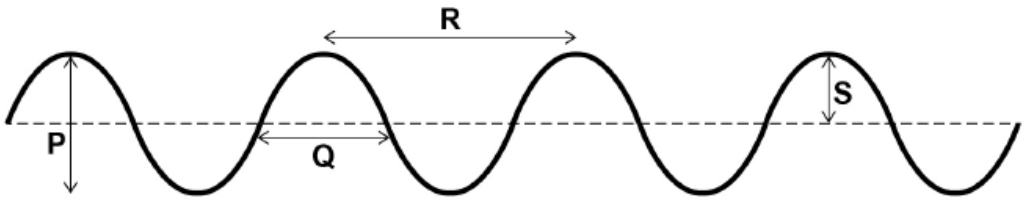
AQA - Waves – GCSE Physics

1. June/2020/Paper_2F/No.3

0 3 **Figure 2** shows some waves.

Figure 2



0 3 . 1 Which arrow represents the wavelength of the waves?

[1 mark]

Tick (✓) **one** box.

P ☐

Q ☐

R ☐

S ☐

0 3 . 2 Which arrow represents the amplitude of the waves?

[1 mark]

Tick (✓) **one** box.

P ☐

Q ☐

R ☐

S ☐

0 3 . 3 The waves have a frequency of 0.20 hertz.

Calculate the period of the waves.

Use the equation:

$$\text{period} = \frac{1}{\text{frequency}}$$

[2 marks]

Period = _____ s

0 3 . 4 The frequency of the waves is increased. The speed of the waves stays the same.

What happens to the wavelength of the waves?

[1 mark]

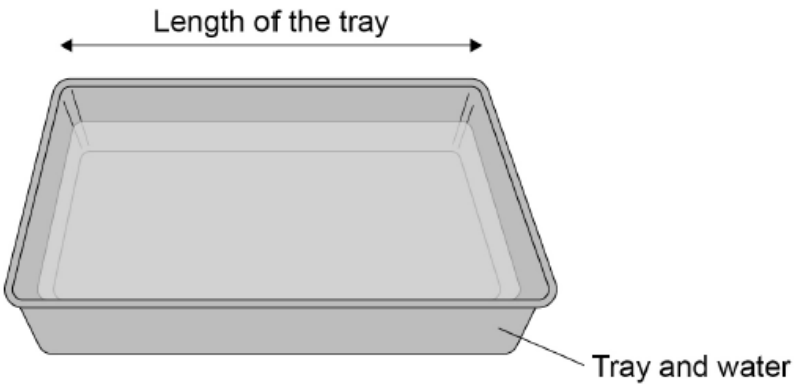
Tick (✓) **one** box.

- The wavelength decreases. ☐
- The wavelength increases. ☐
- The wavelength stays the same. ☐

A student investigated how the speed of water waves is affected by the depth of water in a tray.

Figure 3 shows some water in a rectangular tray.

Figure 3



The student lifted one end of the tray and then dropped it.

This made a wave which travelled the length of the tray.

0 3 . 5 The student measured the length of the tray.

What else should the student measure in order to calculate the speed of the wave?

[1 mark]

Tick (✓) **one** box.

- Area of the bottom of the tray ☐
- Depth of water in the tray ☐
- Temperature of the water in the tray ☐
- Time taken by the wave to travel the length of the tray ☐

0 3 . 6 What was the independent variable in this investigation?

[1 mark]

