Eduqas Physics GCSE
Topic 6.2: Interactions of electromagnetic radiation with matter and their applications
Questions by topic

1.

Infra-red, radio waves and microwaves are types of electromagnetic radiation used in long distance communication.

(i) Complete the table below by selecting from **infra-red, radio waves** or **microwaves**. [3]

Method of communication	Type of radiation used
Optical fibre signals	.....
Satellite communication	.....
Signals from mobile phone masts	.....

(ii) Which of the three types of radiation given above has the longest wavelength? [1]

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4

2.

Radio waves and microwaves are two types of electromagnetic wave.

Both waves:

- can be used for communications
- travel at the same speed through air.

(a) Give **two** more properties that are the same for both radio waves and microwaves.

1 .....

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2 .....

.....

(2)

(b) Some satellites are used to transmit television programmes. Signals are sent to, and transmitted from, the satellites using microwaves.

What is the property of microwaves that allows them to be used for satellite communications?

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(1)

(c) Electromagnetic waves travel at a speed of 3.0×10^8 m/s.

A radio station transmits waves with a wavelength of 2.5×10^2 m.

Calculate the frequency of the radio waves.

Show clearly how you work out your answer and give the unit.

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Frequency = ...

(3)

(Total 6 marks)

3.

(c) (i) State **one** hazard of exposure to infrared radiation.

.....

(1)

(ii) State **one** hazard of exposure to ultraviolet radiation.

.....

(1)

(d) X-rays are used in hospitals for computed tomography (CT) scans.

(i) State **one** other medical use for X-rays.

.....

.....

(1)

(ii) State a property of X-rays that makes them suitable for your answer in part **(d)(i)**.

.....

.....

(1)

(iii) The scientific unit of measurement used to measure the dose received from radiations, such as X-rays or background radiation, is the millisievert (mSv).

The table shows the X-ray dose resulting from CT scans of various parts of the body.

The table also shows the time it would take to get the same dose from background radiation.

Part of the body	X-ray dose in mSv	Time it would take to get the same dose from background radiation
Abdomen	9.0	3 years
Sinuses	0.5	2 months
Spine	4.0	16 months

A student suggests that the X-ray dose and the time it would take to get the same dose from background radiation are directly proportional.

Use calculations to test this suggestion and state your conclusion.

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(3)

4.

(a) The wavelengths of four different types of electromagnetic wave, including visible light waves, are given in the table.

Type of wave	Wavelength
Visible light	0.0005 mm
A	1.1 km
B	100 mm
C	0.18 mm

Which of the waves, **A**, **B**, or **C**, is an infra red wave?

.....

(1)

(b) A TV station broadcasts at 500 000 kHz. The waves travel through the air at 300 000 000 m/s.

Calculate the wavelength of the waves broadcast by this station.

Show clearly how you work out your answer.

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Wavelength = ... m

(2)

(c) What happens when a metal aerial absorbs radio waves?

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(2)

(d) Stars emit all types of electromagnetic waves. Telescopes that monitor X-rays are mounted on satellites in space.

Why would an X-ray telescope based on Earth **not** be able to detect X-rays emitted from distant stars?

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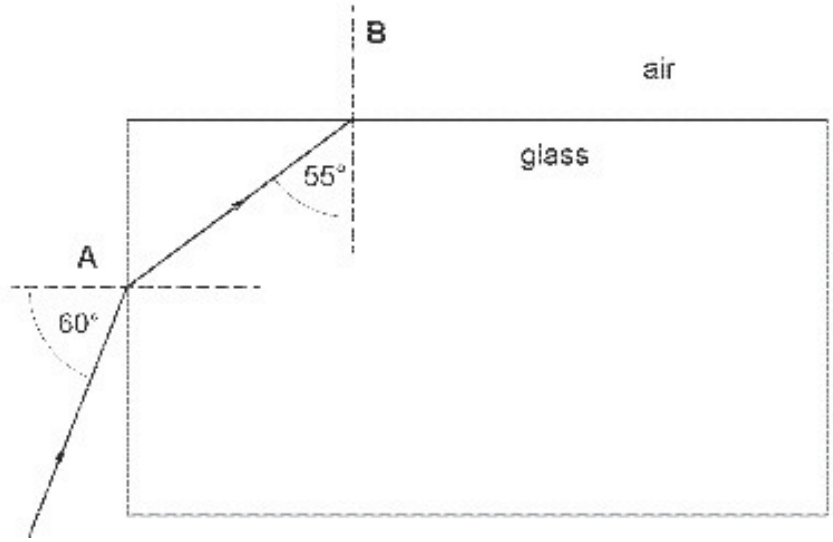
(1)

5.

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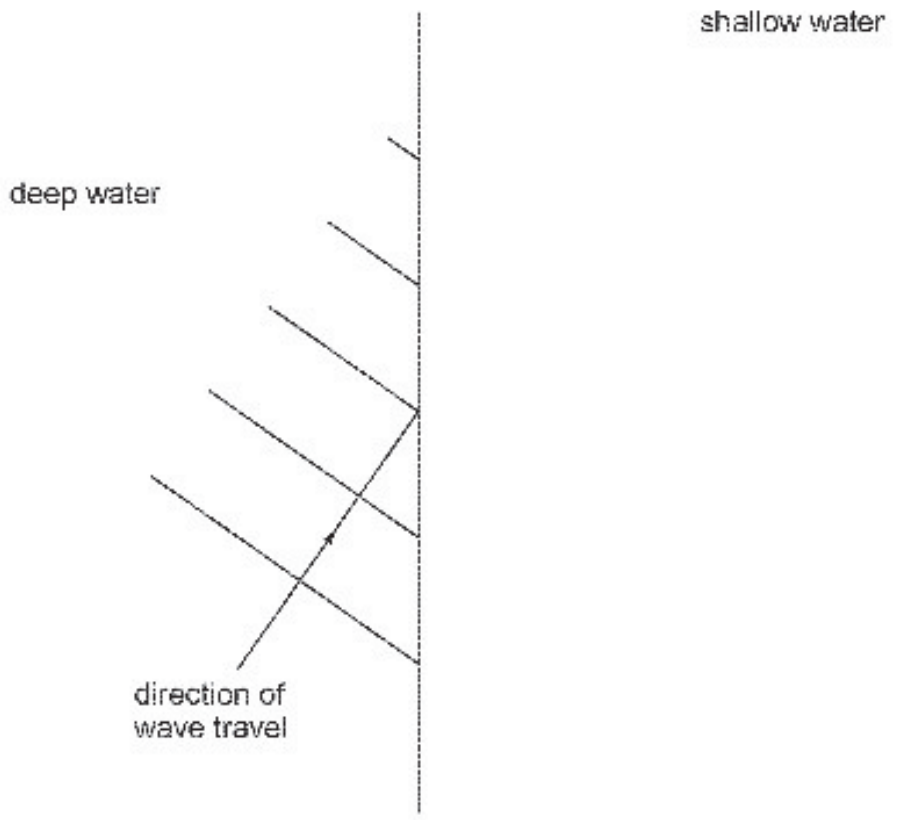
(b) The diagram below shows wavefronts of a water wave in a ripple tank. They are approaching a region of shallow water.



(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]