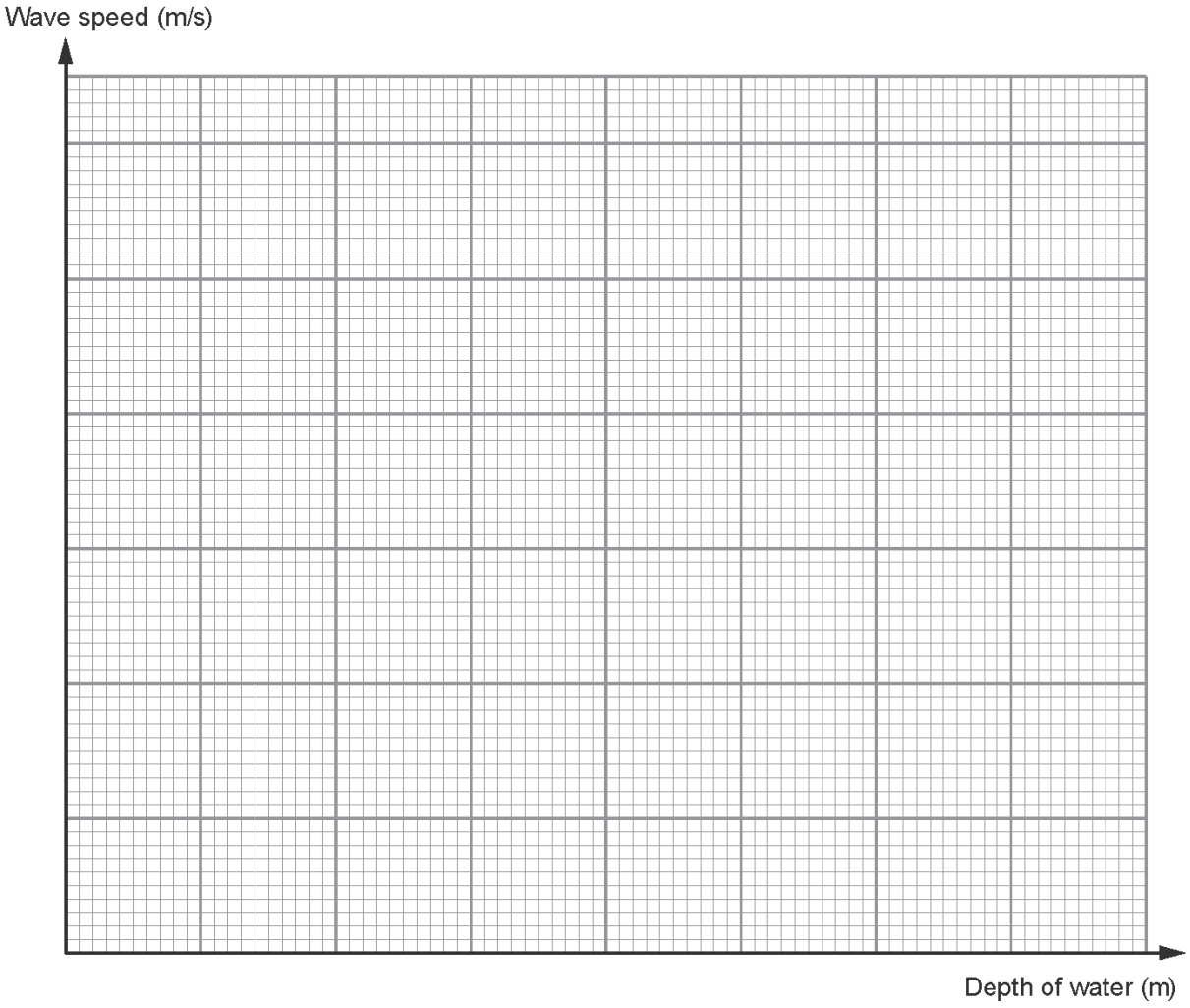
WJEC Physics GCSE
Topic 1.5: Features of waves
Questions by topic

1.

