PEARSON EDEXCEL IGCSE PHYSICS · 4PH1

PHYSICS



EXAM QUESTION PACK

SECTION 3: WAVES (PACK 1)

SCORE	PERCENTAGE
/299	%

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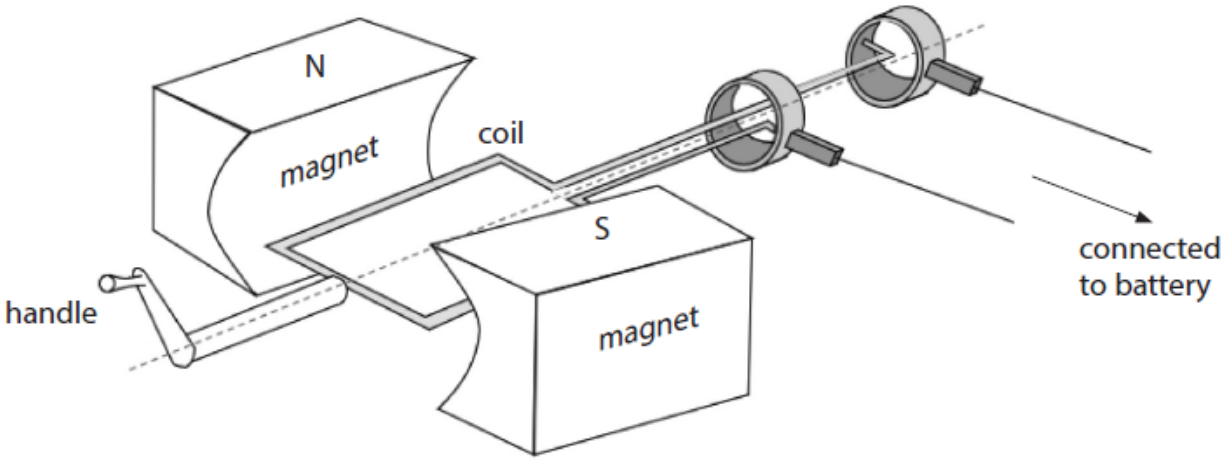
Q1.

This question is about a radio powered by a person turning a handle.

The radio has a battery which stores energy when the handle is turned.

(a) The diagram shows the part of the radio called a generator.

The generator produces a voltage which does electrical work on the battery.



Explain how the generator produces a voltage.

(3)

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(b) The radio receives a radio wave of frequency 93 MHz.

(i) State the formula linking speed, frequency and wavelength of a wave.

(1)

(ii) Calculate the wavelength of the radio wave.

[speed of radio waves = 3.0×10^8 m/s]

(3)

wavelength = ... m

(c) The signal received by the radio is converted into an alternating current (a.c.) signal.

(i) Describe how the loudspeaker in the radio converts this a.c. signal into a sound wave.

(4)

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(ii) State a modification that would increase the force on the loudspeaker coil.

(1)

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(Total for question = 12 marks)

Q2.

Diagram 1 shows a simple loudspeaker.

The coil is connected to an alternating current (a.c.) supply.

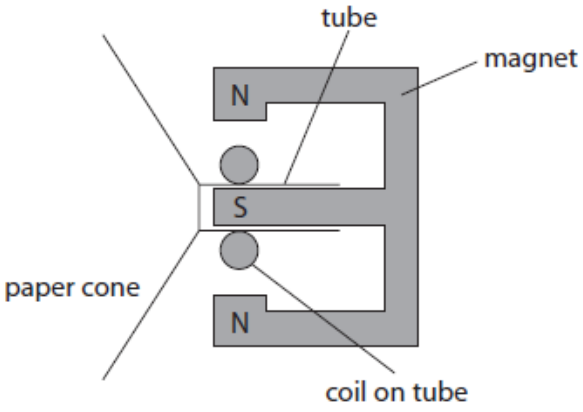


Diagram 1

(a) Describe how the loudspeaker produces sound.

(4)

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(b) Diagram 2 shows two loudspeakers connected in series with a variable resistor.

The variable resistor is set to 5.0 Ω.

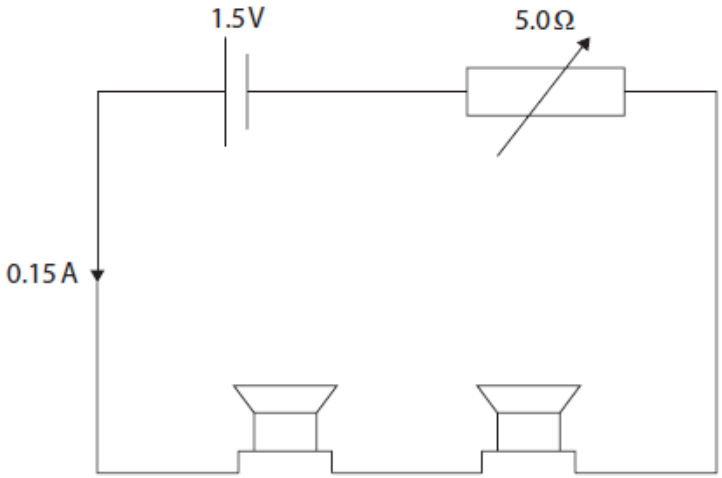


Diagram 2

(i) The total voltage across the two loudspeakers is 0.75 V and the current in the circuit is 0.15 A.

Show that the total power of the two loudspeakers is about 0.1 W.

[power = current × voltage]

(2)

(ii) A student varies the resistance of the variable resistor.

The table shows the power of the loudspeakers for different resistance values of the variable resistor.

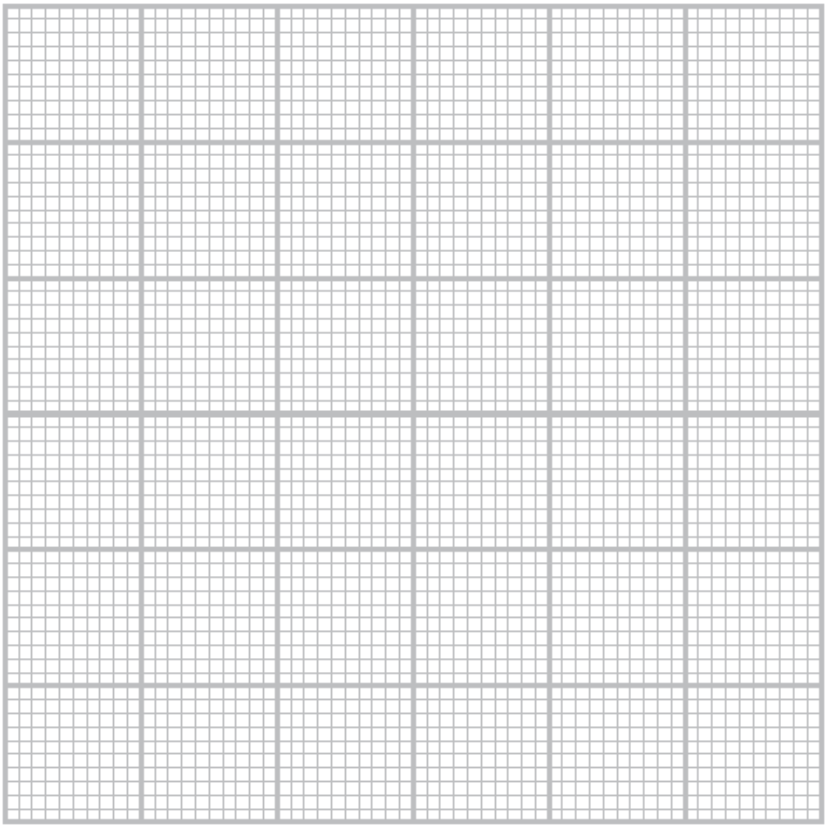
Resistance of variable resistor in Ω	Power of loudspeakers in W
0.0	0.000
2.5	0.100
5.0	0.113
7.5	0.108
10.0	0.100
12.5	0.092
15.0	0.084

Plot the student's results on the grid.

(3)

(iii) Draw a curve of best fit.

(2)



(c) Diagram 3 shows the loudspeakers connected in series to a cell.

Diagram 4 shows the loudspeakers connected in parallel to the same cell.

