CBSE CLASS X

Science (086)

ANSWER KEY

AI-generated question paper

Code: LC35R5 **Questions: 14** **Maximum Marks: 26** **Generated: 2026-06-25 17:44**

SELECTIONS USED

Subject	Science
Lessons	10 The Human Eye and the Colourful World
Level of understanding	Initial understanding
Question selection	Curated chapter coverage (~3 questions per section)
Model	claude-sonnet-4-6

Composition — Difficulty: 7 straightforward · 6 medium · 1 deep | Types: 8 Short · 6 Very short

Q1. straightforward initial-understanding § Chapter Introduction **[1]**

What is the role of the crystalline lens in the human eye?

◆ **The Human Eye and the Colourful World**

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

The crystalline lens provides finer adjustment of focal length to focus objects at different distances clearly on the retina.

Source: Chapter 10, Section 10.1 – The Human Eye

Explanation

The key phrase from the textbook is **"finer adjustment of focal length"** — examiners expect this exact idea. Note that most refraction occurs at the cornea; the lens only fine-tunes focus. Avoid writing that the lens "does all the refraction," as that contradicts the source.

Q2. medium | initial-understanding | § 10.1 THE HUMAN EYE **[3]**

What is the role of the ciliary muscles in enabling the eye to see both nearby and distant objects clearly?

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

Ciliary muscles control the curvature of the eye lens, thereby adjusting its focal length — this ability is called **accommodation**.

- **For distant objects:** Ciliary muscles *relax*, the lens becomes thin, and its focal length *increases*. This focuses the image of distant objects clearly on the retina.
- **For nearby objects:** Ciliary muscles *contract*, the lens becomes thicker (curvature increases), and its focal length *decreases*. This focuses the image of nearby objects clearly on the retina.

Thus, by continuously adjusting the lens shape, ciliary muscles enable the eye to see both nearby and distant objects clearly.

Source: Chapter 10, Section 10.1.1 – Power of Accommodation

Explanation

- The examiner wants three clear points: (1) what ciliary muscles do, (2) action for distant vision, (3) action for near vision. Each is worth ~1 mark.
- Use the key terms: **relax/contract**, **thin/thick**, **focal length increases/decreases** — these are the exact words from the textbook and earn full marks.
- The word **accommodation** should appear — it is the technical term for this property.
- Do not mix up: *relaxed = thin lens = long focal length = distant objects*; *contracted = thick lens = short focal length = nearby objects*. This is a common error students make in exams.

Q3. medium | initial-understanding | § 10.1.1 Power of Accommodation **[2]**

When you shift your gaze from a distant tree to a book held close to you, what change occurs in your eye lens, and which structure brings about this change?

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

When shifting gaze from a distant tree to a nearby book, the **ciliary muscles contract**, increasing the curvature of the eye lens. The lens becomes **thicker**, and its **focal length decreases**, allowing the eye to focus the nearby object clearly on the retina. It is the **ciliary muscles** that bring about this change.

Source: Chapter 10, Section 10.1.1 Power of Accommodation

Explanation

The examiner expects two things for 2 marks: (1) the change in the lens — becomes thicker/more curved, focal length decreases; (2) the structure responsible — ciliary muscles (contract). Avoid vague terms like "the eye adjusts"; be specific. The word "accommodation" can be used as a bonus term but is not compulsory here.

Q4. straightforward | initial-understanding | § 10.2 DEFECTS OF VISION AND THEIR CORRECTION **[1]**

A person can read a newspaper held at arm's length but struggles to read the name board of a shop across the street. Which defect of vision does this person have, and what type of lens corrects it?

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

The person has **myopia (near-sightedness)**. It is corrected by using a **concave lens** of suitable power.

Explanation

The key clue is: can read nearby (newspaper at arm's length) but cannot see distant objects (name board across the street) — this is the classic description of myopia. Examiners expect both the defect name (with its alternative name) and the corrective lens type for full credit.

Q5. medium | initial-understanding | § 10.2 DEFECTS OF VISION AND THEIR CORRECTION **[2]**

A hypermetropic person cannot see nearby objects clearly. (i) Where does the image of a nearby object form in a hypermetropic eye? (ii) Name the type of corrective lens used and state how it helps the person see clearly.

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

(i) In a hypermetropic eye, the image of a nearby object is formed **behind (beyond) the retina** instead of on it.

(ii) A **convex (converging) lens** is used for correction. It provides the additional converging power needed, bringing the image forward onto the retina so the person can see nearby objects clearly.

