

Collegedunia NCERT Solutions

Class 7 Science (Curiosity), step-by-step solutions for the 2026-27 NCERT (Latest Edition)

Chapter 11: Light: Shadows and Reflections

This chapter explains luminous objects, straight-line travel of light, shadows, pinhole images, and reflection. It shows how mirrors and periscopes change light's path.

Also see for this chapter:

Let Us Enhance Our Learning

Q 11.1 Which of the following are luminous objects? Mars, Moon, Pole Star, Sun, Venus, Mirror

Source: Official NCERT Curiosity 2026-27, Exercise Q1, printed p. 165 • Difficulty: Beginner • Intent: Concept check

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: luminous objects emit their own light. Classify the stars as emitters and the planets, Moon, and mirror as reflectors. **Answer: Pole Star and Sun.**

SOLUTION

Concept used. A luminous object produces its own light. A non-luminous object only reflects light.

Concept recall

Stars make light. Planets, moons, and mirrors reflect light.

Step 1. The Sun is a star, so it gives out light.

Step 2. The Pole Star is also a star, so it is luminous.

Step 3. Mars, Venus, Moon, and a mirror only reflect received light.

Final Answer: The Pole Star and Sun are luminous.

EXPERT'S SOLUTION : Aarav Sharma, M.Sc Physics, IIT Madras

Quick reading. Sort each object by where its light begins. Made light means luminous. Reflected light means non-luminous.

Step 1. Put the two stars, Sun and Pole Star, in the luminous group.

Step 2. Put Mars, Venus, and Moon in the reflecting group.

Step 3. A mirror also returns light without making it.

This test works even when an object looks very bright.

Final Answer: Pole Star and Sun.

Q 11.2 Match the items in Column A with those in Column B.**Column A**

Pinhole camera

Opaque object

Transparent object

Shadow

Column B

Blocks light completely

The dark region formed behind the object

Forms an inverted image

Light passes almost completely through it

Source: Official NCERT Curiosity 2026-27, Exercise Q2, printed p. 165 • Difficulty: Beginner • Intent: Concept check

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: light transmission, shadows, and pinhole images. Match each term to its defining property, then use elimination. **Answer:** pinhole-inverted; opaque-blocks; transparent-passes; shadow-dark region.

SOLUTION

Concept used. Materials differ in how much light they pass. A pinhole camera uses straight-line light to form an inverted image.

🔑 Concept recall

Recall: pinhole images are inverted, opaque materials block light, transparent materials pass light, and a shadow is the dark region behind a blocker.

Step 1. Pinhole camera: forms an inverted image.

Step 2. Opaque object: blocks light completely.

Step 3. Transparent object: passes light almost completely.

Step 4. Shadow: dark region formed behind an object.

Final Answer: Pinhole-inverted; opaque-blocks; transparent-passes; shadow-dark region.

EXPERT'S SOLUTION : Priya Iyer, Ph.D Physics, IISc Bangalore

Structural observation. The entries test passage of light and image formation. Sorting them first makes every pair clear.

Step 1. Pair the camera with inverted image.

Step 2. Pair opaque and transparent with opposite light-passing properties.

Step 3. Pair shadow with the remaining dark-region definition.

Every definition now has one term.

Final Answer: The four pairs are pinhole-inverted, opaque-blocks, transparent-passes, shadow-dark.

Q 11.3 Sahil, Rekha, Patrick, and Qasima are trying to observe the candle flame through the pipe as shown in Fig. 11.16. Who can see the flame?

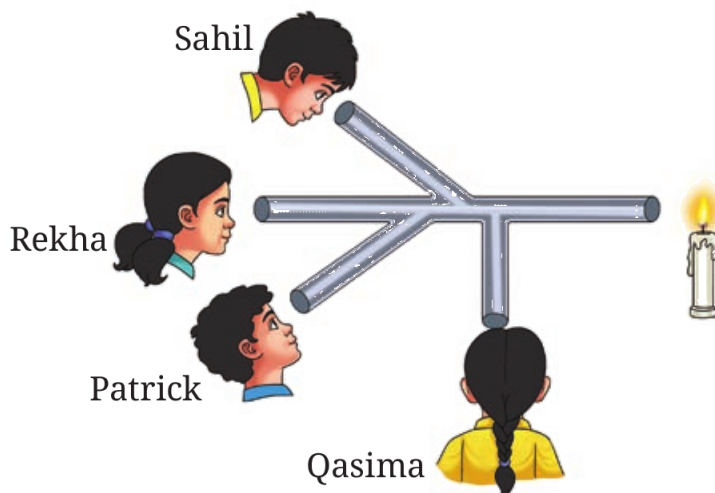


Fig. 11.16

Fig. 11.16, NCERT Curiosity Class 7 Science, Chapter 11.