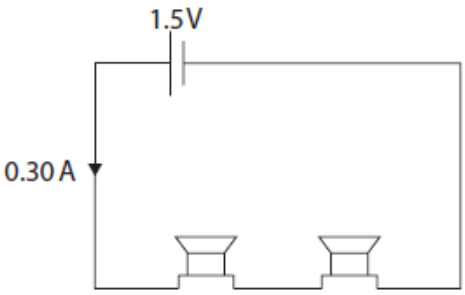


Diagram 3

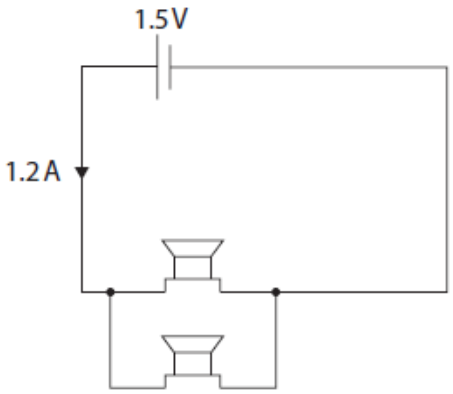


Diagram 4

Comment on how the total resistance of the loudspeakers in diagram 3 compares with the total resistance of the loudspeakers in diagram 4.

(4)

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(Total for question = 15 marks)

Q3.

(a) Diagram 1 shows water waves just before they reflect off the side of a stationary boat.

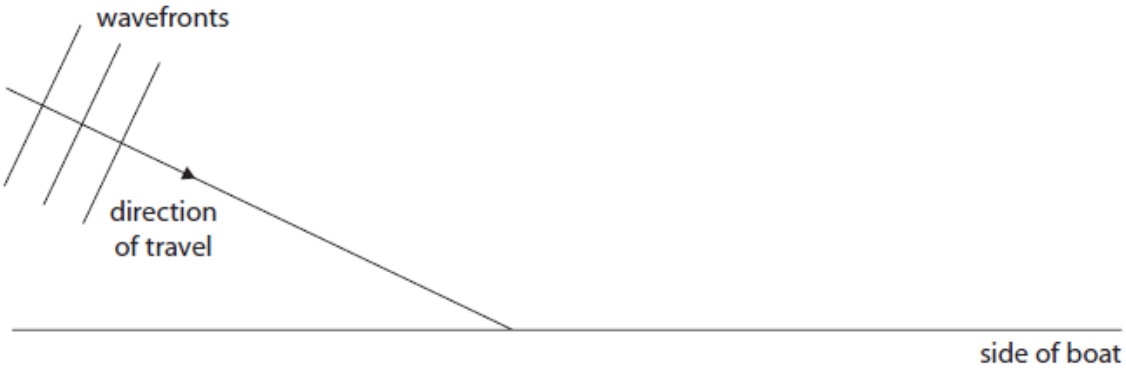


Diagram 1

(i) Draw the normal at the point where the direction of travel of the waves meets the side of the boat.

(1)

(ii) Measure the angle of incidence of the water waves.

(1)

angle of incidence = ... degrees

(iii) Complete the diagram to show the wavefronts after they reflect off the side of the boat.

(3)

(b) The boat starts to move, creating its own waves on the surface of the water.

(i) Surface water waves are transverse.

Describe the difference between transverse waves and longitudinal waves.

(2)

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(ii) Diagram 2 shows the boat moving towards an observer.

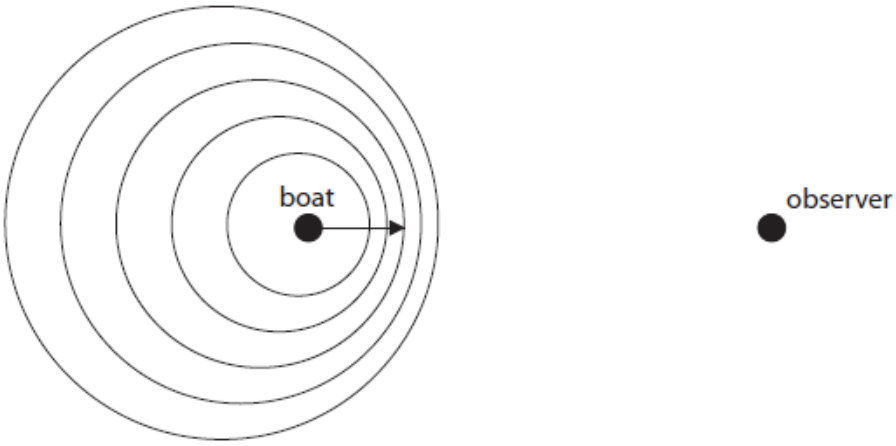


Diagram 2

Explain why the frequency of the water waves measured by the observer is larger than the frequency of the water waves created by the boat.

(3)

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(Total for question = 10 marks)

Q4.

Diagram 1 shows a ray of violet light entering a prism.

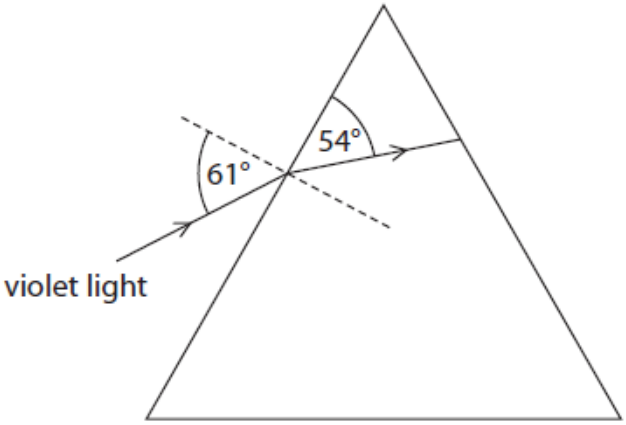


Diagram 1

(a) (i) Calculate the angle of refraction for the violet light.

(1)

angle of refraction = ... degrees

(ii) State the formula linking refractive index, angle of incidence and angle of refraction.

(1)

(iii) Calculate the refractive index of the prism for violet light.

Give your answer to 2 significant figures.

(3)

refractive index = ...

Diagram 2 shows rays of red light and violet light entering the same prism.

Red light has a longer wavelength than violet light.

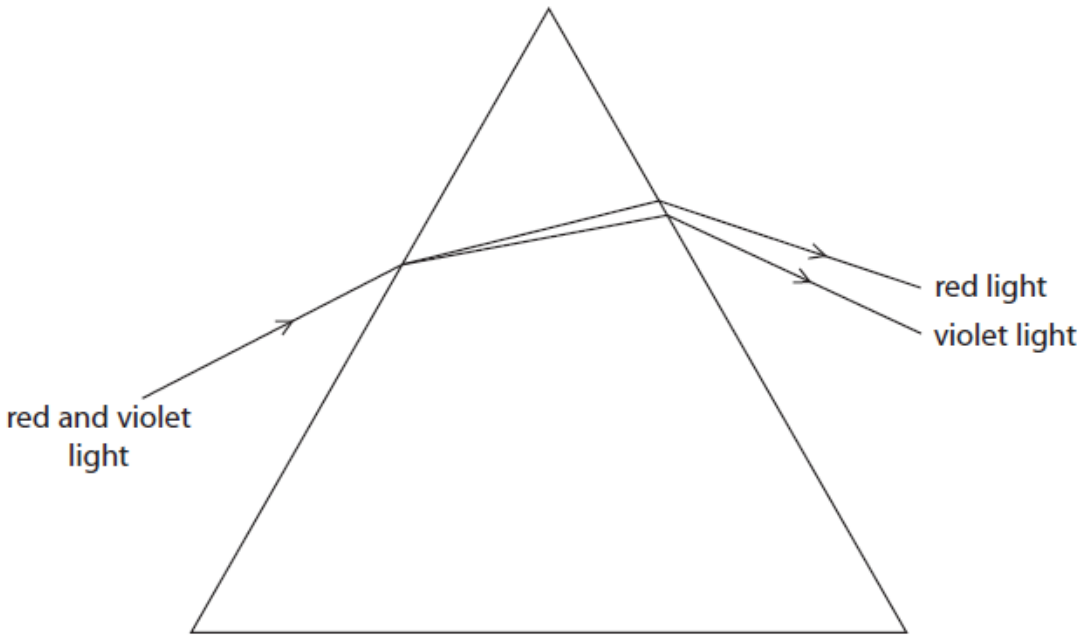


Diagram 2

(b) Deduce a possible relationship between the wavelength and the refractive index for colours of the visible spectrum.

(3)

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(Total for question = 8 marks)

Q5.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross and then mark your new answer with a cross ☒.

(a) Which of these astronomical objects is the largest?

(1)

☒ **A** a comet

☒ **B** the Earth

☒ **C** the Moon

☒ **D** the Sun

(b) Which of these types of radiation is the most ionising?

(1)

☒ **A** alpha

☒ **B** beta

☒ **C** gamma

☒ **D** ultraviolet

(c) Which of these is the unit for resistance?

(1)

☒ **A** ampere

☒ **B** ohm

☒ **C** volt

☒ **D** watt

(d) Which of these parts of the electromagnetic spectrum has the shortest wavelength?

(1)

☒ **A** infrared

☒ **B** microwave

☒ **C** ultraviolet

☒ **D** x-ray

(e) Which of these temperatures is the same as 0 °C?