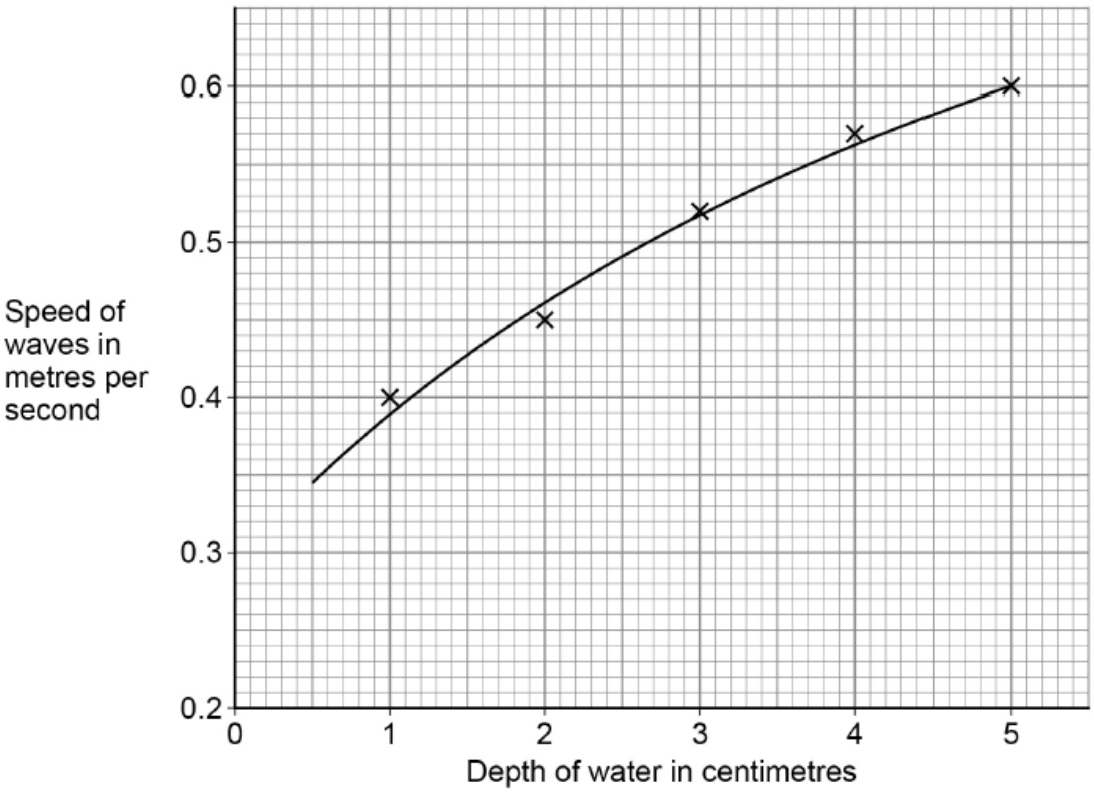
Depth of water ☐

Length of tray ☐

Speed of waves ☐

Figure 4 shows the results.

Figure 4



0 3 . 7 Give **one** conclusion that can be made from **Figure 4**.

[1 mark]

_____

_____

0 3 . 8 What was the speed of a wave when the depth of water was 2.5 cm?

[1 mark]

Speed of wave = _____ m/s

2. June/2020/Paper_2F/No.4

0 4 . 1 Visible light is used for communications.

Which other parts of the electromagnetic spectrum are used for communications?

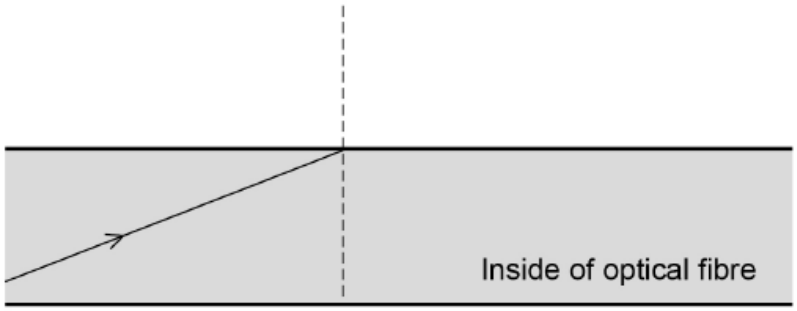
[2 marks]

Tick (✓) **two** boxes.

- Gamma rays ☐
- Microwaves ☐
- Radio waves ☐
- Ultraviolet ☐
- X-rays ☐

Figure 5 shows a ray of light in an optical fibre.

Figure 5



0 4 . 2 What is the name given to the dotted line on **Figure 5**?

[1 mark]

_____

0 4 . 3 Where the ray of light touches the edge of the optical fibre it is reflected.

Draw the reflected ray on **Figure 5**.

[2 marks]

0 4 . 4 Optical fibres need to be able to bend around corners without breaking.

Suggest the property that optical fibres must have to allow them to bend around corners.

[1 mark]

_____

_____

0 4 . 5 The appearance of visible light can change when it interacts with different objects.

Complete the sentences.

Choose the answers from the box.

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

[3 marks]

absorbed	**reflected**	**refracted**	**transmitted**

When white light is incident on a green filter, only green light passes through the filter.

This is because green light is _____ by the filter.

All other colours of light are _____ by the filter.

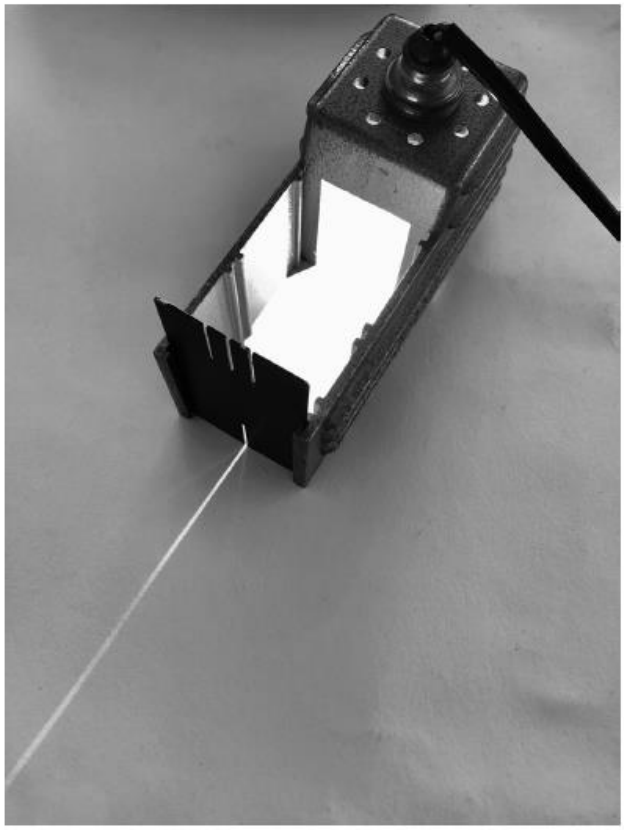
When red light shines on a blue object the red light is _____.