The data below shows how the speed of water waves changes with the depth of water.

(a) (i) Use the data in the table below to plot a graph on the grid below. [3]

Depth of water (m)	Wave speed (m/s)
0.0	0.0
0.5	1.8
1.5	3.8
2.5	4.9
3.5	5.7
4.0	6.0



(ii) Describe how the wave speed changes with the depth of water. [2]

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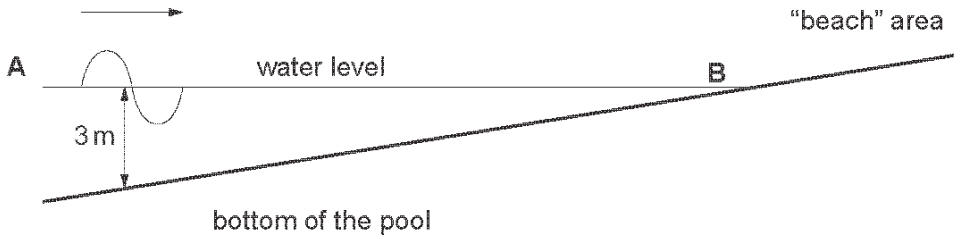
(b) Use the graph to answer the following question.
Water waves produced by a wave machine in a swimming pool have a wavelength of 8.1 m where the depth of water is 3.0 m.

(i) Use an equation from page 2 to calculate the frequency of these waves in the pool. [3]

frequency = ... Hz

(ii) As the waves travel from **A** to **B** in the pool, their frequency remains constant. Explain what happens to their wavelength. [2]



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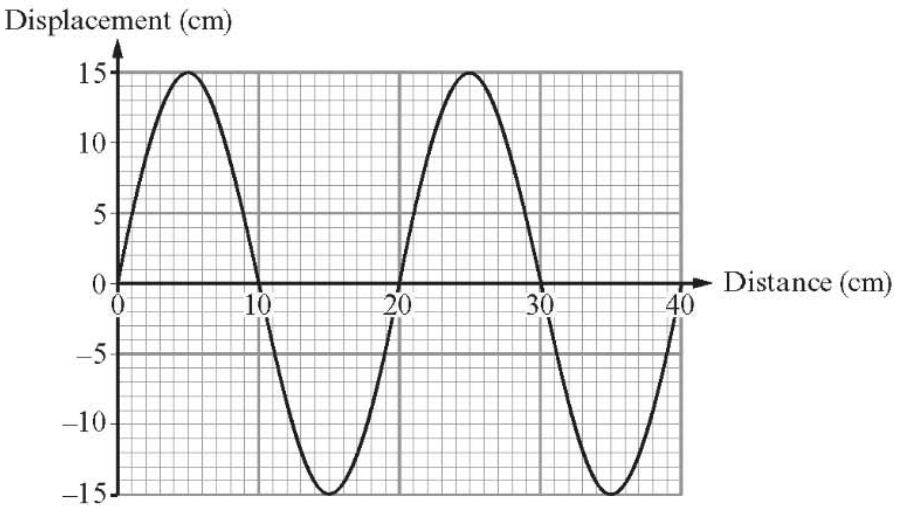
2.

Waves are shown on the grid below.



(a) Write down the amplitude of the waves. ..... cm [1]

(b) Write down the wavelength of the waves. ..... cm [1]

(c) If 10 waves are produced in 5 seconds, calculate their frequency. [2]

frequency = ... Hz

(d) Use the equation:

wave speed = wavelength × frequency

to calculate the speed of the waves and state the unit. [3]

wave speed = ...

unit = ...

(e) **Underline** the correct statement in the bracket below.

If the wave amplitude was doubled the speed of the waves would
(double / stay the same / halve). [1]

3.

Read the following passage.

Its official now! Radiation from your mobile phone may be killing you.

(Freely adapted from an article from EMRstop.org)

Source: DNA India

Professor Kumar, of Bombay University has done extensive research on mobile phone radiation and its effects.