(1)

☒ **A** -273 K

☒ **B** 3 K

☒ **C** 273 K

☒ **D** 373 K

(Total for question = 5 marks)

Q6.

This question is about atmospheric optical illusions.

(a) A mirage is an optical illusion formed due to total internal reflection of light from the sky at the boundary between cold air and hot air.

Diagram 1 shows how a mirage is formed.

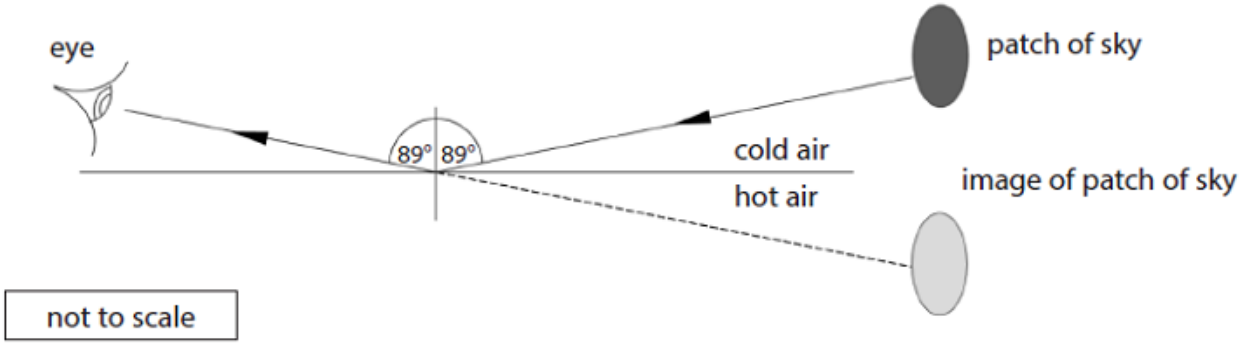


Diagram 1

(i) State the formula linking critical angle and refractive index.

(1)

(ii) The critical angle of the cold air at the boundary is 88.500°

Calculate the refractive index of the cold air.

Give your answer to 5 significant figures.

(3)

refractive index = ...

(b) (i) Diagram 2 shows a ray of light from the Sun.

The refractive index of the atmosphere is greater than the refractive index of space.

Complete the diagram by drawing the path of the ray of light through the atmosphere.

(2)

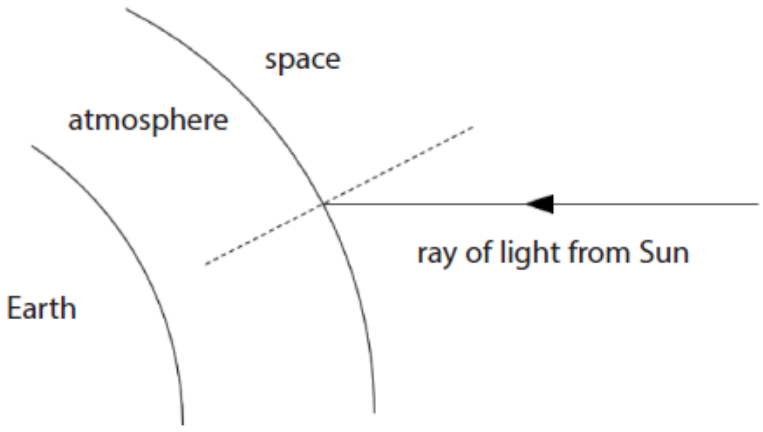


Diagram 2

(ii) Diagram 3 shows a ray of light from the Sun when the Sun is directly overhead.

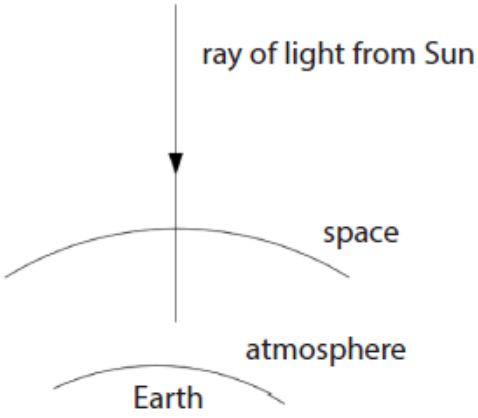


Diagram 3

Explain why the ray of light does not change direction when it enters the atmosphere.

(2)

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(iii) Explain why the wavelength of the light reduces when it enters the atmosphere.

(2)

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(iv) Suggest why the Sun appears not to be circular when it is close to the horizon at sunset.

(1)

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(Total for question = 11 marks)

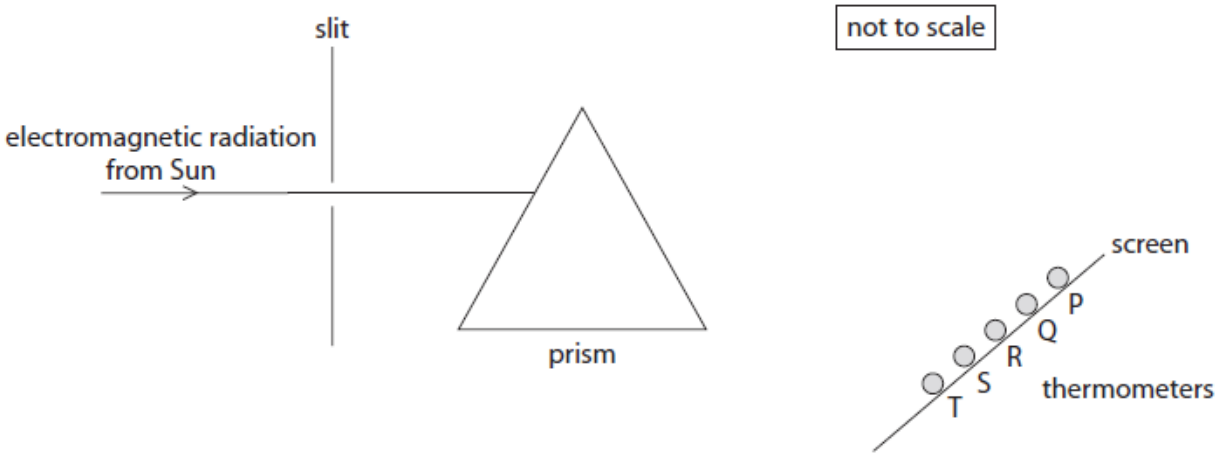
Q7.

The diagram shows the apparatus used to demonstrate the existence of electromagnetic radiation just beyond the visible spectrum.

Electromagnetic radiation from the Sun passes through a slit and a prism.

The electromagnetic radiation refracts through the prism onto the screen.

Five thermometers are placed in front of the screen.



(a) Complete the table to show the missing parts of the electromagnetic spectrum.

(3)

Thermometer	Part of electromagnetic spectrum
P	
Q	red light
R	
S	violet light
T	

(b) Suggest why the lower part of each thermometer should be painted black.

(2)

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(c) The equipment is left for a short period of time.

The thermometers now show higher temperatures than before.

State the part of the electromagnetic spectrum in this demonstration that would give the largest temperature increase.

(1)

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(Total for question = 6 marks)

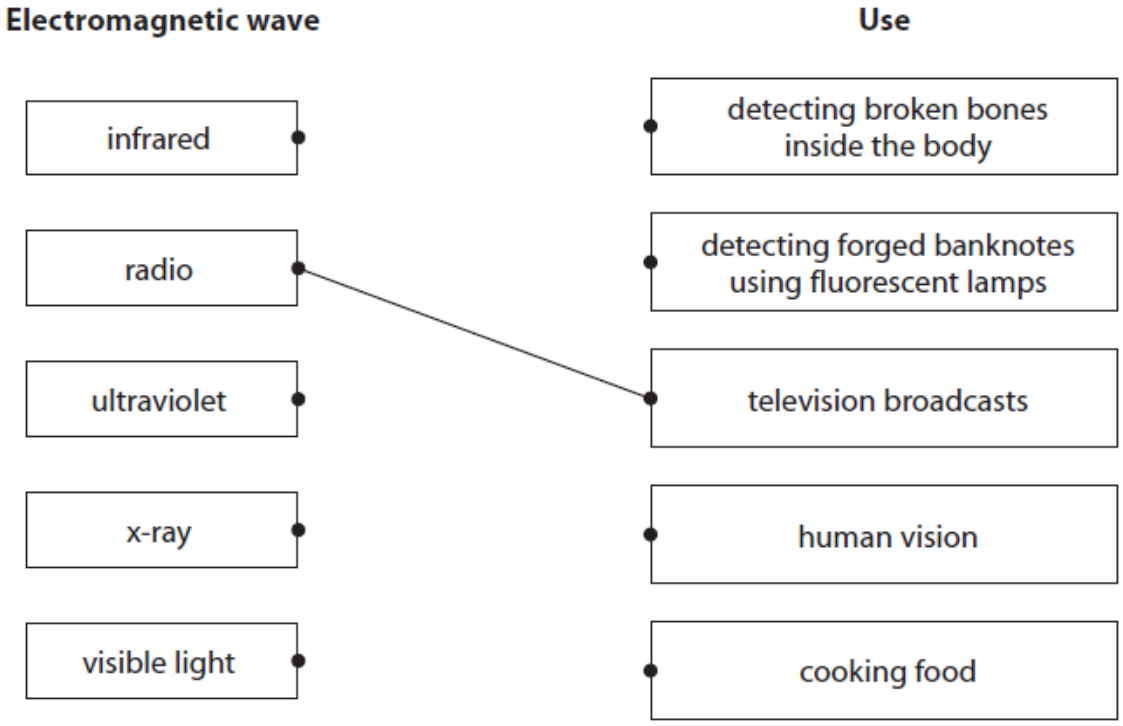
Q8.