3. June/2020/Paper_2H/No.3

0 3 A student investigated the refraction of light at the boundary between air and glass.

Figure 3 shows the ray box used.

Figure 3



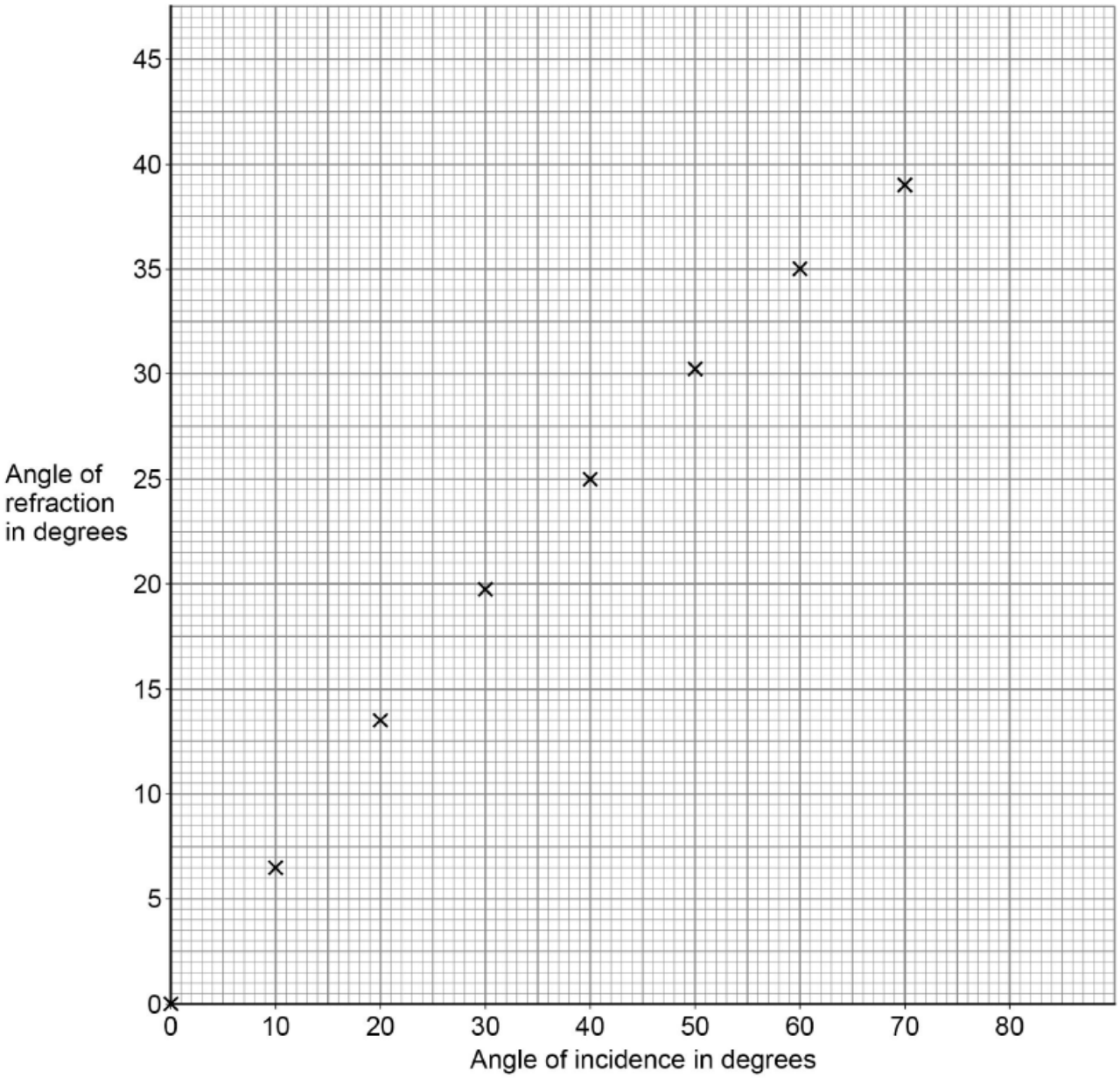
0 3 . 1 The ray of light from the ray box should be as narrow as possible.

Explain why using a wider ray would give less accurate results than using a narrower ray.

[2 marks]

Figure 4 shows the results.

