Name:

Date:

P6 - Test 3
WAVES
Intermediate

GCSE

PHYSICS

AQA - Combined Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1. After a person is injured a doctor will sometimes ask for a photograph to be taken of the patient's bone structure, e.g. in the case of a suspected broken arm.

(i) Which type of electromagnetic radiation would be used to take the photograph?

_____

(1)

(ii) Describe the properties of this radiation which enable it to be used to photograph bone structure.

_____

_____

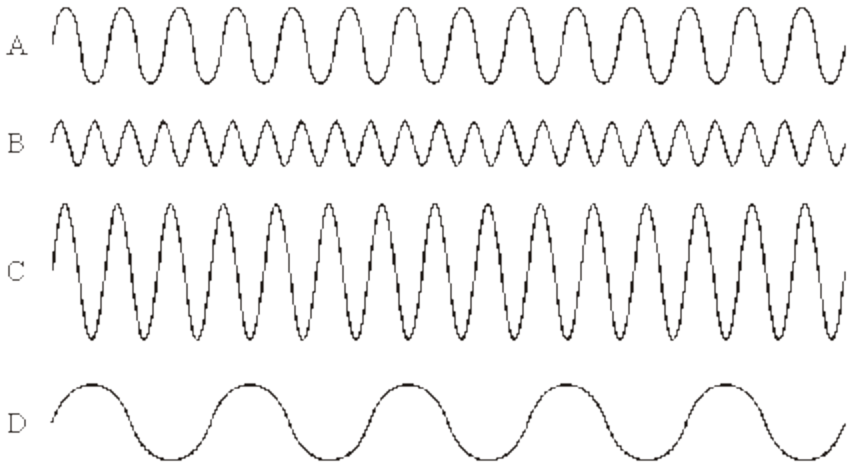
_____

_____

(2)

(Total 3 marks)

2. The diagram shows oscilloscope traces of four waves, **A**, **B**, **C** and **D**. All four waves are drawn to the same scale.



Which wave has:

(a) the longest wavelength; _____

(b) the greatest amplitude; _____

(c) the highest frequency? _____

(Total 3 marks)

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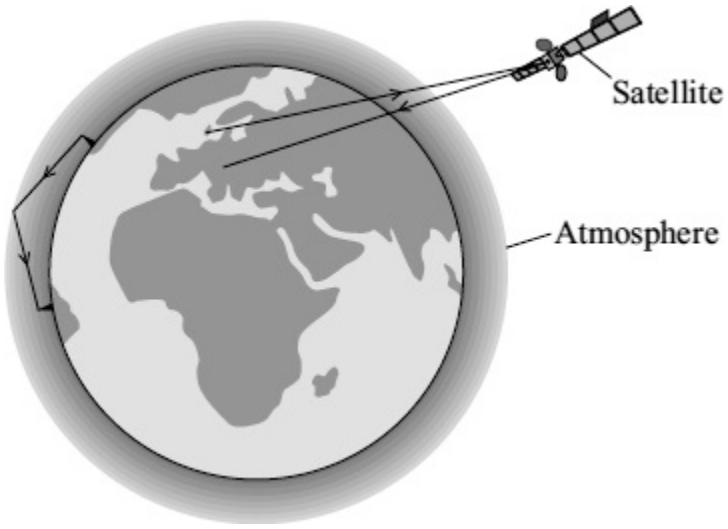
3. (a) Electromagnetic waves have many uses. The diagram shows two ways of sending information using electromagnetic waves.



(i) What type of wave is used to send information to and from satellites?

_____

(1)

(ii) What property of this type of wave makes it suitable for satellite communications?