This question is about electromagnetic waves.

(a) Draw a straight line from each electromagnetic wave to its correct use.

One has been done for you.

(4)



(b) State a hazard to humans of excessive exposure to infrared waves.

(1)

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(c) State a precaution that would reduce a person's risk of exposure to ultraviolet waves.

(1)

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(Total for question = 6 marks)

Q9.

This question is about refraction.

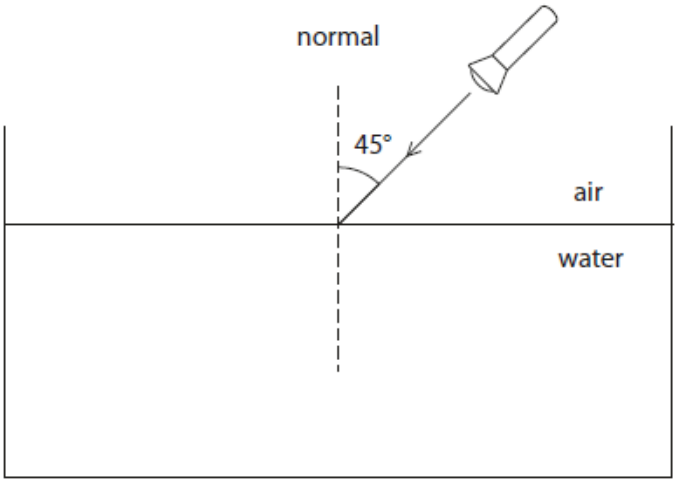
(a) State what is meant by the term **refraction**.

(1)

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(b) The diagram shows a ray of light from a torch incident on the surface of a pool of water.



The angle of refraction of the ray of light is 33°

(i) Draw the path of the ray of light in the water.

(2)

(ii) State the formula linking refractive index, angle of incidence and angle of refraction.

(1)

(iii) Show that the refractive index of water is about 1.3

(2)

(c) The torch is moved below the surface of the water. Light from the torch is incident on the water surface at an angle greater than the critical angle.

(i) Explain the meaning of the term **critical angle**.

You may draw a diagram to help your answer.

(2)

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(ii) State the formula linking critical angle and refractive index.

(1)

(iii) Calculate the critical angle of water.

Assume the refractive index of water is 1.3

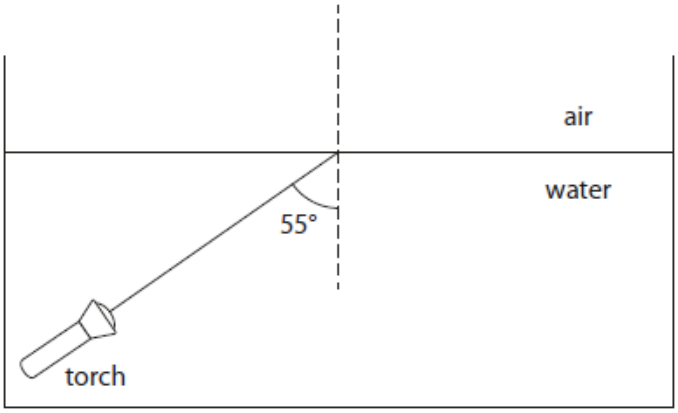
(3)

critical angle = ... °

(iv) A ray of light leaves the torch as shown in the diagram.

Complete the path of the ray of light.

(2)



(Total for question = 14 marks)

Q10.

X-rays and gamma rays are examples of ionising radiation.

(a) Which of these is another example of ionising radiation?

(1)

☒ **A** infrared

☒ **B** microwave

☒ **C** radio

☒ **D** ultraviolet

(b) Give one use of x-rays and one use of gamma rays.

(2)

x-rays

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gamma rays

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(c) (i) State the formula linking speed, frequency and wavelength of a wave.

(1)

(ii) Calculate the wavelength of a gamma ray with a frequency of 2.8×10^{19} Hz.

[speed of gamma ray = 3.0×10^{8} m/s]

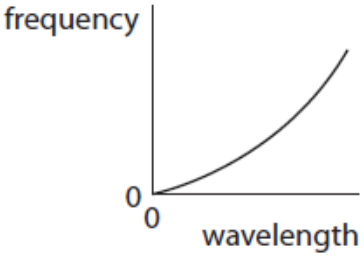
(3)

wavelength = ... m

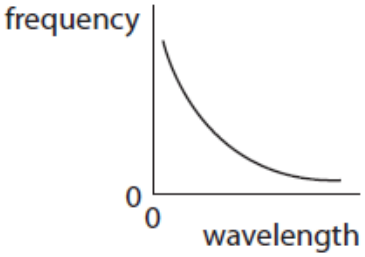
(d) X-rays and gamma rays are electromagnetic waves.

Which of these graphs is correct for waves travelling at a constant speed?

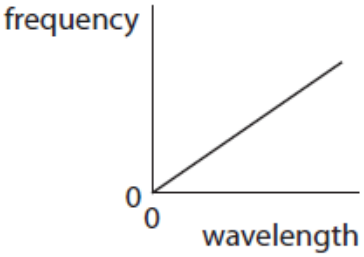
(1)



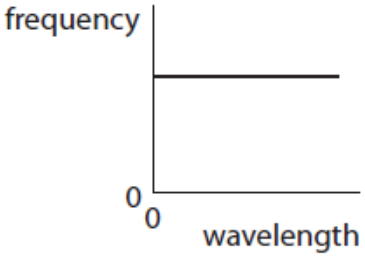
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(Total for question = 8 marks)

Q11.

This is a question about light.

(a) State what is meant by the term critical angle.

You may include a diagram to help your answer.

(2)

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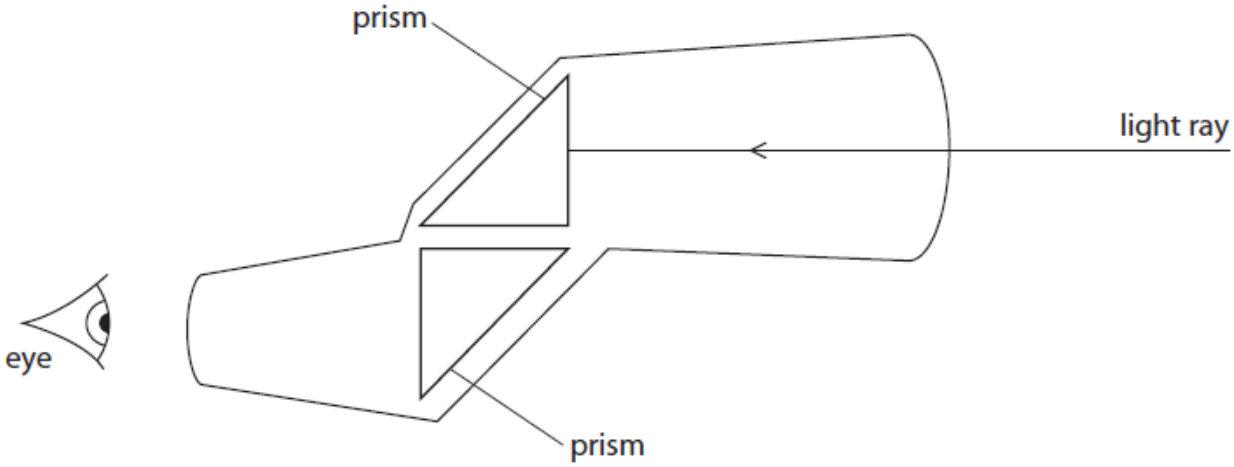
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(b) The photograph shows a pair of binoculars.



The diagram shows a cross-section through one half of a pair of binoculars.



There are two glass prisms inside this half of the pair of binoculars.

Complete the path of the light ray as it travels through this half of a pair of binoculars to the eye.