Figure 4



0 3 . 2 Estimate the angle of refraction when the angle of incidence is 80°.

Show on **Figure 4** how you obtained your answer.

[2 marks]

Angle of refraction = _____ °

0 3 . 3 Describe a method the student could have used to obtain the results shown in **Figure 4**.

[6 marks]

0 3 . 4 The student repeated each measurement three times.

When the angle of incidence was 40° the three measured values for the angle of refraction were

28° 25° 22°

Estimate the uncertainty in the angle of refraction when the angle of incidence was 40°.

Show how you determine your estimate.

[2 marks]

Uncertainty = ± _____ °

0 3 . 5 What property of the light wave changes when it is refracted?

[1 mark]

Tick (✓) **one** box.

Colour ☐

Frequency ☐

Velocity ☐

4. June/2020/Paper_2H/No.4(4.1_4.2)

0 4 A door is fitted with a security lens and a lock.

The security lens allows a person to see a visitor before opening the door.

The security lens is concave.

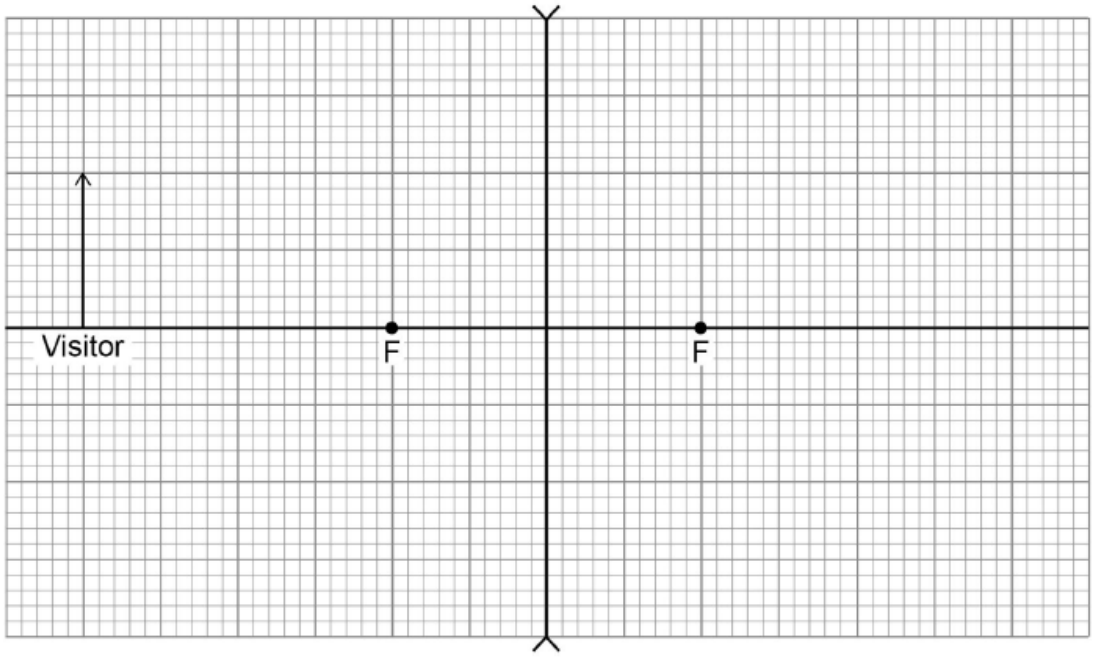
0 4 . 1 **Figure 5** is an incomplete ray diagram representing a visitor standing near the security lens.

Complete **Figure 5** to show how an image of the visitor is formed by the concave lens.

Draw an arrow to represent the image.

[3 marks]

Figure 5



0 4 . 2 The visitor moves further away from the security lens in the door.

How does the size of the image change?

[1 mark]

Tick (✓) **one** box.

Decreases ☐

Increases ☐

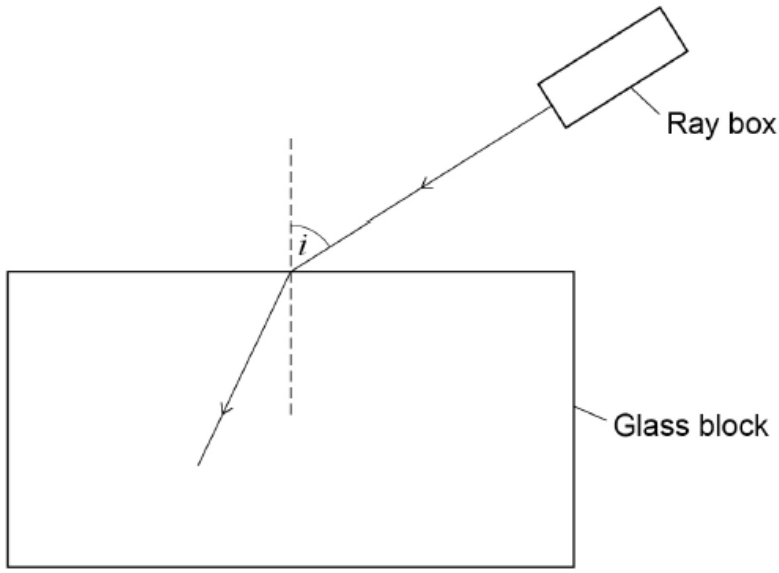
Stays the same ☐

5. June/2019/Paper_2F/No.5

0 5 A student used a ray box and glass block to investigate refraction of light.