Source: Official NCERT Curiosity 2026-27, Exercise Q3, printed p. 166 • Difficulty: Beginner • Intent: Application

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: rectilinear propagation of light. Trace a straight, open path from the flame through Fig. 11.16; bent branches cannot carry the ray without mirrors. **Answer:** Rekha.

SOLUTION

Concept used. Light travels in straight lines. A person sees the flame only through a straight, open pipe path.

♥ Concept recall

A bent pipe cannot show a flame without mirrors.

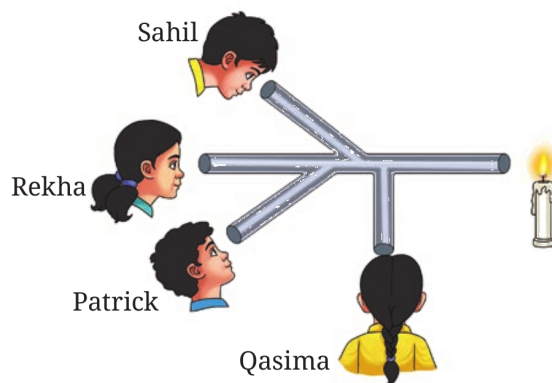


Fig. 11.16

Fig. 11.16 repeated for the detailed solution.

Step 1. Trace a straight line from the flame through the horizontal pipe.

Step 2. Continue it through the left opening.

Step 3. This opening points at Rekha. Other branches bend away.

Final Answer: Rekha can see the flame.

EXPERT'S SOLUTION : Vivaan Patel, M.Tech Applied Physics, IIT Delhi

Picture-first. Imagine one narrow ray leaving the flame. It cannot turn at a pipe junction by itself.

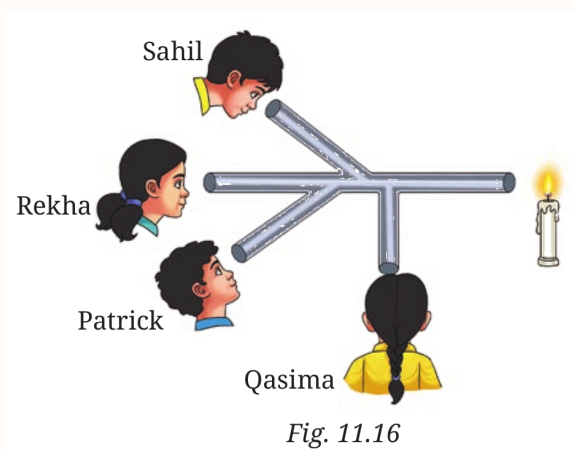


Fig. 11.16

Fig. 11.16 repeated for the expert explanation.

Step 1. Draw the ray leftwards along the main tube.

Step 2. It reaches the opening opposite Rekha.

Step 3. It cannot follow the slanting or downward branches.

Only one observer has a direct line of sight.

Final Answer: Only Rekha.

Q 11.4 Look at the images shown in Fig. 11.17 and select the correct image showing the shadow formation of the boy.