_____

(1)

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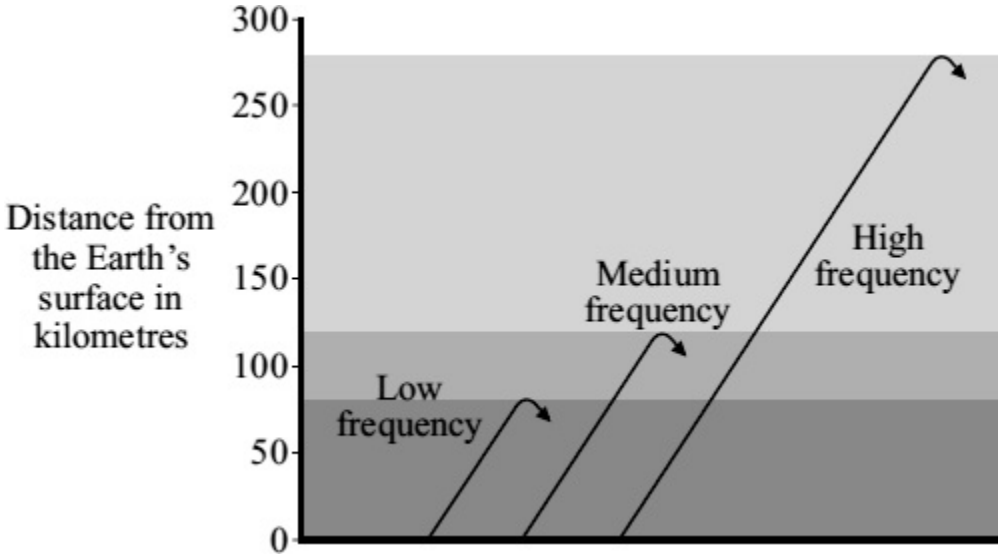
(b) Different frequency radio waves travel different distances through the atmosphere before being reflected.



Use the information in the diagram to describe the connection between the frequency of a radio wave and the distance the radio wave travels through the atmosphere before it is reflected.

_____

_____

(1)

(c) Electromagnetic waves travel at a speed of 300 000 000 m/s.

A radio station transmits waves with a wavelength of 20 metres.

Calculate the frequency, in kilohertz (kHz), of these waves.

Show clearly how you work out your answer.

_____

_____

_____

_____

Frequency = _____ kHz

(2)

(Total 5 marks)

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4. Most young people can hear sounds in the frequency range 20 Hz to 20 000 Hz.

(a) Tick the box beside the statement which best describes frequency.

the maximum disturbance caused by a wave	☐
the number of complete vibrations per second	☐
the distance between one crest of a wave and the next one	☐
the distance travelled by a wave in 1 second	☐

(1)

(b) Diagram **X** shows a trace on an oscilloscope screen.

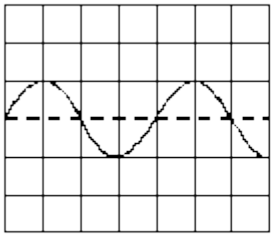


Diagram **X**

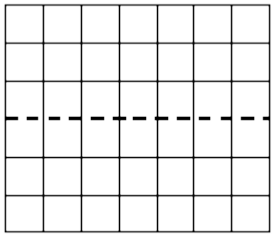


Diagram **Y**

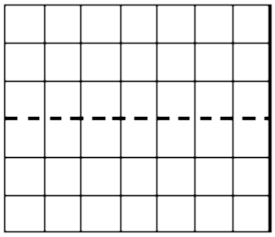


Diagram **Z**

(i) Draw a trace on diagram **Y** which has a higher frequency than that shown in diagram **X**.

(ii) Draw a trace on diagram **Z** which has a larger amplitude than that shown in diagram **X**.

(2)

(c) Choose words from the list below to complete the following sentences.

higher **louder** **lower** **quieter**

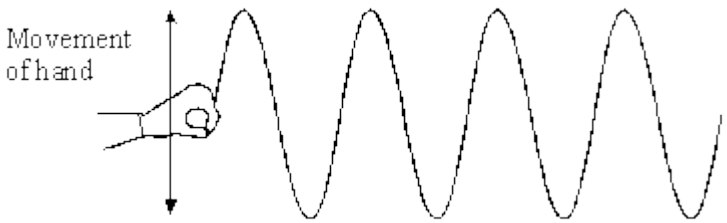
(i) A musical note with a high frequency sounds _____ than one with a low frequency.