The major health hazards of non-ionising radiation from mobile phones and masts are given below.

Excessive use of mobile phones can cause cancer. Use of mobile phones for more than 30 minutes per day for 10 years increases the risk of brain cancer.

There is a 400% increase in the risk of brain cancer among teenagers using mobile phones. The younger the child, the deeper the penetration of electromagnetic radiation because the skull is thinner.

Mobile phone radiation causes irreversible damage to male fertility. Studies have found a 30% lower sperm count in intensive male users of mobile phones.

People who often use mobile phones can suffer damage to their vision. Mobile phones that work at 900 and 1800 MHz have outputs of 0.25 W and 0.125 W respectively and increase the temperature within the eye by 0.1 °C.

Exposure to electromagnetic waves can cause sleep disorders.

(a) Use information in the passage to answer the following questions.

(i) Give **one** frequency at which mobile phones operate. ..... [1]

(ii) It is suggested that the output power is directly proportional to the frequency of mobile phones.
Use evidence from the passage to show whether or not this is correct. [2]

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(iii) Explain what needs to be done for the claims in the passage to be accepted by the wider scientific community. [2]

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(b) Name the region of the electromagnetic spectrum used by mobile phones to communicate with their masts. [1]

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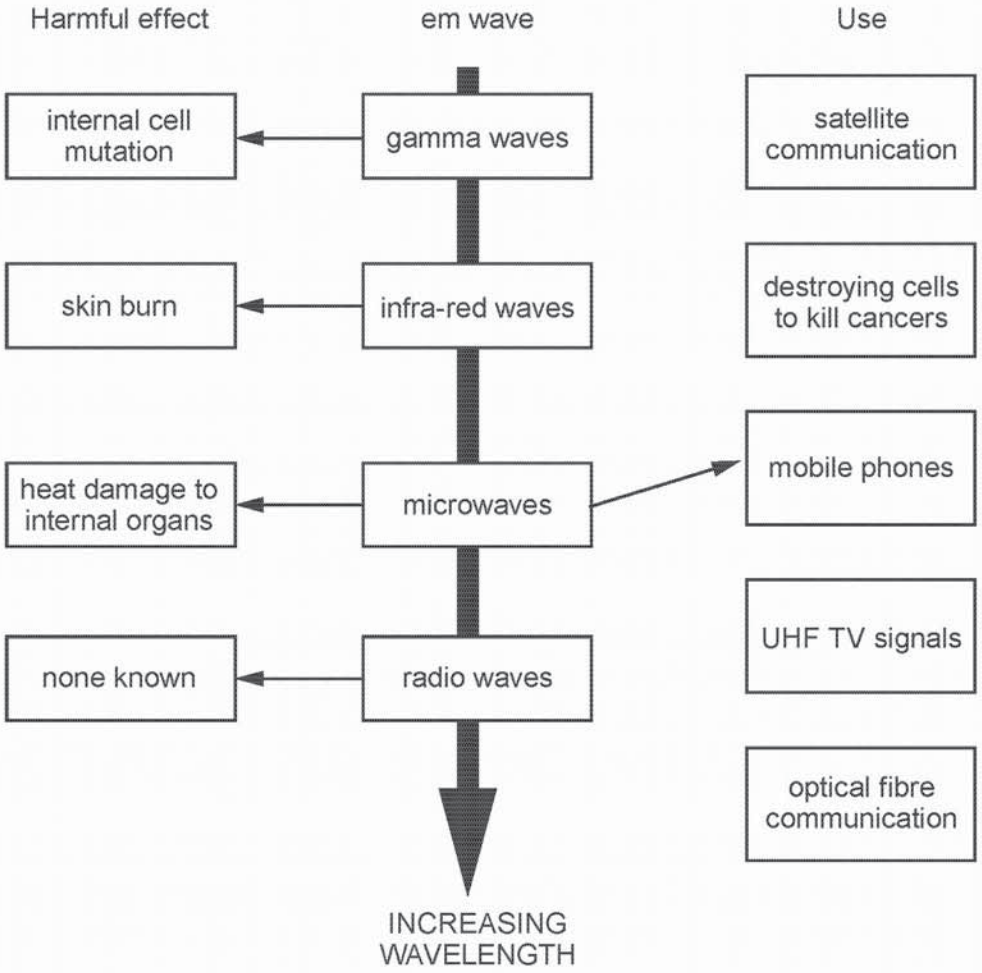
4.