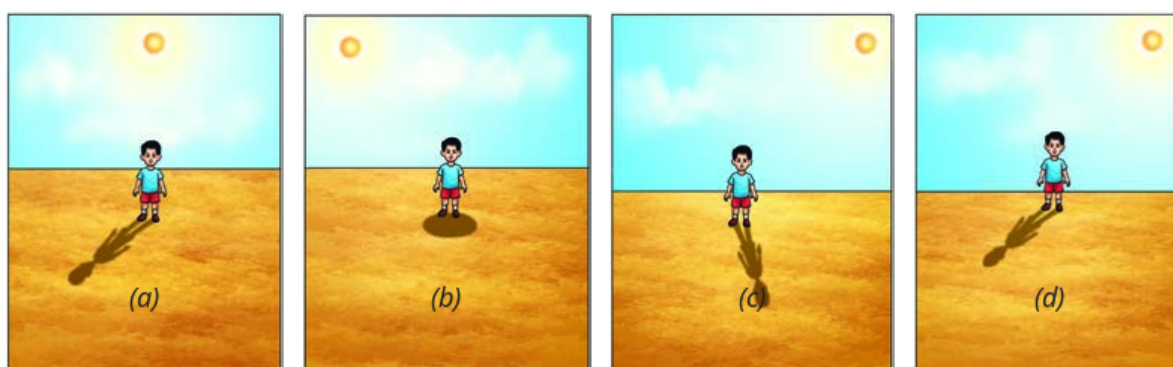


Fig. 11.17

Fig. 11.17, NCERT Curiosity Class 7 Science, Chapter 11.

Source: Official NCERT Curiosity 2026-27, Exercise Q4, printed p. 166 • Difficulty: Beginner • Intent: Application

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: a shadow forms opposite its light source. Extend the Sun-boy line away from the upper-right Sun toward the lower left, then match the drawing. **Answer: image (d).**

SOLUTION

Concept used. A shadow forms opposite the light source. Its direction follows a straight line from source past object.

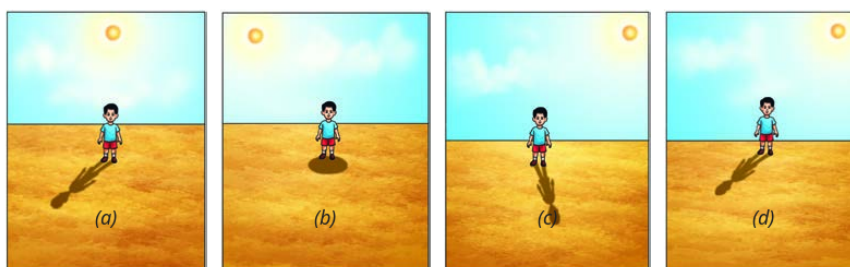


Fig. 11.17

Fig. 11.17 repeated with all four choices.

 Method choice

Extend an imaginary line from Sun through boy.

Step 1. The Sun is above and right of the boy.

Step 2. Rays travel downwards and leftwards.

Step 3. The shadow must stretch to the lower left, as in (d).

Final Answer: Image (d) is correct.

EXPERT'S SOLUTION : Sneha Gupta, B.Tech Engineering Physics, IIT Bombay

Strategic angle. A shadow points away from a source. We need only the two positions.

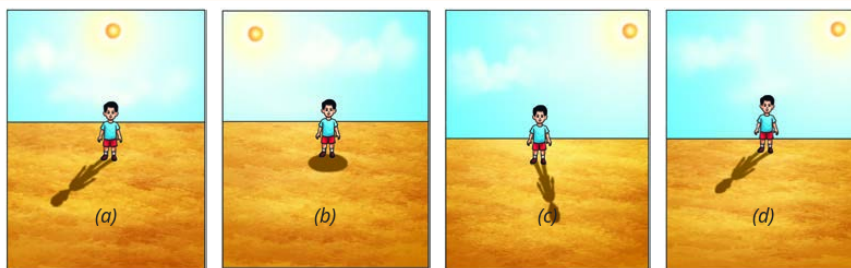


Fig. 11.17

Fig. 11.17 repeated for the expert explanation.

Step 1. Locate the Sun at upper right.

Step 2. Join it to the boy.

Step 3. Extend that direction beyond him to lower left.

That direction matches one choice.

Final Answer: Option (d).

Q 11.5 The shadow of a ball is formed on a wall by placing the ball in front of a fixed torch as shown in Fig. 11.18. In scenario (i) the ball is closer to the torch, while in scenario (ii) the ball is closer to the wall. Choose the most accurate representation of the shadows formed in both scenarios from the options provided (a and b).