Figure 15 shows a ray of light entering the glass block.

Figure 15



0 5 . 1 In **Figure 15**, the angle of incidence is labelled with the letter ***i***.

Label the angle of refraction in **Figure 15** with the letter ***r***.

[1 mark]

0 5 . 2 Measure the angle of incidence in **Figure 15**.

[1 mark]

Angle of incidence = _____ °

0 5 . 3 Complete **Figure 15** to show the path taken by the ray of light through the glass block and out into the air.

[3 marks]

0 5 . 4 Complete the sentence.

Choose an answer from the box.

[1 mark]

random	systematic	zero

The student repeated the measurement three times and calculated the mean to reduce the effect of _____ errors.

Table 2 shows the student's values for the angles of incidence and the mean angles of refraction.

Table 2

Angle of incidence in degrees	Mean angle of refraction in degrees
20	13
30	19
40	**X**
50	31

0 5 . 5 For an angle of incidence of 40° the three measurements for the angle of refraction were:

23° 27° 25°

Calculate the value of **X** in **Table 2**.

[1 mark]

_____

_____

X = _____ °

0 5 . 6 Complete the sentence.

Choose the answer from the box.

[1 mark]

equal to	**greater than**	**less than**

The student used the data in **Table 2** and correctly concluded that the angle of refraction is _____ the angle of incidence used.

0 5 . 7 Why is the student's conclusion only valid for angles of incidence between 20° and 50°?

[1 mark]

_____

_____

_____

0 5 . 8 The student repeated the investigation using a transparent plastic block.

Why did the student use a transparent block and not an opaque block?

[1 mark]

_____

_____

_____

0 5 . 9 The student wanted to compare the refraction caused by the plastic with the refraction caused by the glass.

What must the student keep the same for both the plastic block and the glass block?

[1 mark]

Tick (✓) **one** box.

The angles of incidence tested ☐

The angles of refraction tested ☐

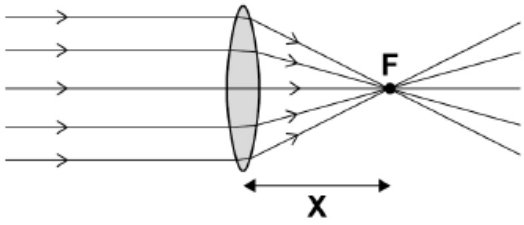
The number of results recorded ☐

The size of the two blocks ☐

6. June/2019/Paper_2F/No.8

0 8 . 1 **Figure 20** shows parallel rays of light being refracted by a convex lens.

Figure 20



What is distance '**X**' called?

[1 mark]

0 8 . 2 Lenses can be used to form the image of an object.

Complete the ray diagram in **Figure 21** to show how a **convex** lens forms the image of the object.

Use an arrow to represent the image.

[2 marks]

Figure 21

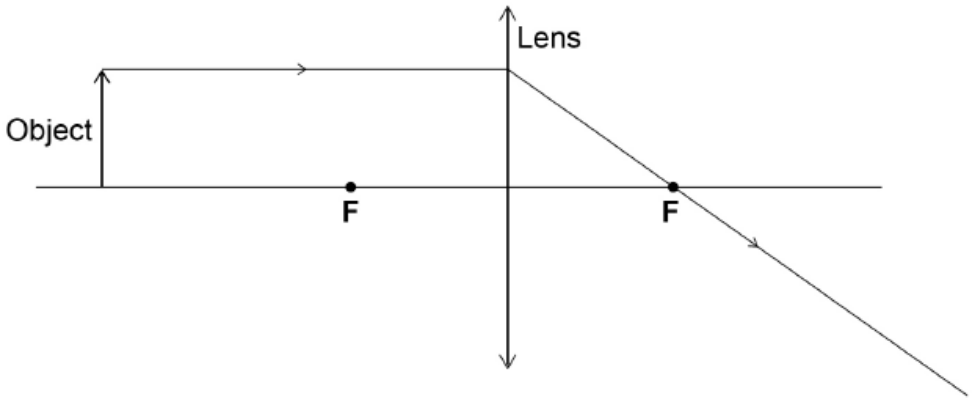
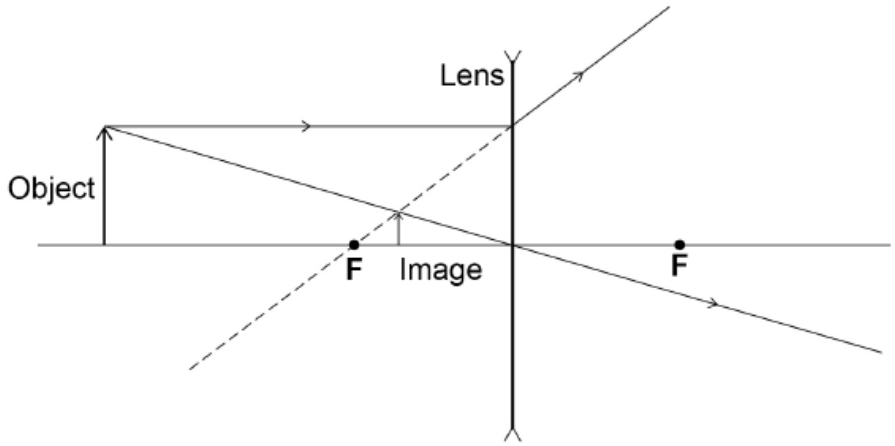


