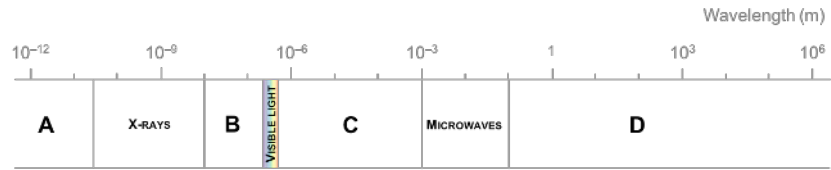


0 1

The electromagnetic spectrum is normally thought of as being made up of seven different types of waves.



0 1 . 1

Identify types A, B, C and D in the above diagram.

A: _____ C: _____

B: _____ D: _____

[4 marks]

0 1 . 2

State **two** things which all electromagnetic waves have in common.

[2 marks]

0 1 . 3

Some mobile phone signals in the UK operate at a frequency of 800 MHz. Calculate the wavelength which this corresponds to.

The speed of electromagnetic waves in air is roughly 3×10^8 m/s.
(1 MHz = 1 million Hz.)

Wavelength = _____ m

[3 marks]

0 1 . 4

Visible light ranges in wavelength from 400 to 700 nm (nanometres). Calculate the **maximum** frequency of a visible light wave.

(1 nm = 10^{-9} m)

Maximum frequency = _____ Hz

[3 marks]

0 2

A light ray is directed from air into a glass block which is sitting flush with a mirror, as shown in the below diagram.



0 2 . 1

Complete the diagram to show how the path of the ray changes after it strikes the top surface of the glass block.

[3 marks]

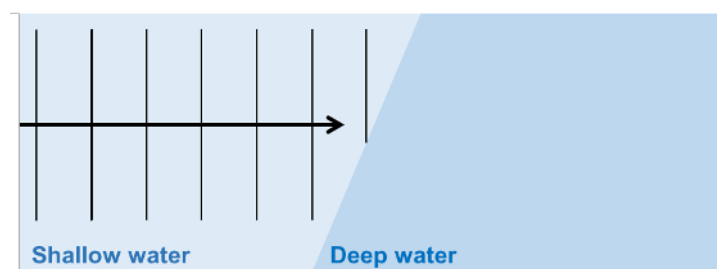
0 2 . 2

Explain why the light ray follows the path shown.

[3 marks]

0 3

A water wave is travelling from shallow water into deep water, as shown in the below wavefront diagram.



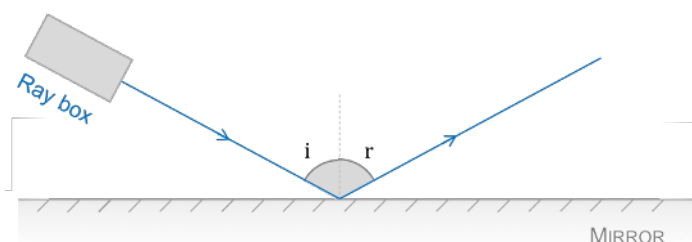
0 3 . 1

Complete the diagram to show how the wavefronts change as they enter and travel through the deep water.

[2 marks]

0 4

A student is using the below experimental setup to investigate the reflection of light from the surface of a plane mirror.



The results which they obtain are as shown in the below table.

Angle of incidence, i ($^{\circ}$)	Angle of reflection, r ($^{\circ}$)		
	Measurement 1	Measurement 2	Average
10	10	10	
20	20	22	
30	29	32	
40	39	40	
50	50	50	
60	60	62	
70	70	110	
80	79	81	

0 4 . 1

State the independent and dependent variables in this investigation

Independent variable _____

Dependent variable _____

[1 mark]

0 4 . 2

There are two values of r for each value of i . Explain why the student decided to repeat the entire experiment once.

[1 mark]

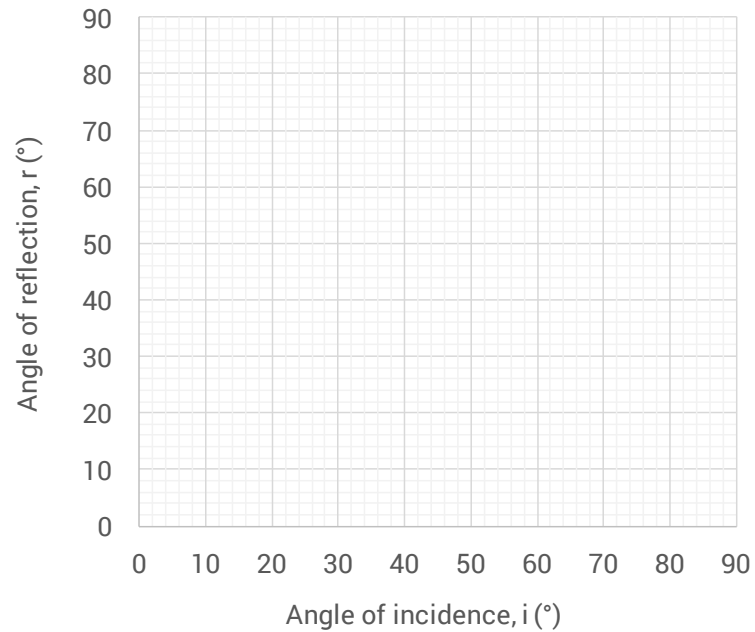
0 4 . 3

Complete the final column of the above table to calculate the *average* angle of reflection of each angle of incidence.

[2 marks]

0 4 . 4

Use the below axes to plot a graph of the results.



[2 marks]

0 4 . 5

Describe the trend shown by the above graph.

[1 mark]

0 4 . 6

The light which strikes a *smooth* reflective surface (such as the plane mirror which was used in this investigation) is said to undergo a process called *specular reflection*.

Describe and explain how the results would have been different had the light from the ray box been directed onto a *rough* reflective surface.

[2 marks]