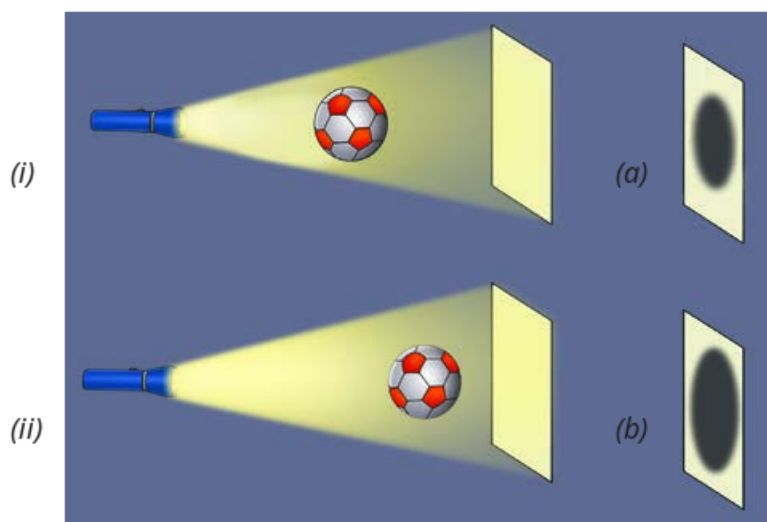


Fig. 11.18

Fig. 11.18, NCERT Curiosity Class 7 Science, Chapter 11.

Source: Official NCERT Curiosity 2026-27, Exercise Q5, printed p. 166 • Difficulty: Beginner • Intent: Application

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: shadow size changes with object-source distance. Compare the spreading blocked cone in both arrangements: nearer the torch gives the larger shadow. **Answer:** (i) to (b), (ii) to (a).

SOLUTION

Concept used. Torch rays spread. A ball near the torch blocks a wider cone and makes a larger wall shadow.

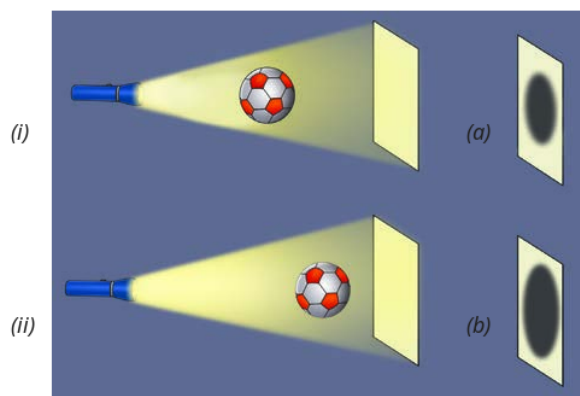


Fig. 11.18

Source Fig. 11.18 kept with the detailed solution.

✗ Trap warning

Moving the ball nearer the wall makes its shadow smaller, not larger.

Step 1. In (i), the ball is near the torch. Its wall shadow is large, which matches option (b).

Step 2. In (ii), it is near the wall. Its shadow is smaller, which matches option (a).

Step 3. Therefore the complete mapping is (i) to (b), and (ii) to (a).

Final Answer: Scenario (i) → option (b); scenario (ii) → option (a).

EXPERT'S SOLUTION : Arjun Mehta, M.Sc Physics, IIT Kanpur

Picture-first. Treat the beam as an expanding cone. The blocked region keeps spreading after the ball.

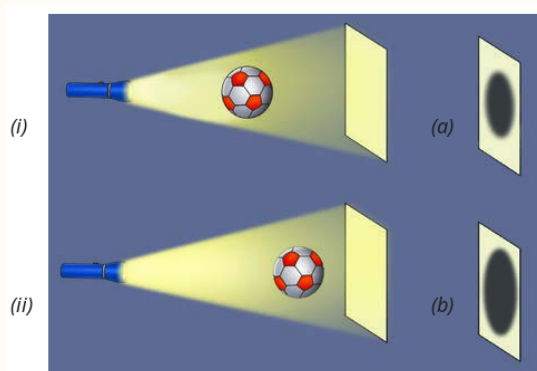


Fig. 11.18

Source Fig. 11.18 kept with the expert solution.

Step 1. Near the torch, much distance remains for spreading, so scenario (i) matches the large shadow in (b).

Step 2. Near the wall, little distance remains, so scenario (ii) matches the small shadow in (a).

Step 3. Check both pairings against the two standalone choices.