(ii) A noise of small amplitude sounds _____ than one with large amplitude.

(2)

(Total 5 marks)

5. The diagram shows a wave travelling along a rope.



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(a) On the diagram:

(i) show the wavelength and label it **W**;

(ii) show the amplitude and label it **A**.

(2)

(b) The wavelength of the wave is 0. I m. Its frequency is 2 Hz.

Calculate the speed of the wave. Show clearly how you work out your answer and give the unit.

_____

_____

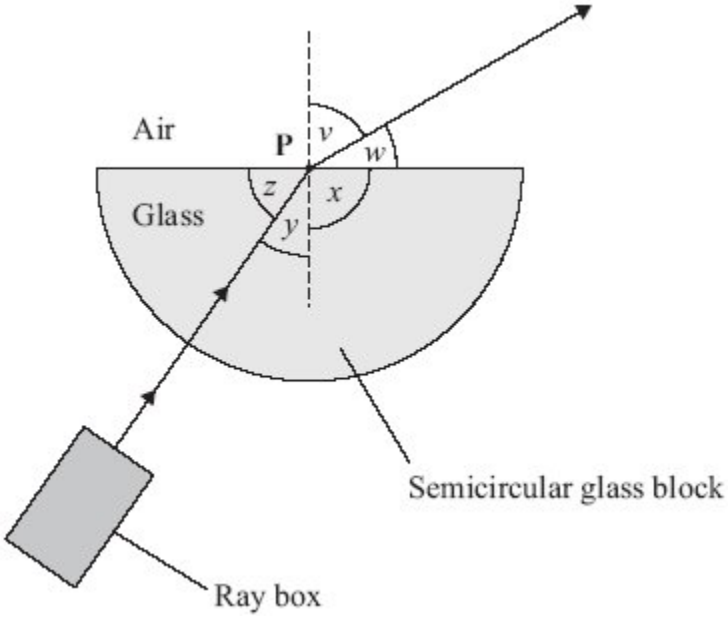
_____

Speed of wave _____

(3)

(Total 5 marks)

6. A student uses a ray box and a semicircular glass block to investigate refraction.



(a) What is the vertical dashed line called?

_____

(1)

(b) Which angle, *v*, *w*, *x*, *y* or *z*, is the angle of refraction?

_____

(1)

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(c) Why has refraction taken place?

_____

_____

(1)

(d) In an investigation, a student always aims the light from the ray box at point **P**.
She moves the ray box to give different values of angle *v*.
She records angle *y* for each of these values. The table shows her results.

Angle *v* measured in degrees	**Angle *y* measured in degrees**
30	19
40	25
50	31
60	35
70	39
80	41

The student studies the data and comes to the following conclusion.

Angle *y* is directly proportional to angle *v*.

Her friend says that this conclusion is **not** correct.

(i) Use data from the table to explain why the conclusion is **not** correct.

_____

_____

(2)

(ii) Write a correct conclusion for the experiment.

_____

_____

(1)

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(iii) Why is your conclusion only valid when angle *v* is between 30° and 80°?

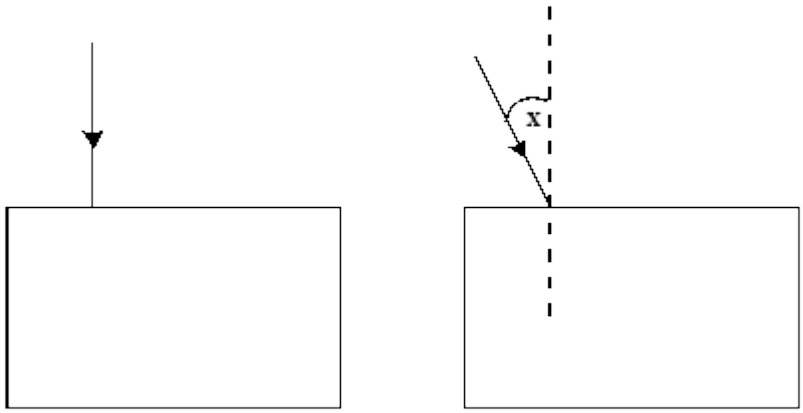
_____

_____

(1)

(Total 7 marks)

7. (a) The diagrams show rays of light. Each ray strikes a surface of a glass block.

