

Bending light: refraction, critical angle and lenses

Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Test

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

This test covers reflection, refraction, critical angle and lens images. Show all your working and give units. Calculators and a ruler are allowed. The paper is worth 20 marks.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** IGCSE 3.2

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

Question 1 Law of reflection (2 marks)

- State the law of reflection. (1 mark)
- A ray strikes a plane mirror at 28° to the mirror surface. Calculate the angle of reflection. (1 mark)

Question 2 Refractive index (3 marks)

- A ray in air meets a transparent plastic at an angle of incidence of 35° . The angle of refraction is 22° . Calculate the refractive index. (2 marks)
- Calculate the speed of light in the plastic. The speed of light in air is 3.0×10^8 m/s. (1 mark)

Question 3 Bending of light (2 marks)

- State whether a ray bends towards or away from the normal when it passes from air into water. (1 mark)
- Explain why. (1 mark)

Question 4 Critical angle (3 marks)

- Define critical angle. (1 mark)
- Calculate the critical angle for a heavy glass of refractive index 1.62. (2 marks)

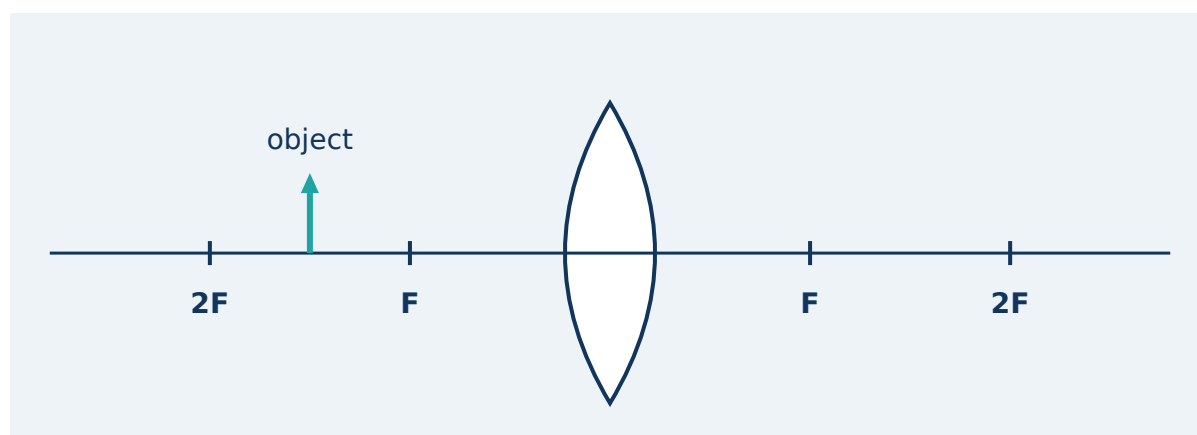
Question 5 Optical fibre (3 marks)

Explain how a ray of light travels along a glass optical fibre from one end to the other.
Include the two conditions needed. (3 marks)

Question 6 Image in a lens (4 marks)

The diagram shows an object in front of a converging lens, with F marking the principal focus on each side.

- Copy the diagram and draw two rays to locate the image. (2 marks)
- Describe the image: real or virtual, upright or inverted, larger or smaller. (2 marks)



F is the principal focus on each side of the lens and $2F$ is twice the focal length from it. The sketch is not to scale.

Question 7 Magnification (2 marks)

- A camera forms an image 1.8 cm tall of a plant 6.0 cm tall. Calculate the magnification. (1 mark)
- Calculate the height of the image of a 9.0 cm plant with the same setup. (1 mark)

Question 8 Real or virtual (1 mark)

State one difference between a real image and a virtual image. (1 mark)