This is also seen with hand shadows.

Final Answer: (i) $\rightarrow$ (b), and (ii) $\rightarrow$ (a).

Q 11.6 Based on Fig. 11.18, match the position of the torch in Column A with the characteristics of the ball's shadow in Column B.

Column A

If the torch is close to the ball

If the torch is far away

If the ball is removed from the set-up

If two torches are present in the set-up
on the left side of the ball

Column B

The shadow would be smaller

The shadow would be larger

Two shadows would appear on the
screen

A bright spot would appear on the
screen

Source: Official NCERT Curiosity 2026-27, Exercise Q6, printed p. 166 • Difficulty: Intermediate • Intent: Application

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: source distance and number control shadows. Classify each change as distance, blocker removal, or extra source. **Answer:** close-larger; far-smaller; removed-bright; two torches-two shadows.

SOLUTION

Concept used. Shadow size depends on source distance. Removing the blocker passes light. Separate sources form separate shadows.

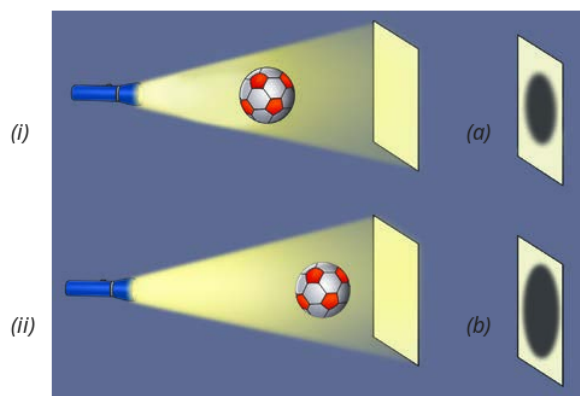


Fig. 11.18

Fig. 11.18 repeated with scenarios and answer choices.

Method choice

Check whether each change affects distance, blocker, or sources.

Step 1. Torch close to ball: larger shadow.

Step 2. Torch far away: smaller shadow.

Step 3. Ball removed: bright spot.

Step 4. Two torches: two shadows.

Final Answer: Close-larger; far-smaller; removed-bright; two torches-two shadows.

EXPERT'S SOLUTION : Aditi Nair, Ph.D Physics, TIFR Mumbai

Structural observation. Each setup changes one feature of the light path.

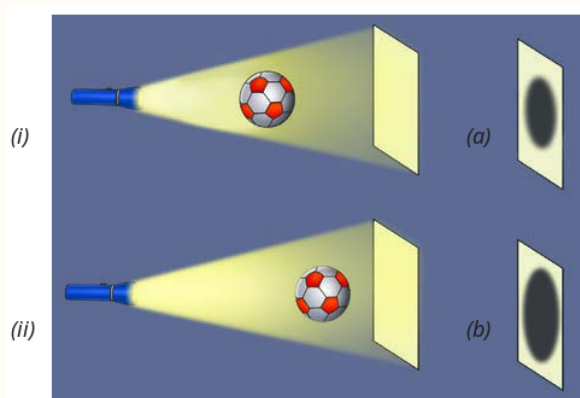


Fig. 11.18

Fig. 11.18 repeated for the expert explanation.

Step 1. A nearby source produces more enlargement.

Step 2. A distant source produces less enlargement.

Step 3. No ball means no shadow.

Step 4. Two sources make two blocked paths.

The four outcomes follow directly.

Final Answer: Close-larger; far-smaller; removed-bright; two torches-two shadows.

Q 11.7 Suppose you view the tree shown in Fig. 11.19 through a pinhole camera. Sketch the outline of the image of the tree formed in the pinhole camera.



Fig. 11.19

Fig. 11.19, NCERT Curiosity Class 7 Science, Chapter 11.

Source: Official NCERT Curiosity 2026-27, Exercise Q7, printed p. 167 • Difficulty: Beginner • Intent: Application

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: pinhole-camera inversion. Rays from the tree's top and base cross at the pinhole, so rotate the whole outline through 180° . **Answer:** draw an upside-down tree.

SOLUTION

Concept used. A pinhole camera forms an inverted image because top and bottom rays cross at the hole.



Fig. 11.19

Source Fig. 11.19, upright reference tree.