Figure 22 shows how a **concave** lens forms the image of an object.

Figure 22



0 8 . 3 Give **one** similarity and **one** difference between the image formed by the convex lens and the image formed by the concave lens.

[2 marks]

Similarity _____

_____

Difference _____

_____

0 8 . 4 A person uses a lens to read the letters on the back of a coin.

The image height of the letters on the coin is 9.0 mm

The magnification produced by the lens is 6.0

Calculate the height of the letters on the coin.

Use the Physics Equations sheet.

[3 marks]

_____

_____

_____

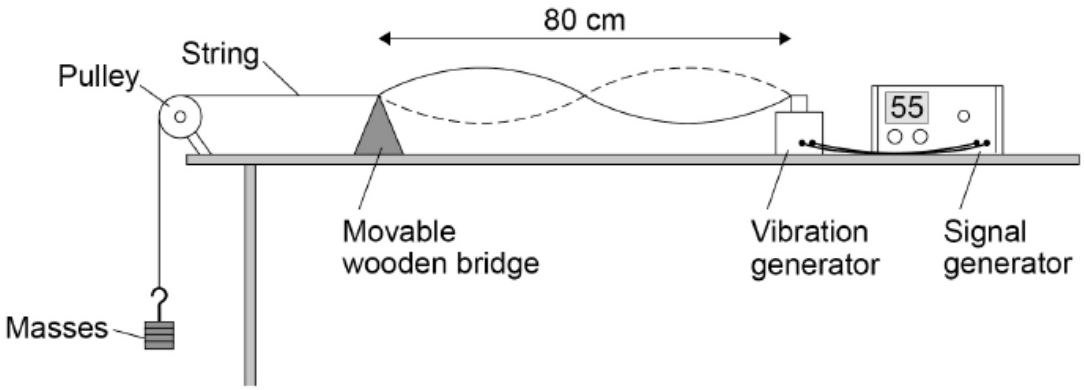
_____

Height = _____ mm

7. June/2019/Paper_2F/No.9

0 9 **Figure 23** shows the apparatus used to investigate the waves in a stretched string.

Figure 23



The frequency of the signal generator is adjusted so that the wave shown in **Figure 23** is seen.

At this frequency the string vibrates between the two positions shown in **Figure 23**.

0 9 . 1 The wavelength of the wave shown in **Figure 23** was measured as 80 cm

What piece of apparatus would have been suitable for measuring this wavelength?

[1 mark]

_____

0 9 . 2 Write down the equation which links frequency, wavelength and wave speed.

[1 mark]

_____

0 9 . 3 The string in **Figure 23** vibrates at 55 Hz

Calculate the wave speed of the wave shown in **Figure 23**.

Use data given in **Figure 23**.

[3 marks]

Wave speed = _____ m/s

0 9 . 4 The frequency of the signal generator is increased.

This makes the wavelength of the wave change.

The wave speed stays the same.

Describe how the apparatus could be adjusted to show one complete wave without reducing the frequency.

[2 marks]

0 9 . 5 A student wants to investigate how the speed of a wave on a stretched string depends on the tension in the string.

The student uses the apparatus in **Figure 23**.

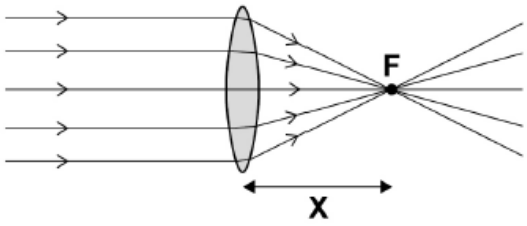
Describe a method the student could use for this investigation.

[4 marks]

8. June/2019/Paper_2H/No.1

0 1 . 1 **Figure 1** shows parallel rays of light being refracted by a convex lens.

Figure 1



What is distance '**X**' called?

[1 mark]

0 1 . 2 Lenses can be used to form the image of an object.