Source: Chapter 10, Section 10.2 – Defects of Vision and their Correction

---

Explanation

- Examiners want both parts answered distinctly — don't merge them.
- Key phrase for (i): "behind/beyond the retina" — not "in front."
- For (ii): name the lens *and* state its action (converges light / adds focusing power → image falls on retina). One without the other loses a mark.
- Avoid vague phrases like "helps see better" — always link to **image falling on the retina**.

Q6. straightforward | initial-understanding | § 10.2 DEFECTS OF VISION AND THEIR CORRECTION **[1]**

What is presbyopia, and what structural changes in the eye cause it?

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

Presbyopia is an age-related defect where the near point recedes, making nearby objects blurry. It is caused by gradual weakening of ciliary muscles and diminishing flexibility of the eye lens.

Explanation

For a 1-mark question, examiners expect: (1) a brief definition/symptom and (2) the two structural causes — weakened ciliary muscles and reduced flexibility of the eye lens. Both causes must be mentioned to score full marks; the definition alone is insufficient.

Q7. medium | initial-understanding | § 10.2 DEFECTS OF VISION AND THEIR CORRECTION **[2]**

A myopic eye has the image of a distant object forming in front of the retina instead of on it. State TWO possible structural reasons why this happens in the eye.

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

In a myopic eye, the image of a distant object forms in front of the retina due to the following structural reasons:

1. **Excessive curvature of the eye lens** — This increases the converging power of the lens, causing light rays to focus before reaching the retina.
2. **Elongation of the eyeball** — The eyeball becomes too long, so the retina lies farther back than the focal point.

Source: Chapter 10, Section 10.2 (a) — Myopia

Explanation

Examiners specifically look for these two causes as stated in the NCERT textbook. Write both clearly with a brief reason for each — just naming them without explanation may not fetch full marks. Avoid writing about correction (concave lens) unless asked; this question only asks for structural reasons.

Q8. deep | initial-understanding | § 10.2 DEFECTS OF VISION AND THEIR CORRECTION **[3]**

An elderly person uses bi-focal lenses. (i) What are bi-focal lenses? (ii) Describe the function of each portion of a bi-focal lens. (iii) Which defect(s) of vision make bi-focal lenses necessary?

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

(i) Bifocal lenses are special lenses that have two different portions — an upper portion and a lower portion — each with a different focal length.

(ii) Function of each portion:

- **Upper portion** — made of a concave lens; used for distant vision (corrects myopia).
- **Lower portion** — made of a convex lens; used for near vision/reading (corrects hypermetropia).

(iii) Defects corrected:
Bifocal lenses are necessary when a person suffers from both **myopia (short-sightedness)** and **hypermetropia (long-sightedness)** simultaneously. This condition commonly occurs in old age and is called **presbyopia**.

Explanation

- Examiners expect all three parts answered clearly and separately.
- Key terms to use: *concave* (upper/distant), *convex* (lower/near), *myopia*, *hypermetropia*, *presbyopia*.
- The word "presbyopia" scores marks in part (iii) — do not omit it.
- Keep each part concise; this is a 3-mark question so ~1 mark per part.

Q9. straightforward | initial-understanding | § 10.3 REFRACTION OF LIGHT THROUGH A PRISM **[1]**

When white light passes through a glass prism, the emergent ray does not travel in the same direction as the incident ray. What is the name given to the angle between the emergent ray and the direction of the incident ray?

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

The angle between the emergent ray and the direction of the incident ray is called the **angle of deviation** ($\angle D$).

Source: Chapter 10, Section 10.3

Explanation

Examiners expect the exact term "angle of deviation." Note that this is different from the angle of refraction or angle of emergence. The peculiar inclined shape of the prism causes the emergent ray to deviate from the original direction of the incident ray, and this angular difference is the angle of deviation.

Q10. straightforward | initial-understanding | § 10.4 DISPERSION OF WHITE LIGHT BY A GLASS PRISM **[1]**

What is the name given to the splitting of white light into its component colours when it passes through a glass prism?

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

The splitting of white light into its component colours (VIBGYOR) when it passes through a glass prism is called **dispersion**.

Source: Chapter 10, Section 10.4 – Dispersion of White Light by a Glass Prism

---

Explanation

The examiner expects the single key term **dispersion**. You may add that the resulting band of colours is called a **spectrum** for completeness, but the direct answer to "what is the name given to..." is dispersion. Remember VIBGYOR as the order of colours produced.