The diagram shows the harmful effects and uses of some electromagnetic (em) waves.

(i) Complete the diagram. Connect each em wave to its correct use or uses.
Each em wave may be used once, more than once or not at all. [3]



(ii) A newspaper report claims that mobile phone masts may be a health risk to the public. How does the diagram support this claim? [1]

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(iii) Name an ionising em wave that is not shown in the diagram above and state its harmful effect. [2]

Name: .....

Harmful effect: .....

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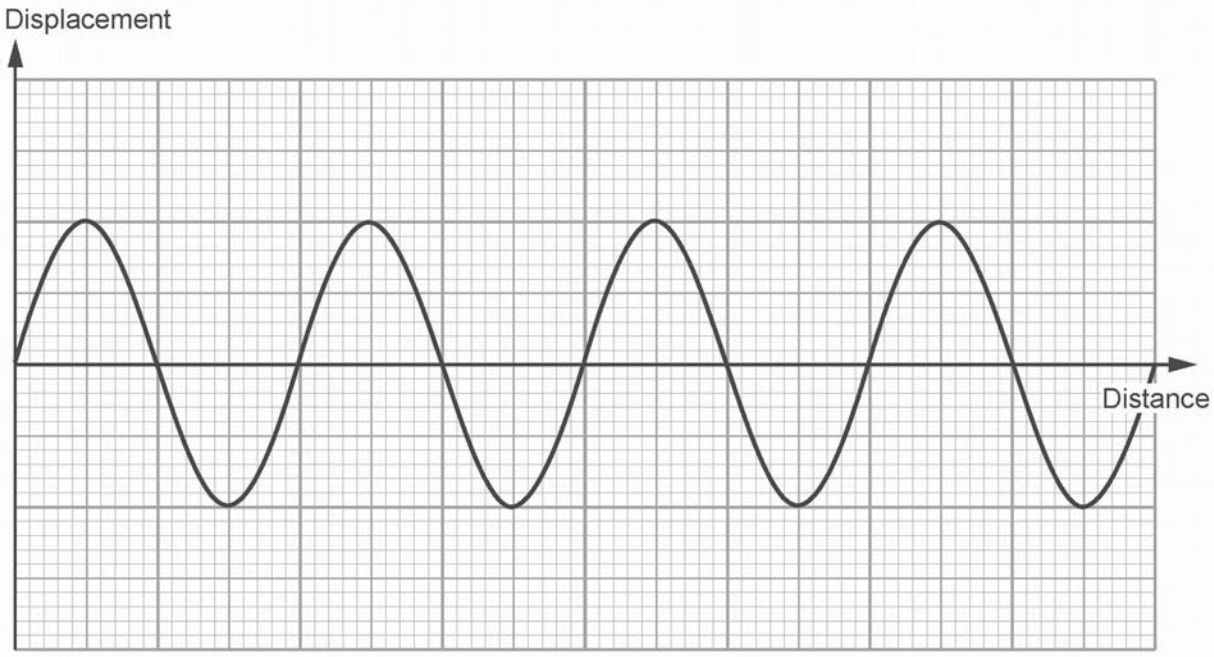
(iv) The wave shown in the diagram represents a microwave. On the same diagram, draw a wave to represent a radio wave. [1]



5.

In an answer to a recent exam question, a candidate wrote: *"A SINGLE geostationary satellite stays in the same place and is the only way of relaying all electromagnetic waves around the world."*
Explain, in detail, what is wrong with the above statement. [6 QWC]

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6.