Complete the ray diagram in **Figure 2** to show how a **convex** lens forms the image of the object.

Use an arrow to represent the image.

[2 marks]

Figure 2

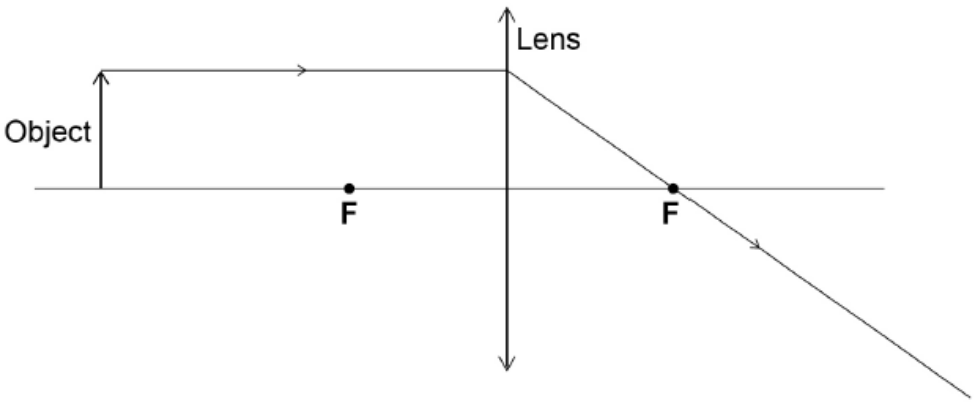
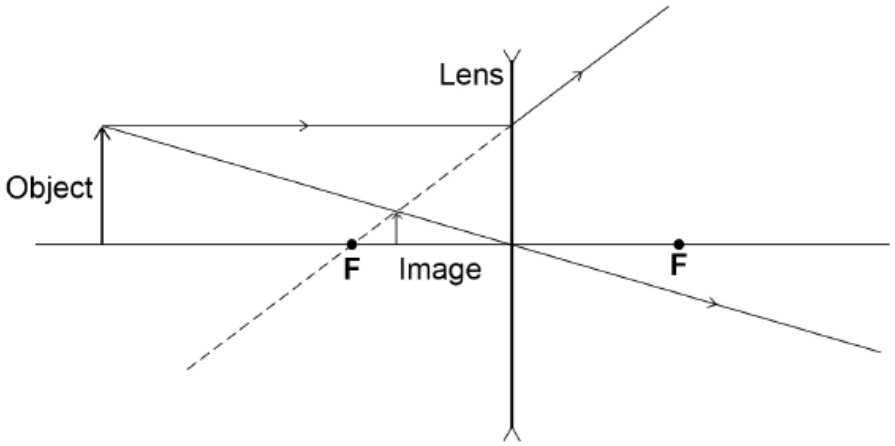


Figure 3 shows how a **concave** lens forms the image of an object.

Figure 3



0 1 . 3 Give **one** similarity and **one** difference between the image formed by the convex lens and the image formed by the concave lens.

[2 marks]

Similarity _____

_____

Difference _____

_____

0 1 . 4 A person uses a lens to read the letters on the back of a coin.

The image height of the letters on the coin is 9.0 mm

The magnification produced by the lens is 6.0

Calculate the height of the letters on the coin.

Use the Physics Equations sheet.

[3 marks]

_____

_____

_____

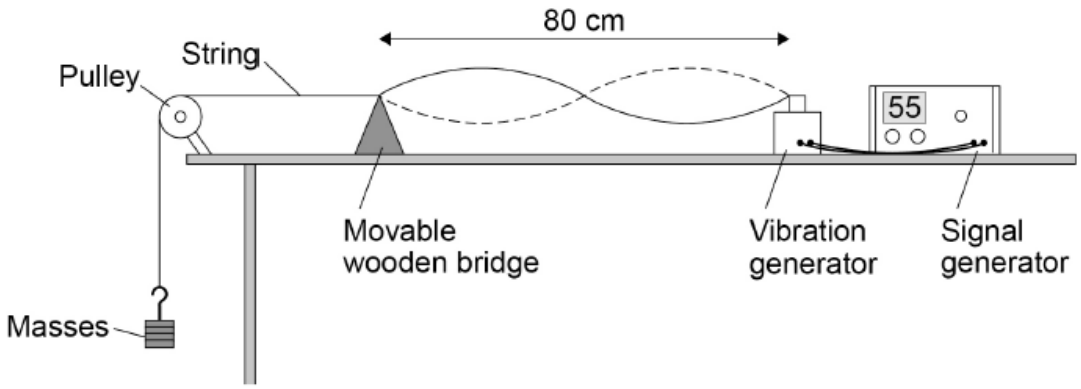
_____

Height = _____ mm

9. June/2019/Paper_2H/No.2

0 2 **Figure 4** shows the apparatus used to investigate the waves in a stretched string.

Figure 4



The frequency of the signal generator is adjusted so that the wave shown in **Figure 4** is seen.