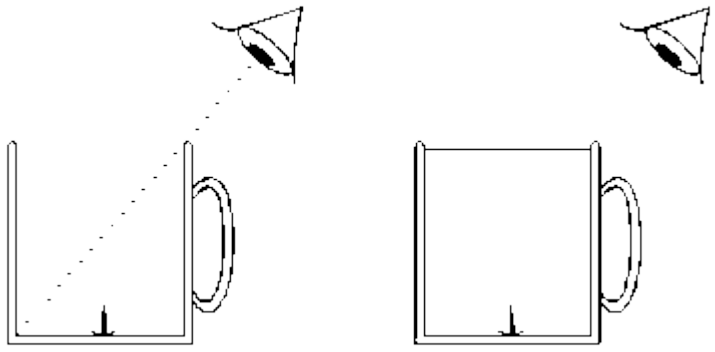


(i) On the diagram draw the path of each ray through the glass block and out into the air again.

(ii) Label another angle on the diagram which is equal to the angle marked **X**. Label this angle **Y**.

(4)

(b) The diagrams show two beakers. Both beakers have a drawing pin inside as shown.



The first beaker is empty. The eye cannot see the drawing pin.
The second beaker is full of water and the eye can see the drawing pin.

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Explain how the eye is able to see the drawing pin in the second beaker. You may add to the diagram if it helps your answer.

_____

_____

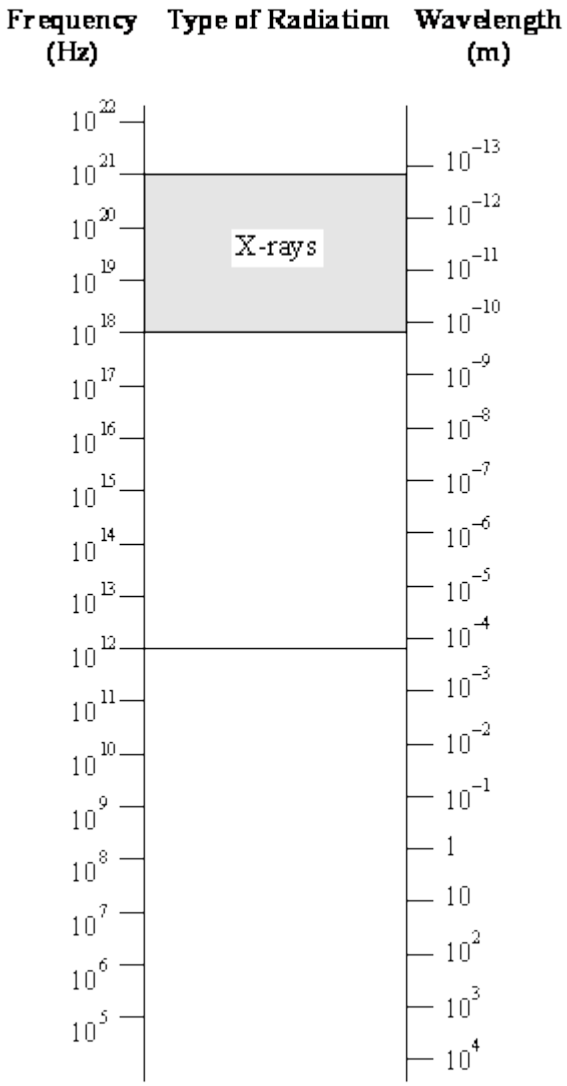
_____

(3)

(Total 7 marks)

8. The diagram below shows the range of wavelengths and frequencies for all the types of radiation in the electromagnetic spectrum.