(a) In answer to a question about geosynchronous satellites, a candidate wrote:
"A geosynchronous satellite *stays in the same place in space* and *orbits the Earth in the same time as Earth orbits.*"
The answer earned zero marks. Re-write the answer in the space below, correcting the parts in italics. [2]

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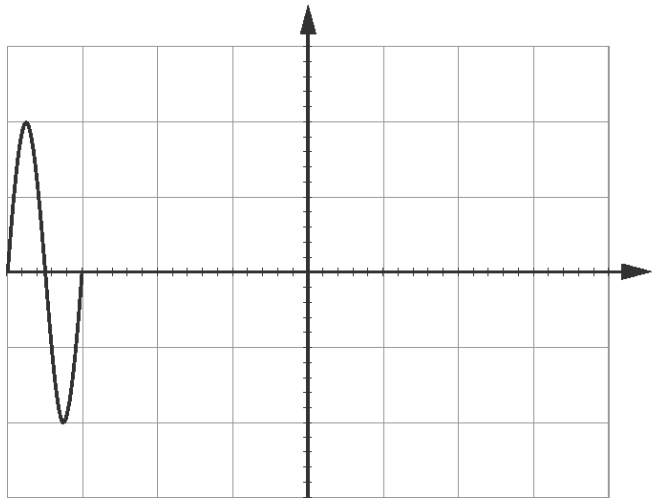
(b) When a geosynchronous satellite is placed in orbit around the Earth, it is tested by sending a pulse of electromagnetic radiation to it.

A **weaker** pulse is received back on Earth a short time later. The sent pulse is shown on the C.R.O. grid below.

Horizontal scale = 0.1 s/cm
Vertical scale = 0.2 V/cm



(i) Calculate the amplitude of the sent pulse. [2]

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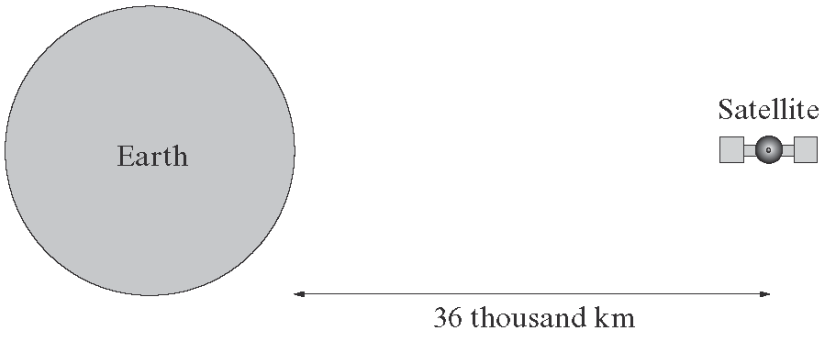
(ii) The height above Earth of a geostationary satellite is 36 thousand km.



It takes 0.12 s for a microwave signal to travel 36 thousand km.
State why it takes 0.24 s for the signal to be received back at the station. [1]

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(iii) **Draw** the received pulse on the C.R.O. grid on the opposite page. [2]

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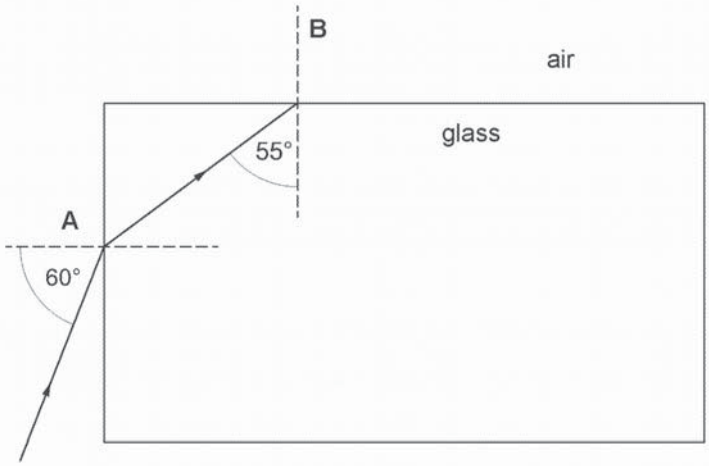
7.

