3 Light and sound – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	**中文**	**Write it 3 times** (English)		
Light	光			
sound	声音			
electromagnetic	电磁			
normal	法线			
angle of incidence	入射角			
angle of reflection	反射角			
total internal reflection	全反射			
optical fibres	光纤			
electromagnetic waves	电磁波			
medium	介质			

Recall

From Part 1 you can describe a wave. **Light** 光 and **sound** 声音 are waves too. Here we look at how light reflects and bends, and at the family of **electromagnetic** 电磁 waves.

- Light reflects off mirrors and bends through glass.
- Light is one member of a big family of waves.

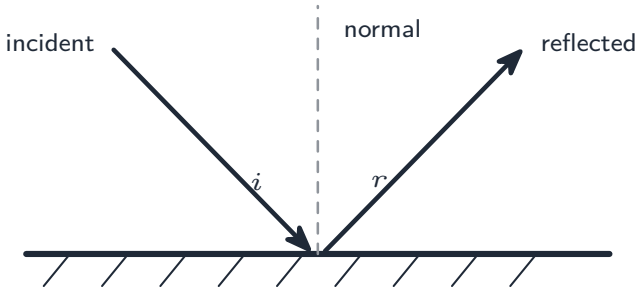
Nothing here is hard – it just adds the rules.

New ideas

Read these first, then do the Practice.

■ 1 Reflection

Angles are measured from the **normal** 法线 (a line at 90° to the surface). The **law of reflection**: the **angle of incidence** 入射角 equals the **angle of reflection** 反射角.



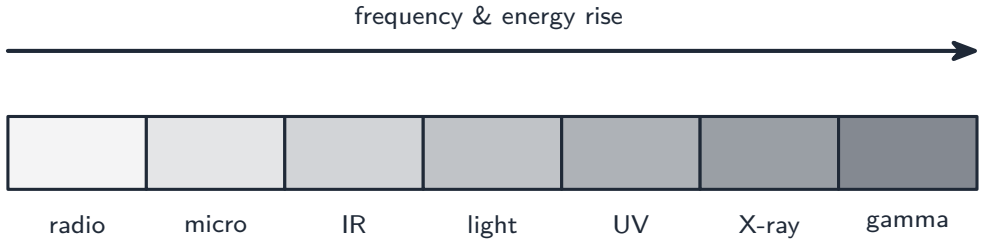
■ 2 Refraction

When light passes into a new material it changes **speed** and **bends**. Going from air **into** glass it slows down and bends **towards** the normal. The **refractive index** is $n = \dfrac{\sin i}{\sin r}$.

When light tries to leave glass at too steep an angle, it cannot get out and reflects completely – **total internal reflection** 全反射. This is how **optical fibres** 光纤 carry light signals.

■ 3 The electromagnetic spectrum

All **electromagnetic waves** 电磁波 travel at the same speed in a vacuum (3.0×10^8 m/s). In order of rising frequency:



From radio waves to gamma rays, the **wavelength falls** while the **frequency and energy rise**.

■ 4 Sound

Sound 声音 is a **longitudinal wave** made by a vibrating object. It needs a **medium** 介质, so it cannot travel through a vacuum.

Watch out: angles are always measured from the **normal** (the 90° line), not from the surface. All electromagnetic waves travel at the **same** speed in a vacuum – what changes across the spectrum is the wavelength and frequency.

Practice

Try these in order.

3.1 State the law of reflection. [1]

3.2 From which line are angles of incidence and reflection measured? [1]

3.3 Going from air into glass, does light bend towards or away from the normal? [1]

3.4 Name the effect used in optical fibres to keep light inside. [1]

3.5 List, in order of **rising frequency**: infrared, radio waves, X-rays, visible light. [2]

3.6 Why can sound not travel through a vacuum? [1]

3.7 Challenge. Light hits a mirror with an angle of incidence of 35°. State (a) the angle of reflection and (b) the angle between the incident and reflected rays. [2]