 Concept recall

The image is upside down because rays cross.

Step 1. Use the same tree outline shown in Fig. 11.19.

Step 2. Rotate the complete outline through 180° .

Step 3. The canopy appears below and the long trunk with its base appears above.



Clean inverted-tree answer outline, without the source caption

Final Answer: Draw an upside-down tree.

EXPERT'S SOLUTION : Rohit Verma, M.Sc Astrophysics, IIT Kanpur

Picture-first. Follow rays from two ends of the tree.



Fig. 11.19

Source Fig. 11.19 kept with the expert explanation.

Step 1. A top ray reaches the lower screen.

Step 2. A base ray reaches the upper screen.

Step 3. Join the points with the tree outline.



The same canopy, branches, trunk, and base appear inverted.

Crossing rays cause inversion.

Final Answer: The tree image is inverted.

Q 11.8 Write your name on a piece of paper and hold it in front of a plane mirror such that the paper is parallel to the mirror. Sketch the image. What difference do you notice? Explain the reason for the difference.

Source: Official NCERT Curiosity 2026-27, Exercise Q8, printed p. 167 • Difficulty: Beginner • Intent: Application

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: lateral inversion by a plane mirror. Reflect each letter point to the corresponding position behind the mirror while keeping top and bottom unchanged. **Answer:** the name appears left-right reversed.

SOLUTION

Concept used. A plane mirror causes lateral inversion. Reflection makes rays appear to come from corresponding points behind the mirror. This reverses the front-back direction. When we face the object and its image, that reversal is perceived as left-right interchange. Top and bottom stay unchanged.

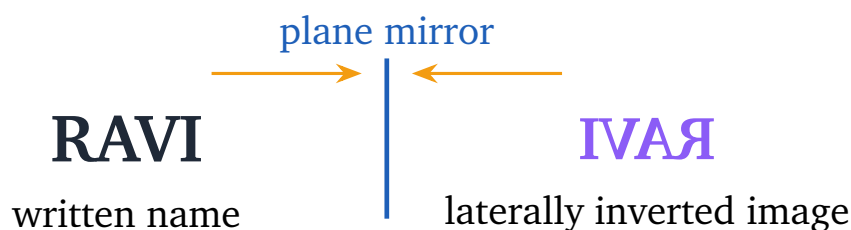
♥ Concept recall

AMBULANCE is reversed on vehicles for mirror reading.

Step 1. Face the name towards the mirror.

Step 2. Copy every letter in its left-right reversed form.

Step 3. Reflected rays appear to come from behind the mirror.



Final Answer: The name appears laterally inverted.

EXPERT'S SOLUTION : Neha Singh, M.Tech Applied Physics, IIT Delhi

Strategic angle. Compare one letter at a time.

Step 1. A left mark appears at the image's right.

Step 2. Sketch each letter with left and right reversed.

Step 3. Keep its height and top-bottom direction unchanged.

left-right reversal

RAVI

object



IVAY

mirror image

The mirror sends rays back to the eye. Their backward extensions locate the virtual image behind the mirror. The front-back direction is therefore reversed. Facing the object and image makes us perceive this as a left-right reversal. This is not an upside-down turn.

Final Answer: Sketch a left-right reversed name.

Q 11.9 Measure the length of your shadow at 9 AM, 12 PM, and 4 PM with the help of your friend. Write down your observations: (i) At which of the given times is your shadow the shortest? (ii) Why do you think this happens?

Source: Official NCERT Curiosity 2026-27, Exercise Q9, printed p. 167 • Difficulty: Beginner • Intent: Observation and application

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: shadow length depends on the Sun's height. Compare the three measurements; steeper midday rays give the least horizontal length.

Answer: about 12 PM, because the Sun is highest.

SOLUTION

Concept used. A higher Sun gives steeper rays and a shorter shadow.

 Concept recall

Lengths vary, but midday is usually shortest among these times.

Step 1. (i) Among the given times, the shadow is usually shortest at about 12 PM.

Step 2. (ii) The Sun is highest then. Its rays fall most steeply, so the shadow covers the least horizontal distance. At 9 AM and 4 PM, slanting rays make longer shadows.

Final Answer: (i) About 12 PM. (ii) The Sun is highest, so its steep rays form the shortest shadow.