X–rays, which have frequencies in the range 10^{18}–10^{21} Hz are already marked on the diagram.



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Complete the diagram by adding the following:

(a) *gamma* radiation, which has shorter wavelengths than X–rays;

(b) *radio* waves which have wavelengths longer than 0.1m;

(c) the *visible* spectrum which has wavelengths from 400 nm (violet) to 700 nm (red);

(d) *ultraviolet* radiation (i.e. radiation with a higher frequency than violet light);

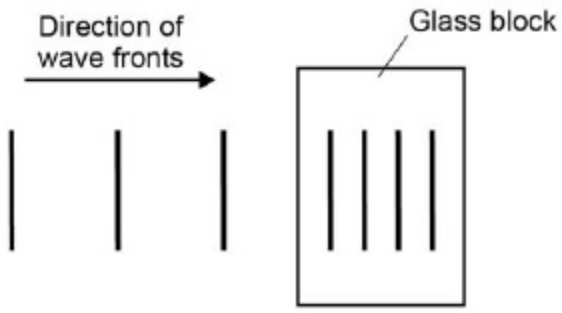
(e) *microwaves* which have a shorter wavelength than radio waves and *infrared* radiation which has a higher frequency than microwaves;

(f) an *FM* radio programme on 92MHz. (Show this with an arrow ®)

(Total 7 marks)

9. **Figure 1** is a wave front diagram showing light travelling through the air and into a glass block.

Figure 1



(a) Complete **Figure 1** by drawing wave fronts after they have left the glass block.

(1)

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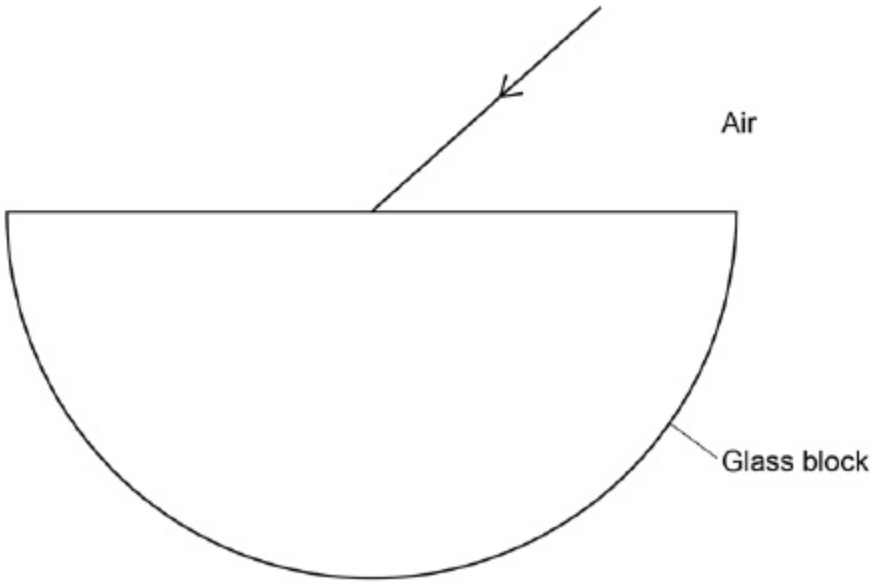
(b) **Figure 2** shows a ray of light incident on a semi-circular glass block.

Figure 2



Complete the ray diagram in **Figure 2**.

- Draw the ray of light passing through and leaving the glass block.
- Label the angle of refraction.

(4)

(c) Explain why the light is refracted.

_____

_____

_____

_____

(2)

(d) A student investigated how different coloured light was refracted by glass.

The student aimed rays of different coloured light at a glass block.

She measured the angle of refraction for each colour.

Give **two** variables that the student should control.

1. _____

2. _____

(2)

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The table shows the student's results.

