

3.2 Light

Name: _____ Class: _____ Date: _____

Total: 10 marks

Objective

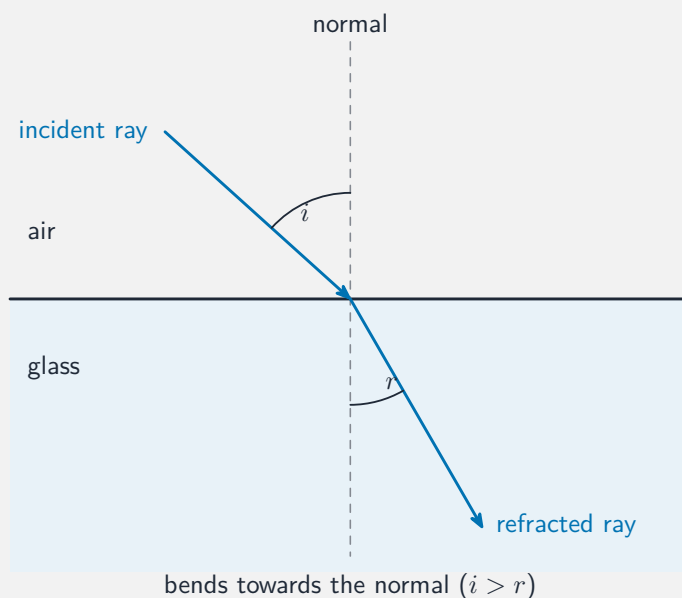
Build the skills to answer exam questions on **light** 光—**reflection** 反射, **refraction** 折射 and the **refractive index** 折射率, **total internal reflection** 全反射, and lenses.

You must be able to:

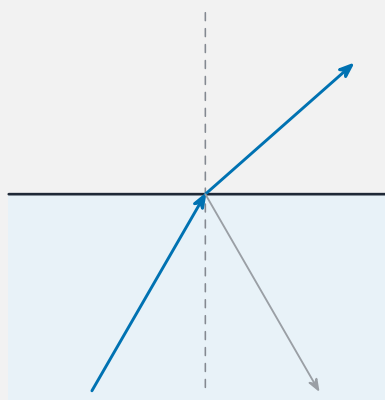
- use the law of reflection (angle i = angle r)
- use $n = \frac{\sin i}{\sin r}$ and $n = \frac{1}{\sin c}$
- describe converging lenses and total internal reflection

1 Worked examples

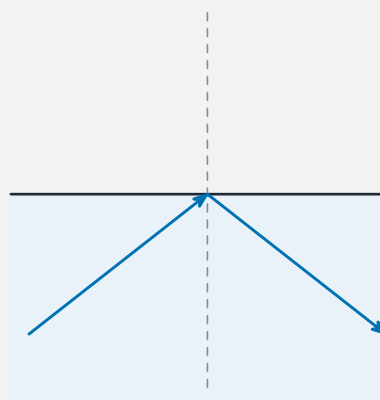
■ Refraction & TIR



Entering glass the light slows and bends towards the normal, so $i > r$



angle < critical:
light refracts out



angle > critical:
total internal reflection

Above the critical angle the light is totally internally reflected; $n = \frac{1}{\sin c}$

$$i = 60^\circ, r = 35^\circ (\sin 60 = 0.87, \sin 35 = 0.57): n = \frac{0.87}{0.57} = 1.5.$$

2 Practice

2.1 State the law of reflection. [1]

2.2 Light enters glass with $\sin i = 0.80$ and $\sin r = 0.50$. Find the refractive index. [2]

3 Exam-style questions

3.1 When light passes from air into glass it: [1]

- A speeds up and bends away from the normal
- B slows down and bends towards the normal
- C slows down and bends away from the normal
- D does not change direction

3.2 A glass has a refractive index of 1.5.

(a) Find the critical angle for the glass. [3]

(b) State one use of total internal reflection. [1]

3.3 Describe what a converging lens does to parallel rays of light, and name the point where they meet. [2]

4 Go further

You are now ready for the real exam questions on this subtopic. Open the **3.2 Light** past-paper sheet in the Library, or try these in **Practice mode**:

- 0625/21 N25 —Q17 (reflection)
- 0625/21 N25 —Q19 (refraction)
- 0625/21 N25 —Q20 (lenses)

Solutions

2.1 the angle of incidence equals the angle of reflection (both measured from the normal).

2.2 $n = \frac{\sin i}{\sin r} = \frac{0.80}{0.50} = 1.6.$

3.1 B. Light slows down and bends towards the normal entering glass.

3.2 (a) $\sin c = \frac{1}{n} = \frac{1}{1.5} = 0.667; c = 41.8^\circ.$

(b) in optical fibres (carrying light/data signals).

3.3 it bends the parallel rays inwards so they meet at a single point; this point is the principal focus.