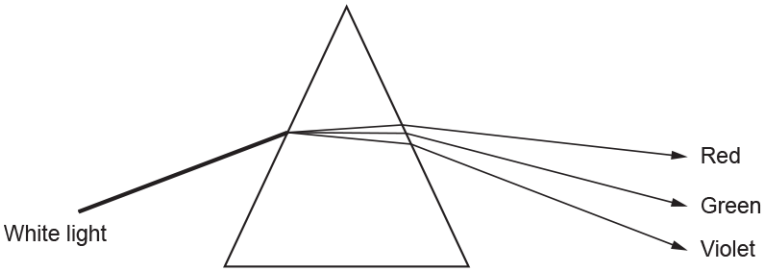
Wave Interaction (H)

1. Look at the diagram of white light as it passes through a prism.



A spectrum of colours is seen. It ranges from red to violet.

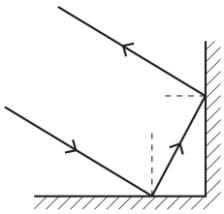
Why does the **violet** light refract **more** than the red light?

A Violet light changes frequency more than red light.
B Violet light has the largest change in speed.
C Violet light has the smallest change in speed.
D Violet light increases its speed in the glass prism.

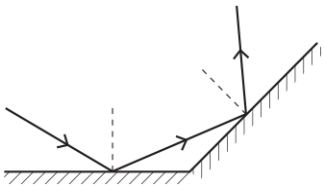
Your answer ☐ **[1]**

2. Look at the diagrams of a light ray reflecting from two identical surfaces.

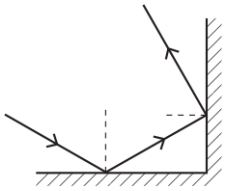
A



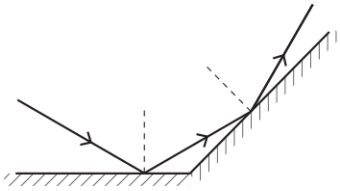
B



C



D



Which diagram is correct?

Your answer ☐

[1]

3 (a). A doctor uses an ultrasound scan instead of X-rays to measure the kidneys.

Explain why.

---

[1]

(b). The graph in **Fig. 19.1** shows how displacement of an ultrasound wave varies with distance.

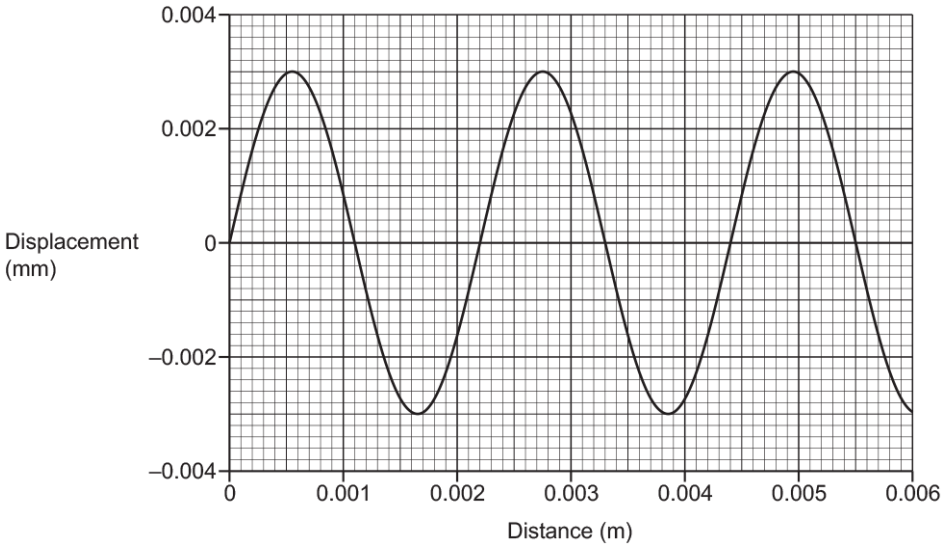


Fig. 19.1

i. Use the graph in **Fig. 19.1** to determine the wavelength of an ultrasound wave.

Wavelength = ... m **[1]**

ii. The speed of ultrasound waves in **(i)** is 4500 m / s.

Calculate the frequency of the ultrasound wave in **Fig. 19.1**.

Use the equation: wave speed = frequency × wavelength

Give your answer in **standard form** and to **2** significant figures.

Frequency = ... Hz **[4]**

(c). Doctors can use an ultrasound scan to measure the size of a person's kidney.

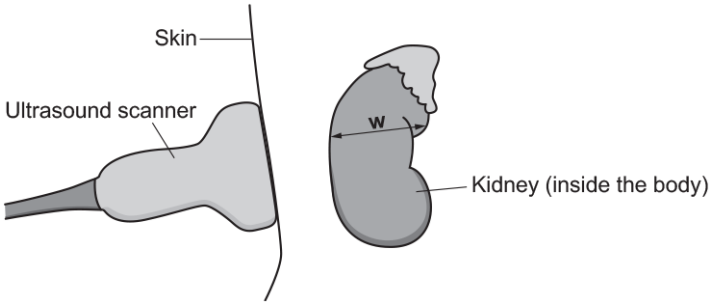


Fig. 19.2

Complete the sentences using the words below.

Each word may be used once, more than once, or not at all.

Increases **Decreases** **Stays the same**

The ultrasound scanner is made from a solid ceramic material.

As the wave enters the body, the speed ..... .

As the wave enters the body, the frequency ..... .

[2]

(d).

i. Explain what happens to the ultrasound wave when it reaches the kidney.

