CLASS 10 SCIENCE EXTRA QUESTIONS

Class 10 Science Chapter 9 Extra Questions – Light: Reflection and Refraction (HOTS)

For complete step-by-step answers and a quick summary, check the Class 10 Science Chapter 9 Solutions and Class 10 Science Chapter 9 Revision Notes. These Class 10 Science Chapter 9 important questions are handy for last-minute exam practice.

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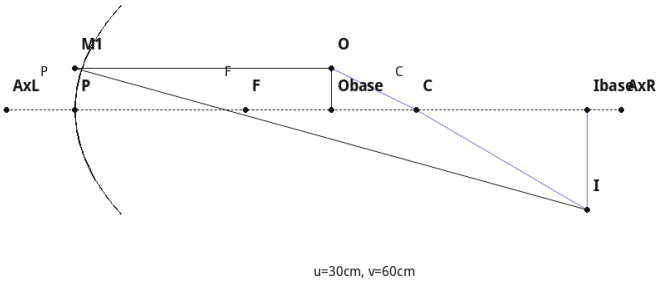
Class 10 Science Chapter 9 Extra Questions (HOTS Level) – Light: Reflection and Refraction

Q1 (Fresh-number mirror-formula problem). An object 6 cm tall is placed 30 cm in front of a concave mirror of focal length 20 cm. Find the image position, size, and nature.



u=30cm, v=60cm

Concave mirror, f=20cm: object at u=30cm -> real, inverted, magnified (2x) image at v=60cm, height 12cm.

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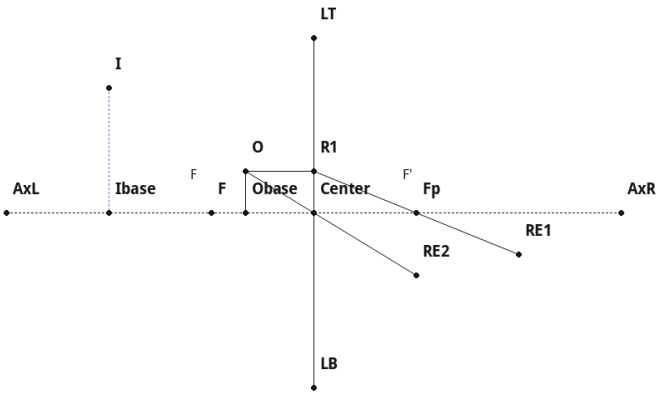
Answer: 1/v = 1/f − 1/u = -1/20 − (-1/30) = -3/60+2/60 = -1/60, so v = -60 cm. m = -v/u = -(-60)/(-30) = -2, image height = -12 cm. **Image is 60 cm in front of the mirror, 12 cm tall, real, inverted, magnified.**

Q2 (Reverse-engineering). A convex lens produces a virtual, erect image 3 times the size of the object placed 10 cm from the lens. Find the focal length.



Convex lens, f=15cm: object at u=10cm (within F) -> virtual, erect, magnified (3x) image at v=30cm, same side as object.

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Answer: For a virtual, erect, magnified image from a convex lens, the object is between the lens and the focus, and m = v/u is positive. m=3, u=-10 cm, so v = m × u = 3 × (-10) = -30 cm (virtual image, same side as object). Using 1/v − 1/u = 1/f: 1/(-30) − 1/(-10) = -1/30+1/10 = (-1+3)/30 = 2/30 = 1/15, so **f = 15 cm**.

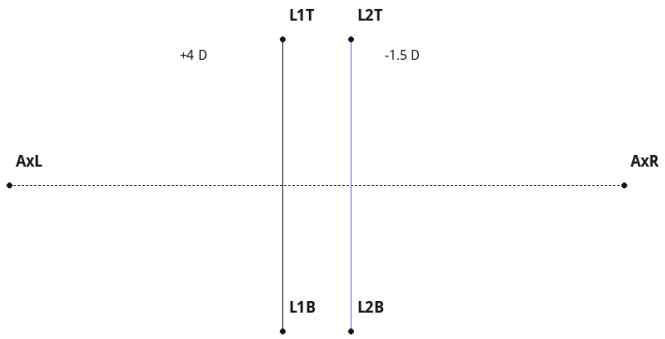
Q3 (Assertion-Reason). Assertion (A): A concave mirror can form both real and virtual images depending on the object's position.

Reason (R): A convex mirror can also form both real and virtual images depending on the object's position. Options: (a) Both true, R explains A. (b) Both true, R does not explain A. (c) A true, R false. (d) A false, R true.
Answer: (c). A is true (concave mirrors form virtual images when the object is within the focal length, and real images otherwise). R is false — a convex mirror always forms only virtual, erect, diminished images regardless of object position.

Q4 (General/abstract proof-style reasoning). Show, using the mirror formula, that a concave mirror forms a virtual image whenever the object distance |u| is less than the focal length |f|.
Answer: With sign convention u=-x (0<x<f) and f=-f (concave, f>0): $1/v = 1/f - 1/u = -1/f + 1/x = (f-x)/(fx)$. Since x<f, (f-x)>0, so 1/v>0, meaning v is positive — a positive image distance means the image forms behind the mirror, i.e. it is **virtual**, for any object distance less than the focal length. This generalises the concave-mirror-magnifier case.

Q5 (Multi-number word problem). Light travels from a medium of refractive index 1.2 into a medium of refractive index 1.8. If the speed of light in the first medium is 2.5×10^8 m/s, find its speed in the second medium.
Answer: Using $n_1v_1 = n_2v_2$ (since n = c/v, so nv = c = constant): $v_2 = n_1v_1/n_2 = (1.2 \times 2.5\times10^8)/1.8 =$ **1.67×10^8 m/s** (approx).

Q6 (Reciprocal power combination, fresh numbers). Two thin lenses of power +4 D and -1.5 D are placed in contact. Find the power and focal length of the combination.



Two thin lenses (+4D and -1.5D) in contact: combined power = +2.5D (f=40cm).

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Answer: Combined power P = P1+P2 = 4 + (-1.5) = **+2.5 D**. Focal length f = 1/P = 1/2.5 = **0.4 m (40 cm)**, and since P is positive, the combination behaves as a converging (convex) lens system.

Class 10 Science Chapter 9 – Solutions and Notes

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