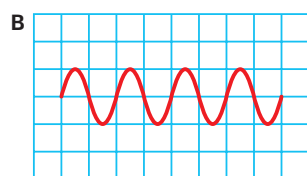
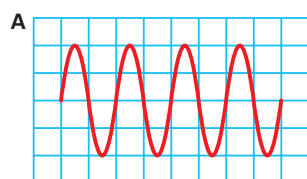


# Self-assessment practice test questions Block 3

- 1 A student is trying to measure the speed of sound in air. She stands at a distance of 50 m from a high wall. She bangs a hammer on a metal block. She hears an echo as the sound is reflected by the wall. An electronic timer shows that the echo is detected 0.31 s after the initial bang is made.
- How far has the sound travelled in this time?
  - Estimate the speed of sound in air.
  - Suggest **one** way in which the student could arrive at a more accurate value for the speed of sound.
- 2 The diagram shows two sound waves, A and B, displayed on the screen of an oscilloscope.



- The two sound waves have the same pitch. Explain how you can tell this from the diagram.
- In what way would the two sound waves sound different to an observer? Explain how you know.
- Copy part A of the diagram. Add a second trace to represent a sound wave which is quieter than trace A and of a lower pitch.

- 3 Inside a loudspeaker there is a paper cone which moves back and forth, horizontally, to produce sound waves in the air.
- Describe how the moving cone produces a sound wave. Include a description of the motion of the particles of the air.
  - How will the motion of the air particles change if the sound becomes louder?

4 When a ray of light reflects off a plane (flat) mirror, it obeys the law of reflection of light:

angle of incidence = angle of reflection

Draw a diagram to show this. Your diagram should include:

- a the incident and reflected rays
- b the normal to the surface of the mirror at the point of reflection
- c the angles of incidence and reflection.

5 A lamp is placed at a distance of 10 cm from a plane (flat) mirror. An observer can see an image of the lamp in the mirror.

- a Where is the image of the lamp? Include a diagram in your answer.
- b Is the image real or virtual?
- c The lamp has the word LAMP inscribed on it. Draw to show how this word appears in the image of the lamp?

6 A ray of light, passing through air, strikes the surface of a glass block with an angle of incidence of  $30^\circ$ .

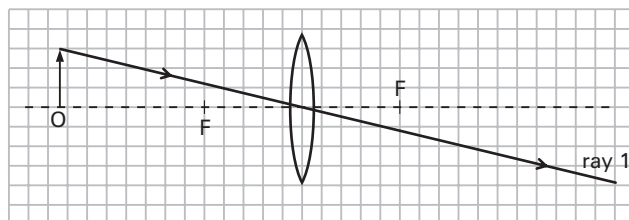
- a Draw a diagram to show this, and mark the angle of incidence.
- b On your diagram, show the approximation position of the refracted ray. Mark the angle of refraction.
- c The refractive index of the glass is 1.65. Calculate the angle of refraction.
- d In which material does light travel more quickly, air or glass?

7 A converging lens causes parallel rays of light to converge.

- a Draw a diagram to show how rays travelling parallel to the axis of a converging lens pass through the lens.
- b What name is given to the point where the rays converge?
- c What would you observe if you placed a sheet of white paper at this point?

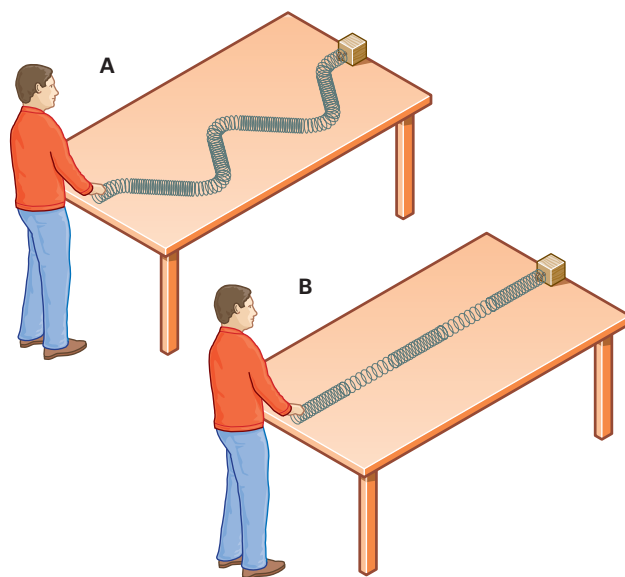


- 8 The diagram shows a partially drawn ray diagram.
- An object O is placed near a converging lens.
  - A light ray from the top of O passes undeflected through the centre of the lens.
  - F marks the principal focus on each side of the lens.



- Copy the diagram onto graph paper. Add a second ray from the top of O, travelling parallel to the principal axis of the lens.
  - Show how the ray is deflected by the lens.
  - Indicate the position of the image of O formed by the lens.
  - Is this image real or virtual?
- 9 The pitch of a sound wave depends on its frequency.
- Explain what is meant by the frequency of a wave.
  - A particular sound wave has a period of 0.0040 s. Calculate its frequency.
  - If the period of the sound wave decreases, will its pitch increase or decrease?

10 The diagram shows how two different types of waves can be made to move along a stretched spring.



- What type of wave is shown in part A of the diagram?
- How must the boy move his hand to produce the wave shown in part A? In which direction does the wave move?
- Draw a diagram to show how you would measure the wavelength of this wave.
- What type of wave is shown in part B of the diagram?
- Referring to part B of the diagram, explain what is meant by a rarefaction and a compression.

**S** 11 A trumpeter plays a musical note of frequency 360 Hz.

- The speed of sound in air is 330 m/s. Calculate the wavelength of the note.
- What will be the frequency of a note of wavelength 0.60 m?
- Which of the two notes will have a lower pitch?

**S** 12 Waves show the following different forms of behaviour:

**reflection      refraction      diffraction**

For each of the following, state which form of behaviour is being described:

- a** an echo is heard when someone shouts inside a cave
- b** waves on the surface of the sea spread out as they enter the mouth of a harbour
- c** you can hear someone speaking in the next room through an open doorway although you cannot see them
- d** a mirage is seen when light is bent as it passes through warmer air.

13 White light can be passed through a prism to form a spectrum on a screen. Red light from a laser is not split up in this way when it passes through a prism.

- a** Name the colours of the spectrum of white light, in order.
- b** What name is given to the splitting of white light into a spectrum?

**S** **c** Why is red laser light not split into a spectrum?

14 All electromagnetic waves travel at the speed of light through empty space: 300 000 000 m/s.

- a** Name the waves which appear in the electromagnetic spectrum just beyond the violet end of the visible spectrum.
- b** Name the electromagnetic waves which have the shortest wavelengths.
- c** Give **two** uses for microwaves.

**S** **d** A radio station broadcasts using radio waves of frequency 100 000 000 Hz. What is their wavelength?