

Reflection, refraction and images from mirrors and lenses

AP Physics 2 (algebra-based) · Test

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

This test covers the law of reflection, Snell's law, total internal reflection and images from lenses and mirrors. It lasts 45 minutes and is worth 20 points. Use $c = 3.00 \times 10^8$ m/s and show every substitution with units.

Level: AP Physics 2 (algebra-based) · **Curriculum:** AP P2 Unit 13

Time: 45 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Reflection (2 marks)

A ray strikes a plane mirror at 25° to the mirror surface.

- Calculate the angle of incidence. (1 mark)
- Calculate the angle between the incident and reflected rays. (1 mark)

Question 2 Refraction into glass (3 marks)

Light in air strikes glass of refractive index 1.60 at 50° to the normal. Use $c = 3.00 \times 10^8$ m/s.

- Calculate the speed of light in the glass. (1 mark)
- Calculate the angle of refraction. (2 marks)

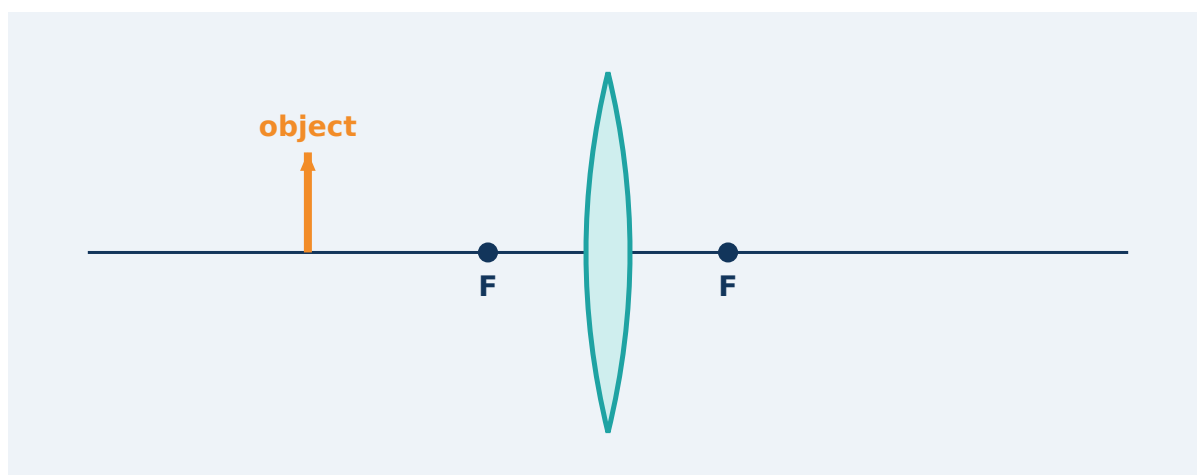
Question 3 Total internal reflection (3 marks)

A glass has refractive index 1.55.

- Calculate the critical angle for glass in air. (2 marks)
- State the two conditions needed for total internal reflection. (1 mark)

Question 4 Image from a lens (4 marks)

A converging lens has $f = 20$ cm. An object 5.0 cm tall is 50 cm from the lens.



Lens and object (not to scale).

- a. Calculate the image distance. (2 marks)
- b. Calculate the magnification. (1 mark)
- c. Describe the image. (1 mark)

Question 5 Convex mirror (3 marks)

A convex mirror has $f = -15$ cm. An object is 45 cm from the mirror.

- a. Calculate the image distance. (2 marks)
- b. State whether the image is real or virtual, and upright or inverted. (1 mark)

Question 6 Diverging lens (2 marks)

Explain why a diverging lens cannot form a real image of a real object. (2 marks)

Question 7 Bent pencil (2 marks)

A pencil standing in a glass of water looks bent at the surface. Explain why. (2 marks)

Question 8 Sign convention (1 mark)

State the sign of the focal length of a converging lens and of a concave mirror. (1 mark)