EXPERT'S SOLUTION : Kavya Rao, M.Sc Physics, IIT Madras

Quick reading. Use sunlight angle, not the clock alone.

Step 1. (i) Compare the three measurements. The smallest should occur near 12 PM.

Step 2. (ii) At that time the Sun has its greatest elevation among the three observations. Steeper rays place the shadow tip nearer the feet. Morning and afternoon rays are more slanted, so their shadows extend farther.

Measure from feet to the shadow tip each time.

Final Answer: (i) 12 PM. (ii) The Sun is highest and its rays are steepest.

Q 11.10 On the basis of following statements, choose the correct option.

Statement A: Image formed by a plane mirror is laterally inverted.

Statement B: Images of alphabets T and O appear identical to themselves in a plane mirror.

- (i) Both statements are true
- (ii) Both statements are false
- (iii) Statement A is true, but Statement B is false
- (iv) Statement A is false, but Statement B is true

Source: Official NCERT Curiosity 2026-27, Exercise Q10, printed p. 167 • Difficulty: Intermediate • Intent: Concept check

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: lateral inversion and vertical symmetry. Test Statement A with the mirror rule, then reverse T and O; their matching halves make them look unchanged. **Answer:** option (i), both statements are true.

SOLUTION

Concept used. A mirror interchanges left and right. Vertical symmetry can hide the visible change.

Concept recall

Matching halves mean reversal may look unchanged.

Step 1. A is true because mirror images are laterally inverted.

Step 2. T has vertical symmetry.

Step 3. O has vertical symmetry. Therefore B is true.

Final Answer: Option (i): Both statements are true.

EXPERT'S SOLUTION : Ishaan Bhat, B.Tech Engineering Physics, IIT Bombay

Structural observation. Inversion still occurs, but symmetric letters look unchanged.

Step 1. Apply the mirror rule to A. It is true.

Step 2. Reverse T; it looks the same.

Step 3. Reverse O; it also looks the same.

The mirror has not stopped inverting them.

Final Answer: Both A and B are true.

Q 11.11 Suppose you are given a tube of the shape shown in the Fig. 11.20 and two plane mirrors smaller than the diameter of the tube. Can this tube be used to make a periscope? If yes, mark where you will fix the plane mirrors.

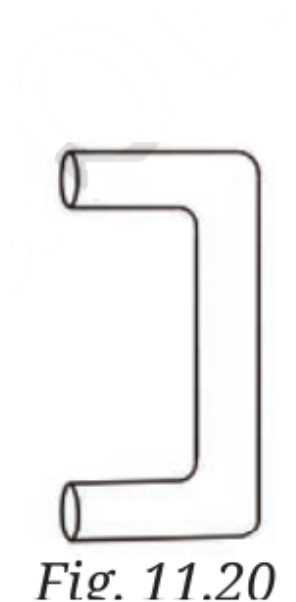


Fig. 11.20, NCERT Curiosity Class 7 Science, Chapter 11.

Source: Official NCERT Curiosity 2026-27, Exercise Q11, printed p. 167 • Difficulty: Beginner • Intent: Application

QUICK SOLUTION

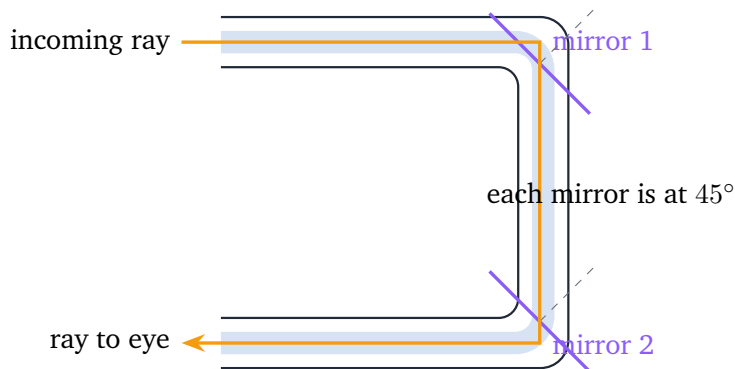
Chapter 11: Light: Shadows and Reflections. Concept: the law of reflection. Place two parallel mirrors diagonally at the bends so each turns the ray through the tube. **Answer:** yes, fix one 45° mirror at each bend.