---**[2]**

ii. **Fig. 19.2** shows the thickness of the kidney, **w**.

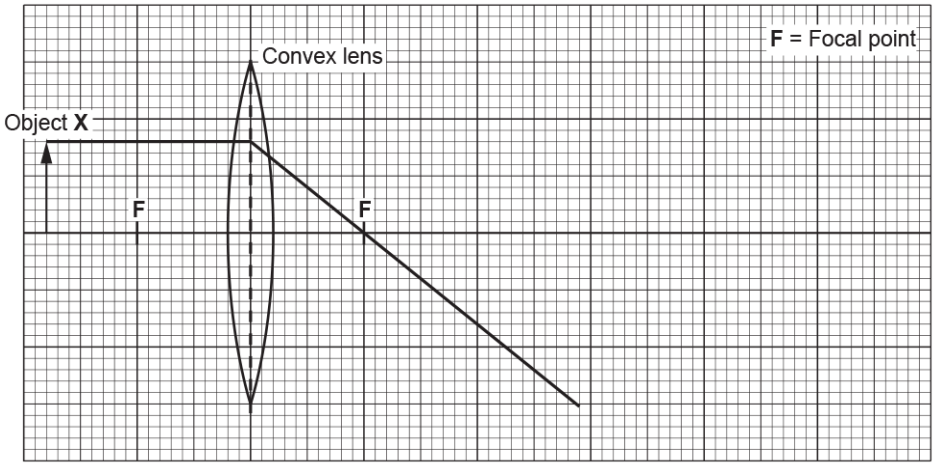
Explain how ultrasound waves are used to measure **w**.

---**[2]**

4(a). A projector is used to create a larger image of an object.

The diagram shows one light ray as it passes through the convex lens.

Draw **one** more ray on the diagram to show where the image is formed. Label the image **Y**.



[2]

(b). The projector contains a white light source.

Explain how this white light source can be used to get **red** light.

---

[2]

5 (a). White light is made of different colours.

White light passes through a transparent filter **X**.

Filter **X** absorbs green, blue, indigo and violet light.

The light then passes through another transparent filter, **Y**, as shown in **Fig. 18.3**.

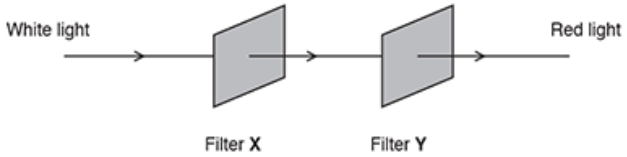


Fig. 18.3

The light that leaves filter **Y** is red.

i. What colours are transmitted by filter **X**?

---

[1]

ii. What colours are absorbed by filter **Y**?

---**[1]**

(b). A wall is painted red.

When some coloured lights shine on it, the wall appears black.

i. Explain why.

---**[1]**

ii. Suggest **two** different colours of light that would cause the wall to appear black.

and

--- ---

[1]

(c). An optician uses red and green light to test vision.

Fig. 18.4 is a ray diagram showing **red light** passing through a lens.

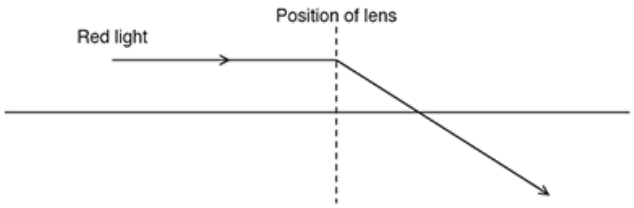


Fig. 18.4

i. Green light passes through the same lens as in **Fig. 18.4.**

Complete the ray diagram in **Fig. 18.5** for **green light**. The focal point for red light F_R is shown.

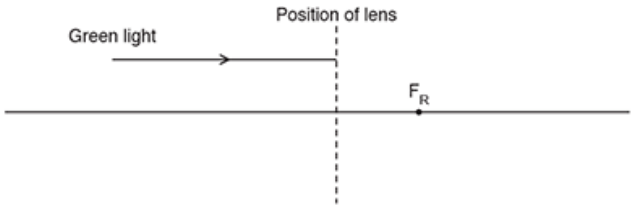


Fig. 18.5

[1]

ii. Explain your answer to **(i)**.

_____

_____ **[1]**

iii. Is the lens in **Fig. 18.4** and **18.5** suitable for correcting long-sight or short-sight?

Tick (✓) **one** box.

Long-sight ☐

Short-sight ☐

Explain your answer.

_____

_____ **[2]**

(d). A student investigates reflection and refraction of light rays.

The student sends a ray of red light into a glass prism.

Fig. 18.1 shows the light ray as it leaves the glass prism.

On **Fig. 18.1** complete the ray of light as it travels towards **and** through the glass prism.

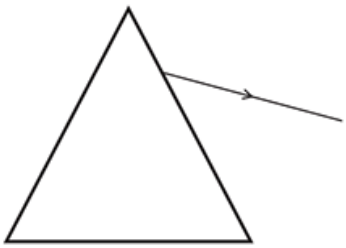


Fig. 18.1

[2]

(e). Fig. 18.2 shows two mirrors placed at 90° to each other.

A light ray hits one of the mirrors at 45°.

On **Fig. 18.2** complete the ray of light as it reflects from both mirrors.

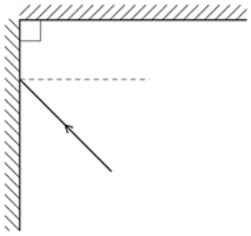


Fig. 18.2

[2]

END OF QUESTION PAPER