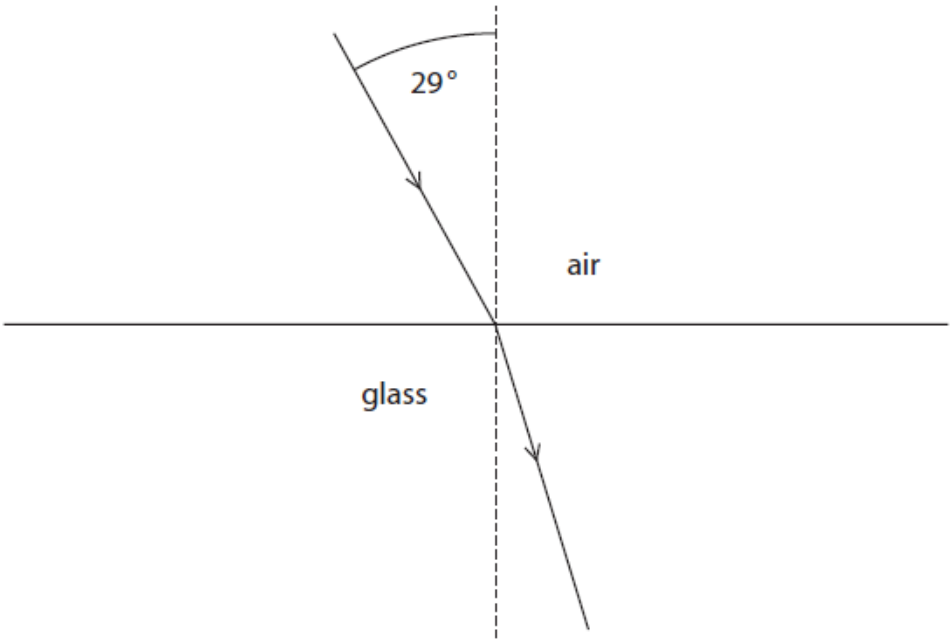
[critical angle of glass = 42°]

(3)

(Total for question = 5 marks)

Q12.

The diagram shows a ray of light travelling from air into glass.



(a) Use a protractor to determine the angle of refraction.

(1)

angle of refraction = ... degrees

(b) State the formula linking refractive index, angle of incidence and angle of refraction.

(1)

(c) Calculate the refractive index of this glass.

(3)

refractive index = ...

(Total for question = 5 marks)

Q13.

A student does an investigation to determine the refractive index of a block made from flint glass.

(a) She directs a ray of red light at the block, as shown in diagram 1.

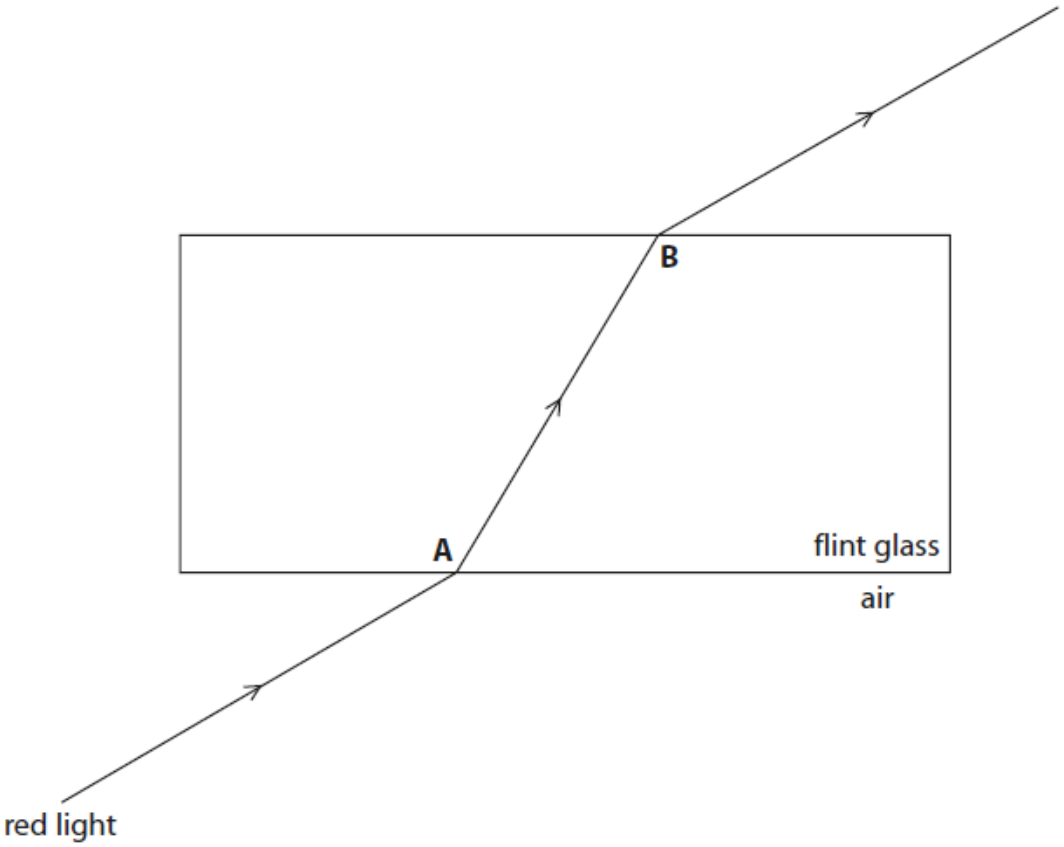


Diagram 1

(i) Some of the light is reflected from the surface of the block at point A.

On diagram 1, draw this reflected ray of light.

(1)

(ii) Use a protractor to determine the angle of incidence and the angle of refraction of the red light at point A on diagram 1.

(2)

angle of incidence = ... degrees

angle of refraction = ... degrees

(iii) State the formula linking refractive index, angle of incidence and angle of refraction.

(1)

(iv) Calculate the refractive index of the glass for red light.

(2)

refractive index = ...

(v) Describe how the student could improve her investigation to obtain a more reliable value of the refractive index.

(3)

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(b) The student replaces the red light with a blue light.

Diagram 2 shows a ray of blue light directed at point A, at the same angle of incidence as the previous ray of red light.

The dashed lines on diagram 2 show the previous path of the ray of red light.

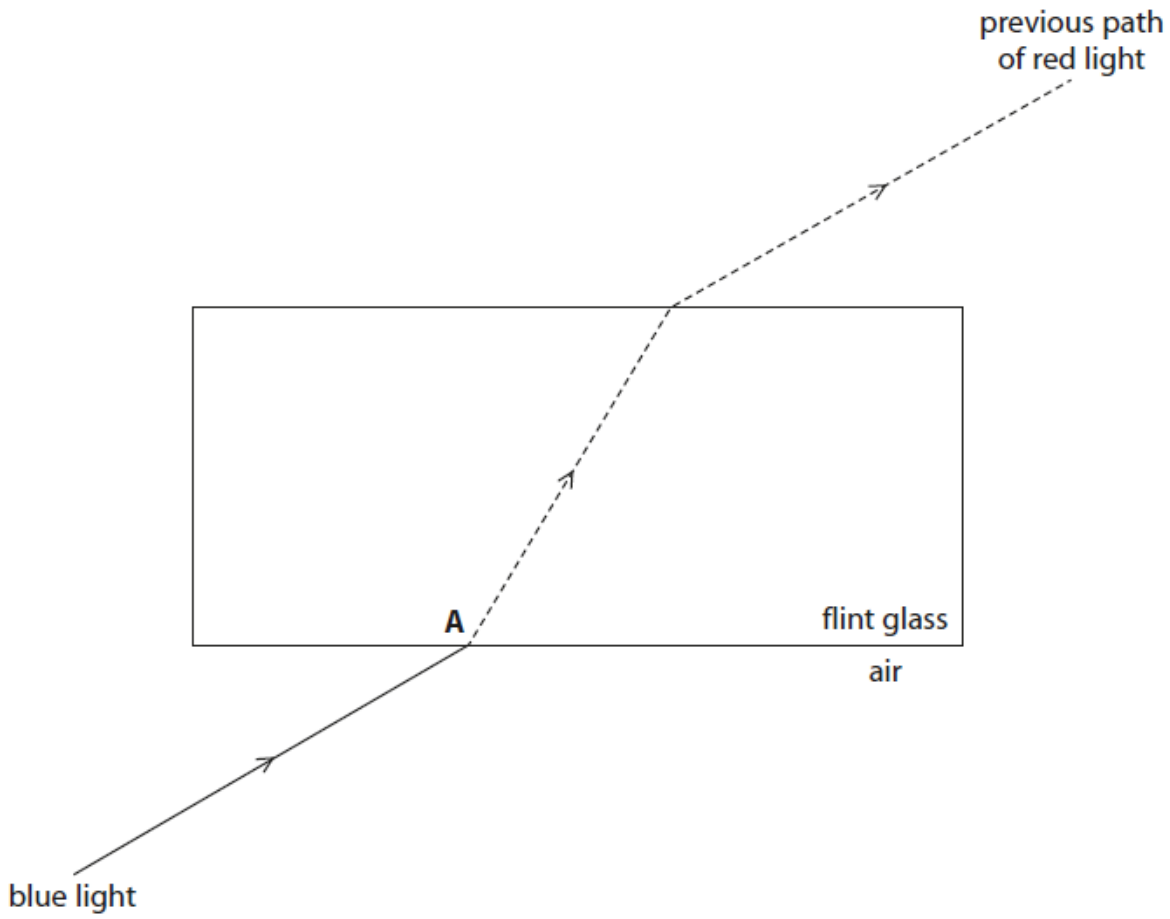


Diagram 2

The refractive index of flint glass for blue light is higher than the refractive index of flint glass for red light.