Colour of light	Angle of refraction in degrees
Red	27.94
Orange	27.90
Yellow	27.82
Green	27.78
Blue	27.70

(e) Explain why these results could **not** have been obtained with a normal protractor.

_____

_____

_____

_____

(2)

(f) What conclusion can be made about the relationship between the wavelength of light and the angle of refraction?

_____

_____

(1)

(g) Glass does **not** transmit ultraviolet radiation.

Suggest what happens to ultraviolet radiation when it is incident on glass.

_____

_____

(1)

(Total 13 marks)

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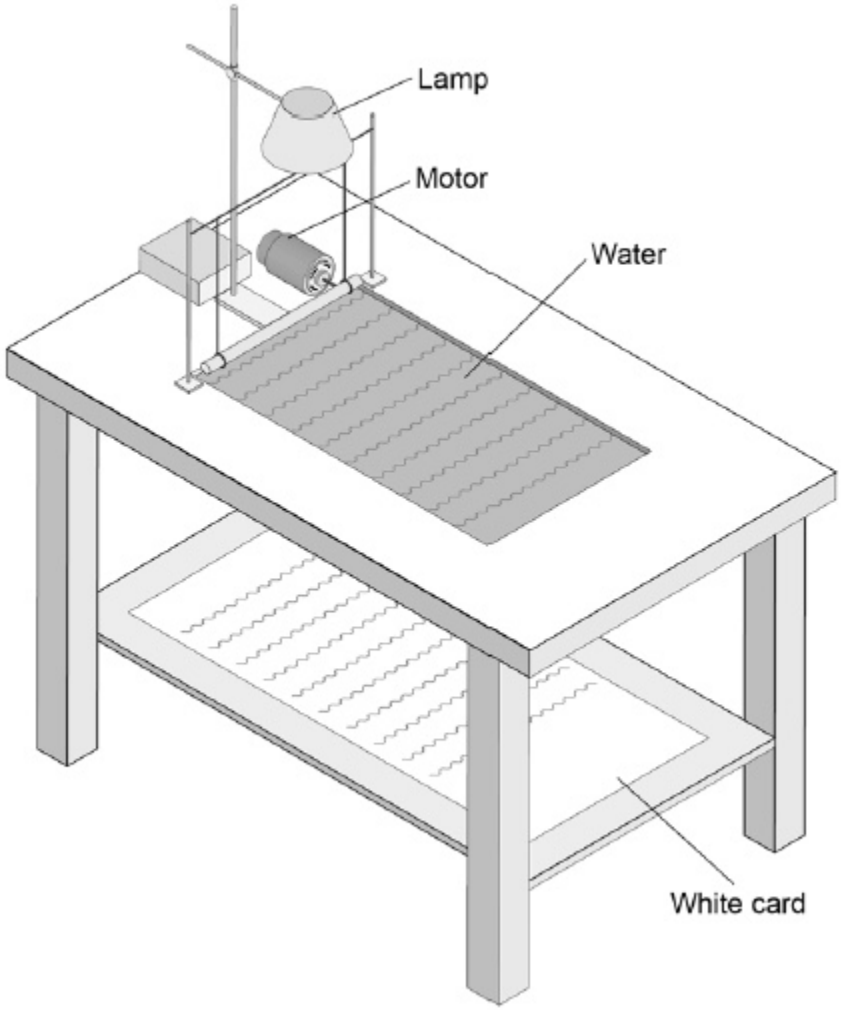
10. The diagram shows a ripple tank.



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(a) The motor makes a noise when it is turned on.

Describe the differences between the properties of the sound waves produced by the motor and the water waves in the ripple tank.

(4)

(b) The period of the sound waves produced by the motor is 8.3 milliseconds.

Calculate the frequency of the sound waves.

Use the Physics Equations Sheet.

Frequency = _____ Hz

(3)

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(c) Explain how a student could make appropriate measurements and use them to determine the wavelength of the waves in the ripple tank.

(6)

(Total 13 marks)

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