(a) The diagram shows a ray of light passing into a rectangular glass block. The critical angle for glass is 42°.



(i) The light bends at **A**. Name this effect and give a reason why the light bends. [2]

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(ii) I. **Complete** the diagram to show what happens to the ray of light at **B**. [1]

II. Explain why the ray of light follows this path. [2]

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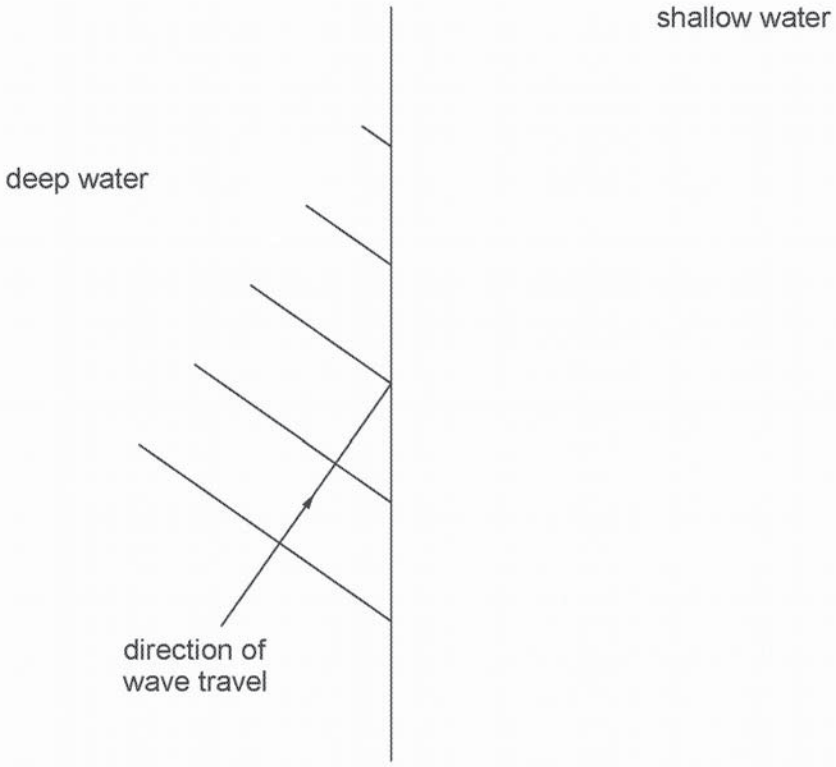
(b) The diagram below shows wavefronts of a water wave in a ripple tank. They are approaching a region of shallow water.

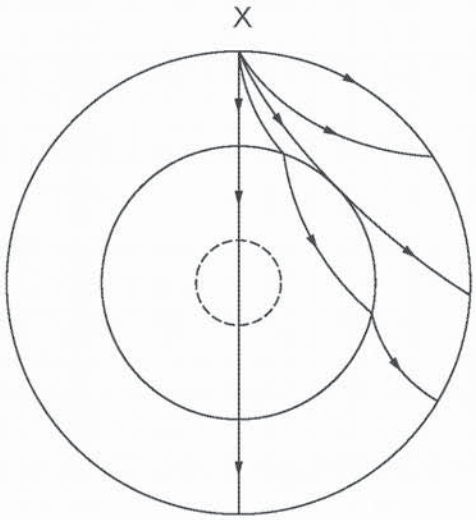


(i) Measure the wavelength of the waves in the deep water. [1]

wavelength = ... cm

(ii) **Complete the diagram** to show the wavefronts in the shallow water. [2]

(c) The diagram shows the paths taken by seismic waves travelling from an earthquake at X. These waves are detected by scientists at recording stations around the Earth.



Use the diagram and your knowledge to describe the properties of P waves, S waves and surface waves. [6 QWC]