Complete diagram 2 by drawing the path of blue light from point A until it passes into air.

(3)

(Total for question = 12 marks)

Q14.

A student investigates the reflection of light by a plane mirror.

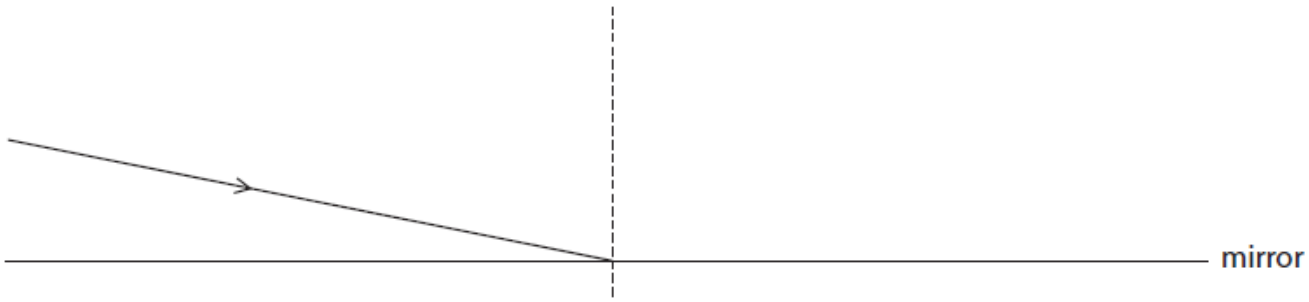
The student uses a ray box, a ruler, a pencil and a mirror.

(a) Name the apparatus that can be used to measure angles during the investigation.

(1)

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(b) The diagram shows a ray of light directed to a point on the mirror.



(i) Label the angle of incidence.

(1)

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(ii) Measure the angle of incidence.

(1)

angle of incidence = ... degrees

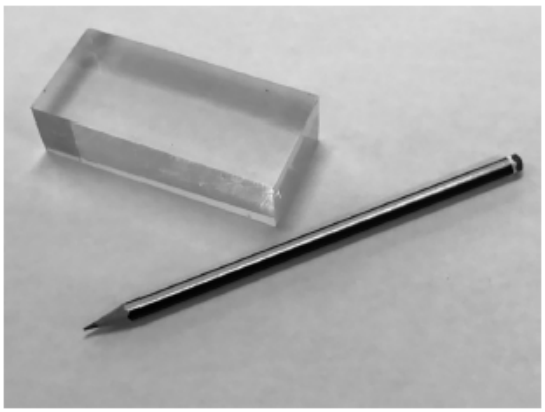
(iii) Complete the diagram to show the ray reflected from the mirror.

(2)

(Total for question = 5 marks)

Q15.

A student does an experiment to determine the refractive index of a glass block.



(a) The student places the glass block on a piece of paper and draws round the block with a pencil.

Name two additional pieces of equipment the student will need for his experiment.

(2)

1 .....

2 .....

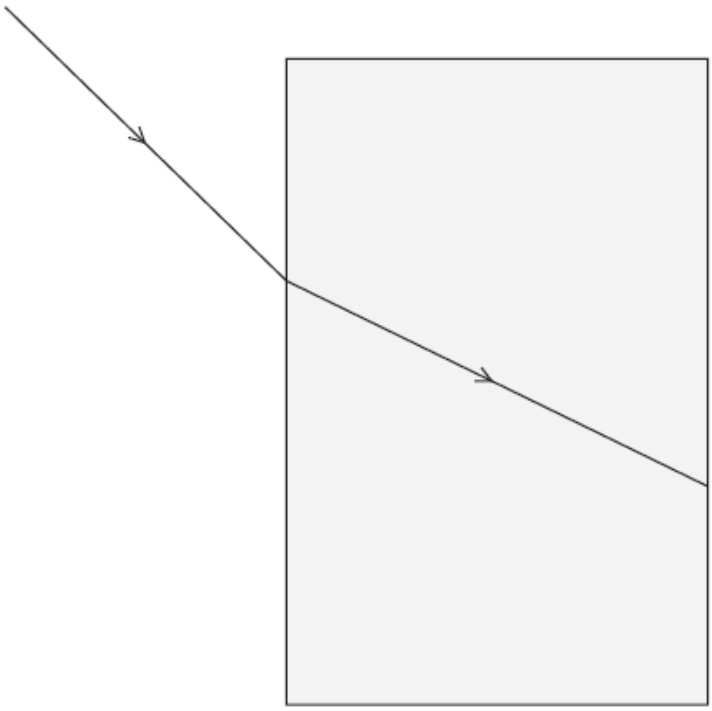
(b) The diagram shows the path of a ray of light as it travels towards and then through the glass block.

(i) Draw the path of the ray of light when it leaves the glass block.

(2)

(ii) Draw the normal line at the point where the ray of light enters the glass block.

(1)



(iii) Determine the angle of incidence and the angle of refraction at the point where the ray of light enters the glass block.

(2)

angle of incidence = ... °

angle of refraction = ... °

(iv) State the formula linking refractive index, angle of incidence and angle of refraction.

(1)

(v) Calculate the refractive index of the glass block.

(2)

refractive index = ...

(c) A teacher suggests that a more accurate value for the refractive index can be found using a graphical method.

Design a method to obtain a value for the refractive index of the glass block using a graph.

You may draw a diagram to support your answer.

(3)

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(Total for question = 13 marks)

Q16.

Diagram 1 shows what happens when light is incident on a piece of transparent material.

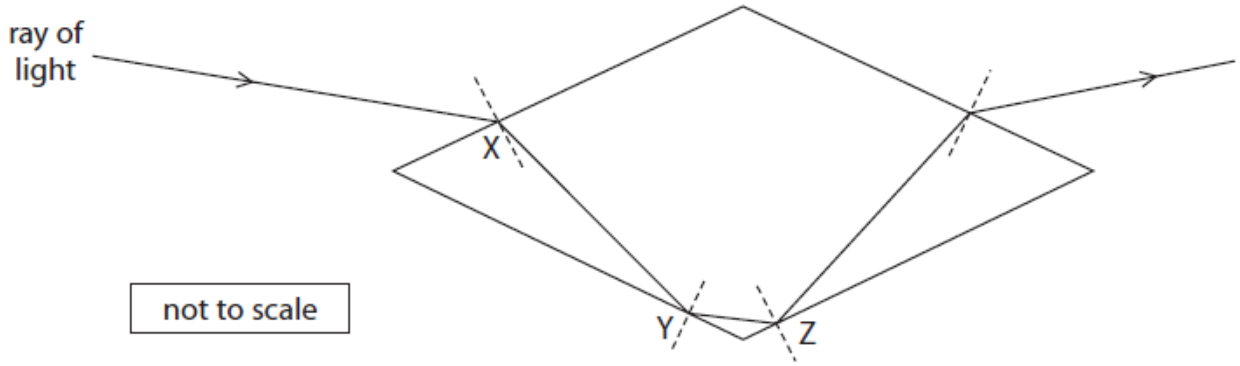


Diagram 1

(a) When very bright light shines on this transparent material, a small amount of light is reflected at point X.

(i) On diagram 2, draw the reflected ray from point X.