SOLUTION

Concept used. The law of reflection states that the angle of incidence equals the angle of reflection, both measured from the normal. Two parallel plane mirrors at 45° turn light through the tube.

✗ Trap warning

Mirrors without the diagonal tilt cannot guide light through both bends.



Step 1. Put one mirror at the upper bend, tilted 45° .

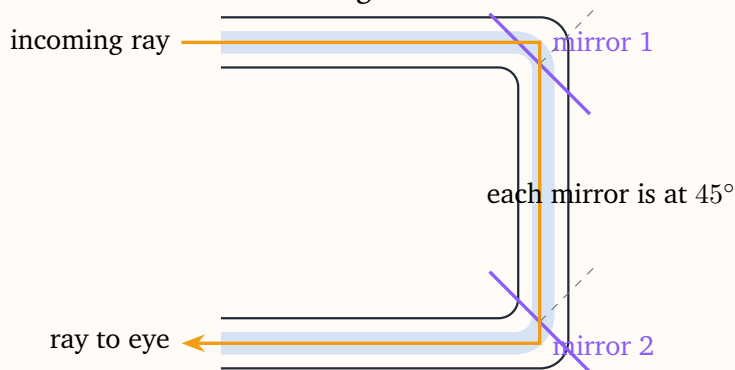
Step 2. Put the second at the lower bend, parallel to the first.

Step 3. Light enters, reflects down, then reflects out.

Final Answer: Yes. Fix parallel 45° mirrors at the two bends.

EXPERT'S SOLUTION : Diya Kapoor, M.Sc Physics, IIT Madras

Picture-first. The law of reflection gives equal incidence and reflection angles at both mirrors. The ray needs two direction changes.



Step 1. Face the upper mirror towards the top opening.

Step 2. Face the lower mirror towards the first mirror.

Step 3. Check the path: in, down, then out.

This makes a simple periscope.

Final Answer: Use one parallel 45° mirror at each bend.

Q 11.12 We do not see the shadow on the ground of a bird flying high in the sky. However, the shadow is seen on the ground when the bird swoops near the ground. Think and explain why it is so.

Source: Official NCERT Curiosity 2026-27, Exercise Q12, printed p. 167 • Difficulty: Beginner • Intent: Concept check

QUICK SOLUTION

Chapter 11: Light: Shadows and Reflections. Concept: umbra and penumbra from an extended source. Compare bird-ground distance: solar rays fill a distant blocked region but have little space to spread nearby. **Answer:** a high shadow is faint; a low shadow is dark and visible.

SOLUTION

Concept used. The Sun is an extended source. It makes a dark full shadow and a lighter partial shadow.

♥ Concept recall

A hand shadow also sharpens near a wall.

Step 1. Different parts of the Sun's broad disc send rays towards the bird from slightly different directions.

Step 2. Far below a high bird, those rays enter and fill much of the region blocked from other parts of the Sun. The full shadow can end before reaching the ground, while the partial shadow spreads and becomes too faint to notice.

Step 3. Near the ground, there is too little distance for rays from different parts of the Sun to fill the blocked region. The shadow stays dark and sharp.

Final Answer: The high shadow is faint and spread out; the low shadow is dark and sharp.

EXPERT'S SOLUTION : Yash Desai, Ph.D Physics, IISc Bangalore

Strategic angle. Treat the ground as a screen and compare its distance from the bird.

Step 1. The Sun is not a point source. Rays from different points across its disc reach the bird at slightly different angles.

Step 2. At a large bird-ground separation, rays from one part of the Sun reach regions blocked from another part. They progressively fill the shadow region, so only a broad, weak partial shadow reaches the ground.

Step 3. When the bird swoops low, the rays have little distance to spread into that region. A compact dark shadow reaches the ground and is easy to see.

The bird always blocks some light, but the shadow contrast changes with distance.

Final Answer: Different solar rays fill the distant shadow region, while a nearby shadow remains dark and visible.

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Key Takeaways

- Luminous objects emit their own light.
- Light travels in straight lines.
- Opaque objects form shadows.
- Pinhole images are inverted.
- Plane mirrors cause lateral inversion.

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