circuit Diagram:

- Connect the battery, bulb, and switch in a complete loop.

Page 32: Coloured Filters

(a) Explanation:

- The green filter only allows green light to pass through, absorbing all other colours from the white light.

(b)

(i) Through the red filter, the red lamp will appear **red** because red light can pass through.

- Explanation: The red filter allows red light to pass and absorbs all other colours.

(ii) Through the green filter, the red lamp will appear **black** because the filter absorbs red light.

- Explanation: The green filter does not transmit red light, so no light passes through.

Page 33: Reflected and Refracted Rays

(a)

(i) Reflected rays: **B and E**

(ii) Refracted ray: **C**

(b) Reason:

- The incident ray is brighter because it has not lost energy due to partial reflection or refraction.

Page 34: Spot of Light on the Screen

(a) Correct box: **Light travels in straight lines.**

(b) Draw a straight line from the torch through the hole in Card A to Card B, extending to the screen.

Page 35: Gabby's Torch and Circuit

(c) **Reflection Diagram**

- Draw an incident ray from the torch hitting the mirror at an angle.
- Draw a reflected ray leaving the mirror at the same angle as the incident ray (following the law of reflection).
- Use a ruler to ensure accuracy.

(d) **Circuit Modification**

- Correct answer: **Add another battery.**
    - Explanation: Adding another battery increases the voltage, making the bulb brighter.

Page 36: James' Experiments

(a) **Reflection Table**

- The angle of reflection that was not measured accurately: **65°**.
    - Explanation: It does not match the corresponding angle of incidence (60°) according to the law of reflection.

(b) **Refraction Diagram**

- Draw the refracted ray bending toward the normal as it enters the glass and away from the normal as it exits.

Page 37: Refraction Graph

(i) **Angle of incidence when refraction is 20°:**

- From the graph: **30°**.

(ii) **Conclusion from the graph:**

- When light passes from air into glass, the angle of incidence is always **greater than** the angle of refraction.

(iii) **Complete the refracted ray on diagram 2:**

- Extend the refracted ray in a straight line as it exits the glass block.

Page 38: Fish Tank Reflection

(a) **Reflection Diagram**

- Draw a ray of light traveling from the snail to the surface of the water, reflecting at an angle, and then reaching the fish's eye.
- Ensure arrows show the direction of light.

Page 39: Refraction from Snail to Andrew

(i) **Refraction Diagram**

- Draw a ray of light traveling from the snail to the surface of the water, bending away from the normal as it passes into the air, and reaching Andrew's eye.

(ii) **Name of effect:**

- **Refraction**

Page 40: George's Reflection

(a) **Reflection Diagram**

- Draw a ray of light traveling from the lamp to the laptop screen, reflecting toward George's eyes.

(b) **Effect of tilting the screen forward:**

- The reflected ray moves downward, allowing George to see the screen more clearly.

Page 42: Refraction in Glass Block

(a) **Name of effect:**

- **Refraction**

(b) **Path of Ray C:**

- Draw Ray C bending toward the normal as it enters the block and away from the normal as it exits.

Page 43: Underwater Rays

(c) **Path of Rays D and F:**

- Continue Ray D straight upward after exiting the water.
- Ray F bends away from the normal as it leaves the water and enters the air.