(2)

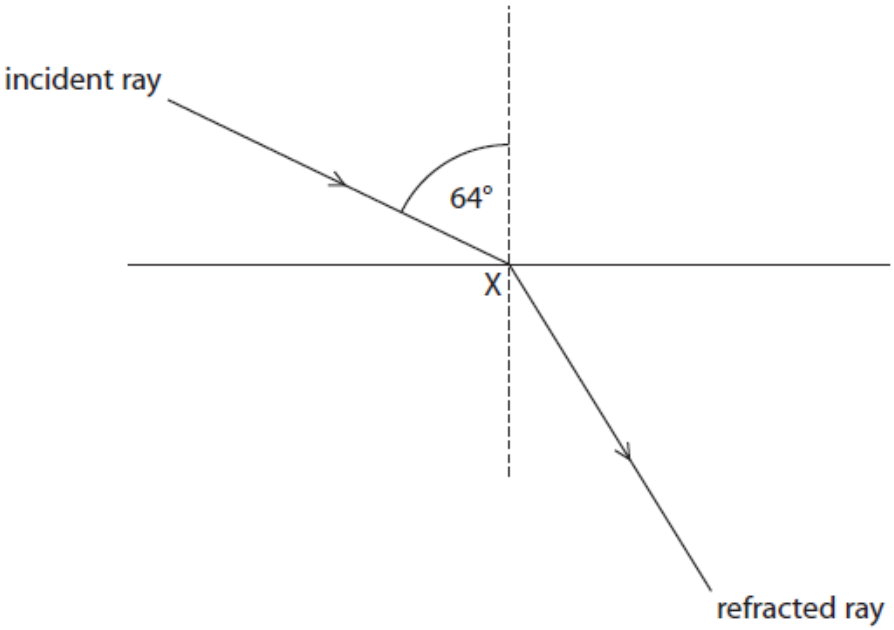


Diagram 2

(ii) Measure the angle of **refraction** at point X on diagram 2.

(1)

angle = ... degrees

(iii) State the formula linking refractive index, angle of incidence and angle of refraction.

(1)

(iv) Show that the refractive index of the transparent material is about 1.7

(2)

(v) State the formula linking refractive index and critical angle.

(1)

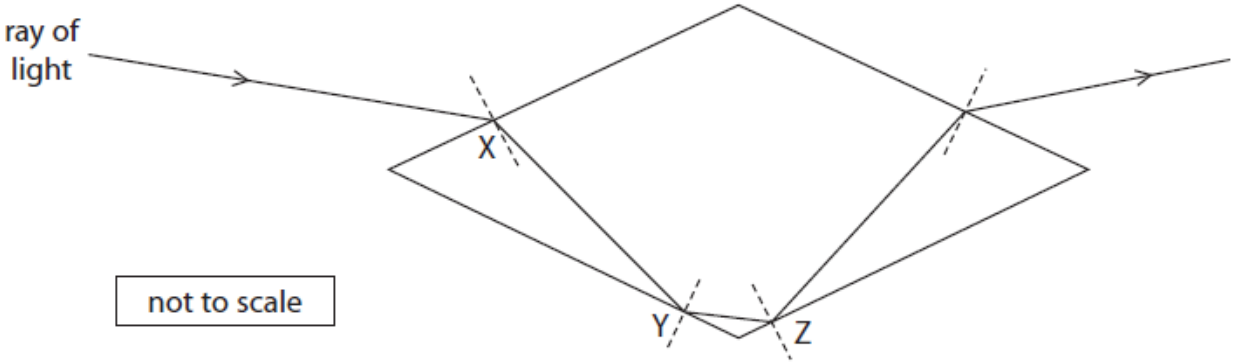
(vi) Calculate the critical angle for the transparent material.

(2)

critical angle = ... degrees

(b) Explain the behaviour of the light at points Y and Z.

(3)



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(Total for question = 12 marks)

Q17.

This question is about light.

(a) Diagram 1 shows a light ray entering a glass prism.

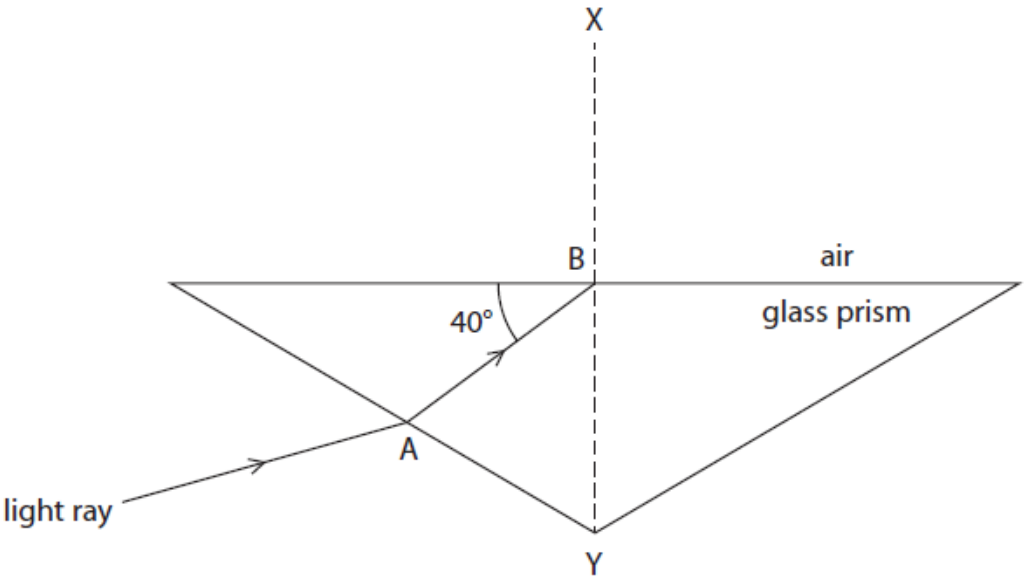


Diagram 1

(i) Describe what happens to the light ray when it enters the prism at point A.

(2)

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(ii) State the name of line XY.

(1)

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(iii) State the formula linking critical angle and refractive index.

(1)

(iv) The refractive index for the glass in this prism is 1.6

Calculate the critical angle for the glass in this prism.

(3)

critical angle = ... °

(v) Complete Diagram 1 by continuing the path of the light ray from point B.

(2)

(b) Diagram 2 shows a similar prism that is made from a material with a different refractive index.

The critical angle for the material of this prism is 55°

Complete Diagram 2 by continuing the path of the light ray.

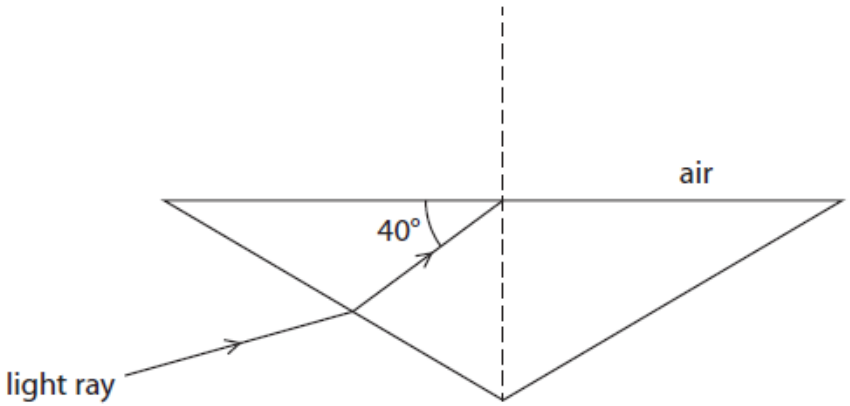


Diagram 2

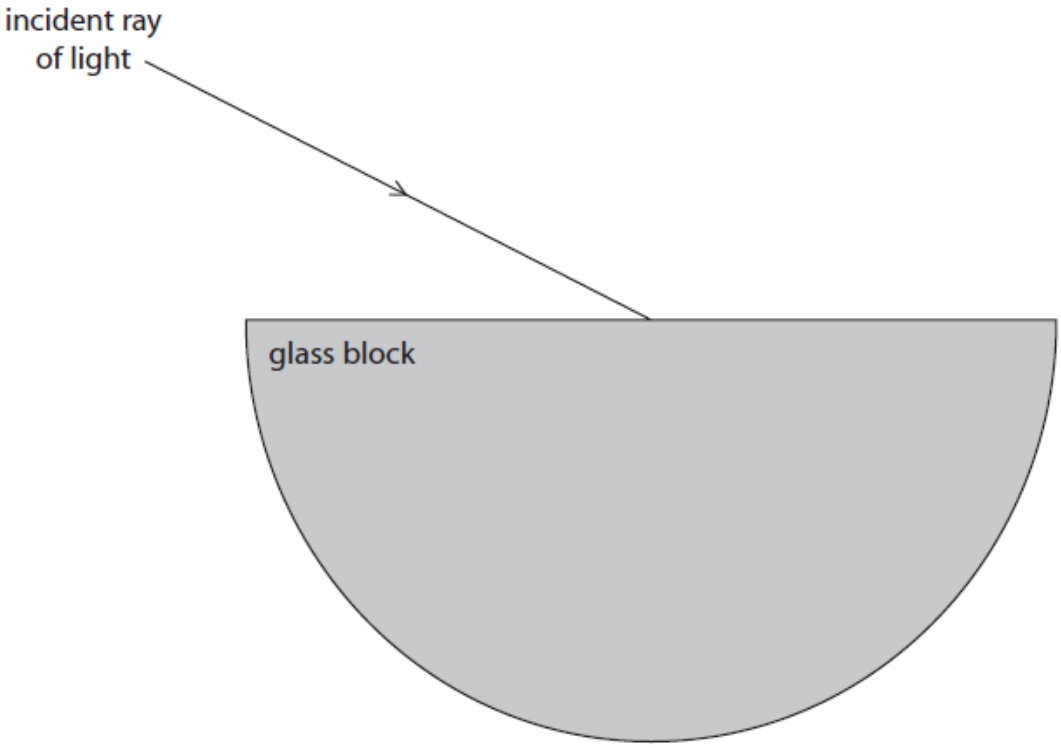
(2)

(Total for question = 11 marks)

Q18.