At this frequency the string vibrates between the two positions shown in **Figure 4**.

0 2 . 1 The wavelength of the wave shown in **Figure 4** was measured as 80 cm

What piece of apparatus would have been suitable for measuring this wavelength?

[1 mark]

_____

0 2 . 2 Write down the equation which links frequency, wavelength and wave speed.

[1 mark]

_____

0 2 . 3 The string in **Figure 4** vibrates at 55 Hz

Calculate the wave speed of the wave shown in **Figure 4**.

Use data given in **Figure 4**.

[3 marks]

Wave speed = _____ m/s

0 2 . 4 The frequency of the signal generator is increased.

This makes the wavelength of the wave change.

The wave speed stays the same.

Describe how the apparatus could be adjusted to show one complete wave without reducing the frequency.

[2 marks]

0 2 . 5 A student wants to investigate how the speed of a wave on a stretched string depends on the tension in the string.

The student uses the apparatus in **Figure 4**.

Describe a method the student could use for this investigation.

[4 marks]

10. June/2019/Paper_2H/No.9

0 9 . 1 **Table 3** gives the frequencies in the hearing ranges of five different animals.

Table 3

Animal	Frequencies of hearing range
Cat	55 Hz to 77 kHz
Chicken	125 Hz to 2 kHz
Dog	20 Hz to 30 kHz
Gerbil	56 Hz to 60 kHz
Horse	55 Hz to 33 kHz

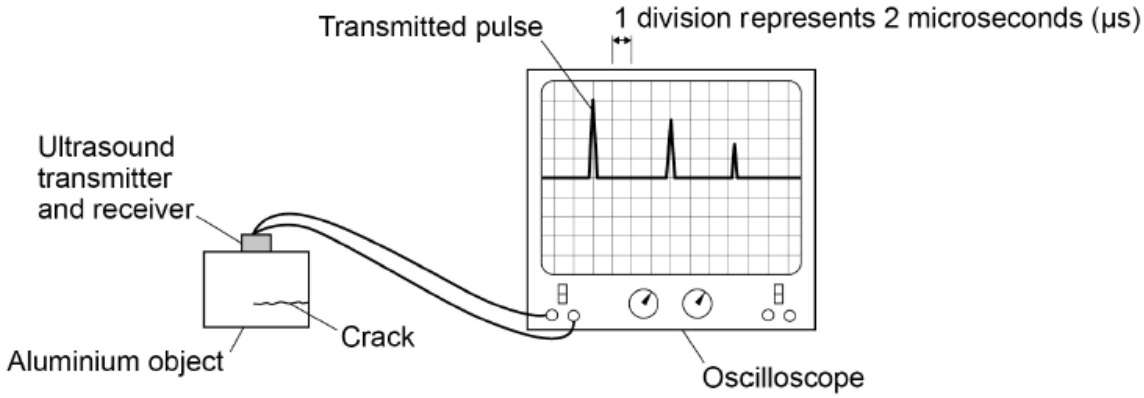
Which **one** of the animals from **Table 3** would not be able to hear ultrasound?

[1 mark]

_____

Figure 17 shows ultrasound being used to detect a hidden crack in a solid aluminium object. The transmitted and reflected pulses of ultrasound are shown on the screen.

Figure 17


Transmitted pulse
1 division represents 2 microseconds (μs)
Ultrasound transmitter and receiver
Crack
Aluminium object
Oscilloscope

0 9 . 2 Which of the following is the same as 2 microseconds?

[1 mark]

Tick (✓) **one** box.

2×10^{3} s ☐

2×10^{-3} s ☐

2×10^{-6} s ☐

2×10^{-9} s ☐

0 9 . 3 Ultrasound travels at 6300 m/s in aluminium.

Determine the depth of the crack below the top surface of the aluminium.

Use information from **Figure 17**.

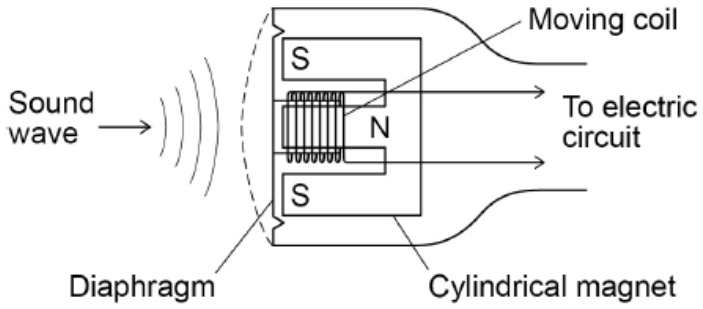
Give your answer to **two** significant figures.

[4 marks]

Depth = _____ m

Figure 18 shows the parts of a moving-coil microphone.

Figure 18



0 9 . 4 What is the function of a microphone?

[1 mark]

0 9 . 5 Explain how a moving-coil microphone works.

[4 marks]