Q11. medium | initial-understanding | § 10.4 DISPERSION OF WHITE LIGHT BY A GLASS PRISM **[3]**

When white light passes through a glass prism and forms a spectrum, which colour bends the least and which bends the most?

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

When white light passes through a glass prism, it undergoes **dispersion** — splitting into its seven component colours (VIBGYOR).

- **Red** light bends the **least** (smallest angle of deviation).
- **Violet** light bends the **most** (largest angle of deviation).

Different colours of light bend through different angles with respect to the incident ray as they pass through the prism. This is why the rays of each colour emerge along different paths, forming a distinct spectrum on the screen with red at one end and violet at the other.

Source: Chapter 10, Section 10.4 — Dispersion of White Light by a Glass Prism

---

Explanation

- The examiner expects you to name both colours clearly and directly — **Red (least)** and **Violet (most)**.
- Mentioning **dispersion** and **VIBGYOR** shows conceptual understanding and earns method marks.
- The reason (different colours bend by different angles) is essential for full marks on a 3-mark question.
- Do not confuse the order: Red is at the top of the spectrum (least bent), Violet at the bottom (most bent).

Q12. medium | initial-understanding | § 10.5 ATMOSPHERIC REFRACTION **[3]**

Stars twinkle but planets do not. Why?

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

Stars twinkle because they are extremely far away and act as **point-sized sources** of light. As starlight travels through the earth's atmosphere, it undergoes continuous refraction through layers of varying refractive index. Since atmospheric conditions keep changing, the amount of starlight reaching our eye fluctuates — the star appears alternately brighter and fainter, causing the **twinkling effect**.

Planets do not twinkle because they are much closer to the earth and appear as **extended sources** (a collection of many point-sized sources). The variations in light from all these individual points average out to zero, nullifying the twinkling effect.

Source: Chapter 10, Section 10.5 — Atmospheric Refraction

Explanation

- The key contrast examiners look for: **point source (star) vs extended source (planet)**.
- Mention **atmospheric refraction** and **changing refractive index** for stars — these are the cause.
- For planets, the phrase **"average out to zero"** (or equivalent) is important to include.
- Do not confuse twinkling with scattering — it is a refraction phenomenon.
- 3 marks are typically split: 1.5 for stars + 1.5 for planets, so give roughly equal weight to both.

Q13. straightforward | initial-understanding | § 10.5 ATMOSPHERIC REFRACTION **[1]**

Due to atmospheric refraction, does the Sun appear to rise earlier or later than it actually does? Give a reason for your answer.

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

The Sun appears to rise **earlier** than it actually does. Due to atmospheric refraction, light from the Sun bends towards the normal as it enters the denser atmosphere, making the Sun visible about 2 minutes before it actually crosses the horizon.

Explanation

The key points examiners look for: (1) the correct answer — "earlier," and (2) the reason linked to atmospheric refraction bending sunlight so the Sun is visible before actual sunrise. The passage specifically states "The Sun is visible to us about 2 minutes before the actual sunrise... because of atmospheric refraction." Mentioning "2 minutes" adds precision but is not strictly required for 1 mark.

Source: Chapter 10, Section 10.5 (Advance sunrise and delayed sunset)

Q14. straightforward | initial-understanding | § 10.6 SCATTERING OF LIGHT **[2]**

Why does the sky appear blue during the day?

◆ The Human Eye and the Colourful World

Generated by claude-sonnet-4-6 · 2026-06-26 01:06 · grounding rag

Model Answer

The sky appears blue due to **scattering of light** by fine particles (molecules of air and fine dust) in the atmosphere. These particles are smaller than the wavelength of visible light and scatter shorter wavelengths (blue light) much more strongly than longer wavelengths (red light). The scattered blue light enters our eyes, making the sky appear blue.

Source: Chapter 10, Section 10.6.2 – Why is the colour of the clear Sky Blue?

Explanation

- **Two key points** the examiner expects: (1) scattering of sunlight by fine atmospheric particles, and (2) blue light (shorter wavelength) is scattered more than red light (longer wavelength).
- Mention that scattered blue light reaches our eyes — this completes the explanation.
- Avoid vague statements like "light bends" — use the correct term **scattering**.
- A bonus fact (not required but useful): if there were no atmosphere, the sky would appear dark — shows depth of understanding.

Available for free from:
https://cbsegrade10studyguide.com
https://github.com/orgs/cbse-free-resources/repositories