This question is about refraction in a semi-circular glass block.

(a) The diagram shows a ray of light incident on the flat side of the glass block.



(i) Draw the normal where the incident ray of light strikes the glass block.

Label this line **normal**.

(1)

(ii) Some light from the incident ray passes into the glass block and is refracted.

Draw the refracted ray of light.

Label this line **refracted ray**.

(2)

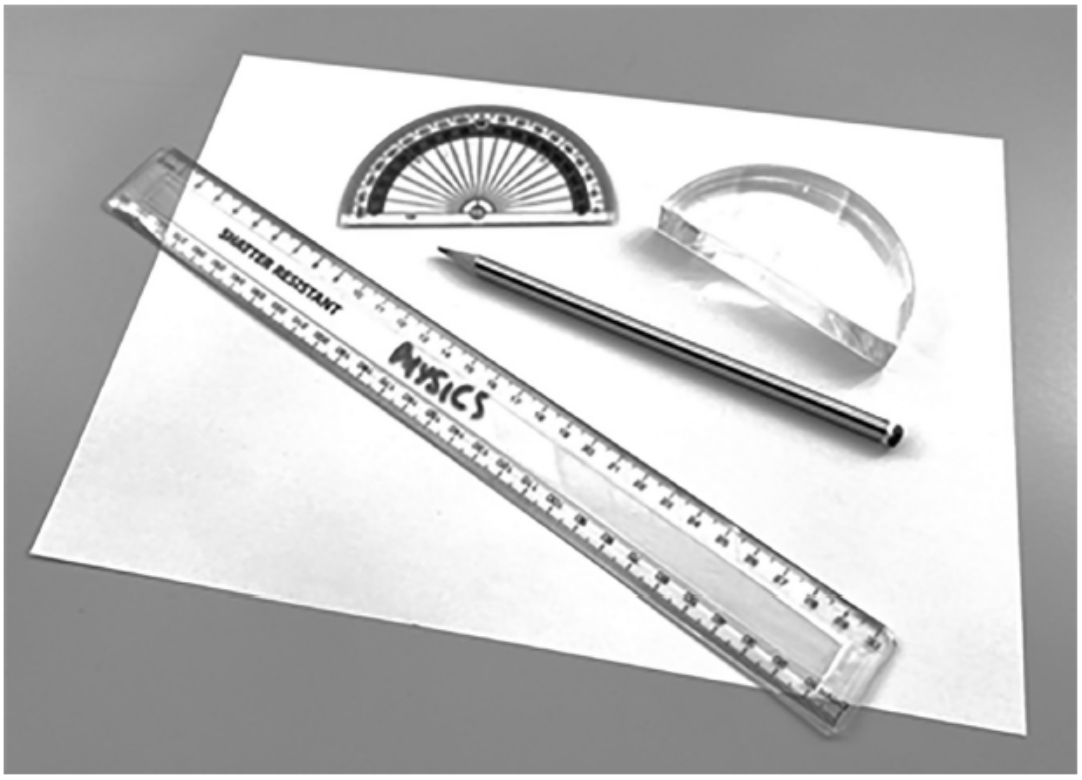
(iii) Some light from the incident ray is reflected at the boundary.

Draw the reflected ray of light.

Label this line **reflected ray**.

(2)

(b) A student investigates the refraction of light by the semi-circular glass block using the equipment in the photograph.



Design an experiment to investigate how the angle of incidence of a ray of light affects the angle of refraction in the glass block.

You may draw a diagram to help your answer.

(6)

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(Total for question = 11 marks)

Q19.

(a) Describe an experiment to determine the refractive index of a glass block.

In your answer you should include

- a labelled diagram
- the apparatus needed
- the method used

(6)

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(b) Give two uses of total internal reflection.

(2)

1 .....

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2 .....

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(Total for question = 8 marks)

Q20.

This question is about refraction.

(a) Diagram 1 shows a ray of light incident on the boundary between a liquid called acetone and air.

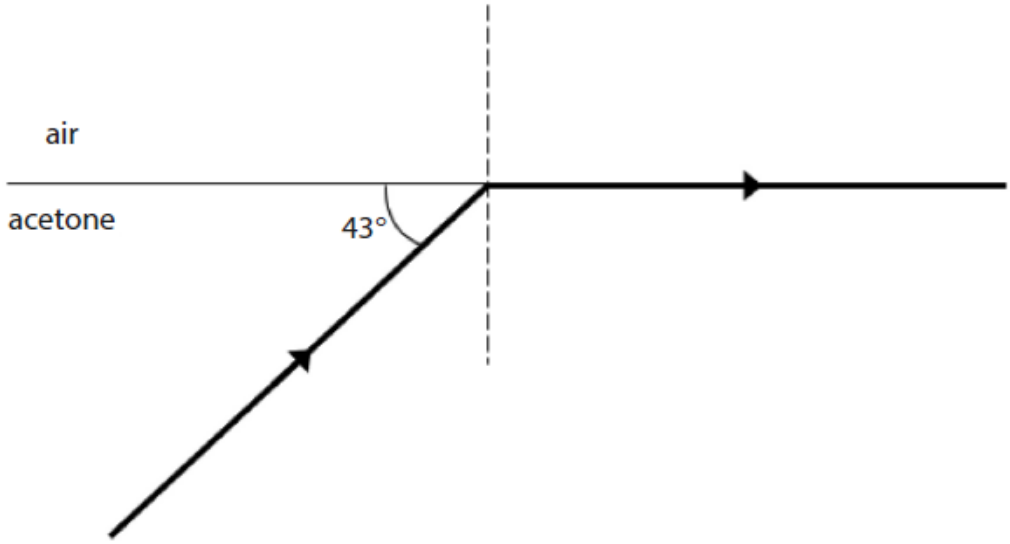


Diagram 1

(i) Calculate the critical angle for the boundary between acetone, and air.

(1)

critical angle = ... °

(ii) State the formula linking critical angle and refractive index.

(1)

(iii) Calculate the refractive index of acetone.

(2)

refractive index = ...

(b) Diagram 2 shows a ray of light incident on the boundary between water and air.

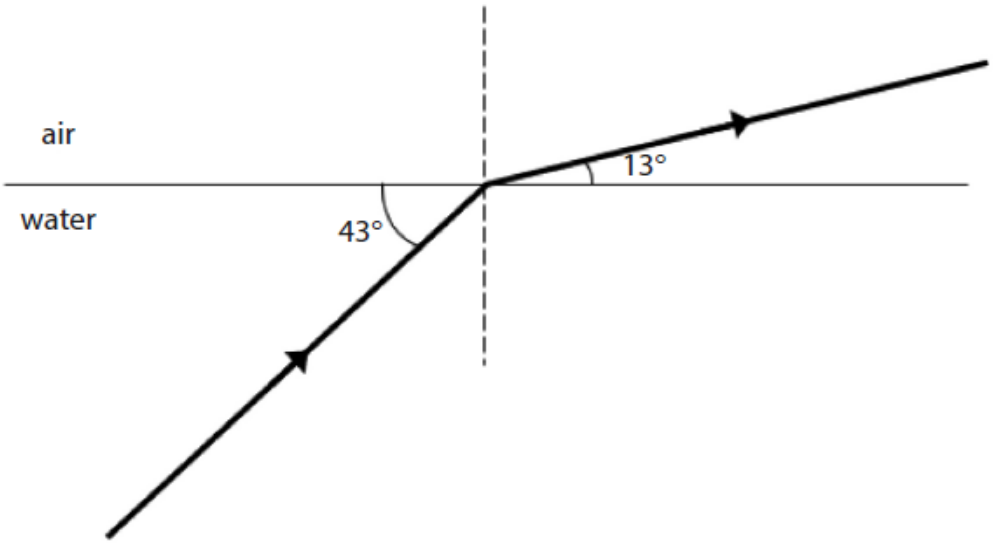


Diagram 2

Explain how the refractive index of water compares to the refractive index of acetone.

(3)

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(Total for question = 7 marks)

Q21.

This question is about satellites and their orbits.

(a) (i) State a difference between an artificial satellite's orbit and a planet's orbit.

(1)

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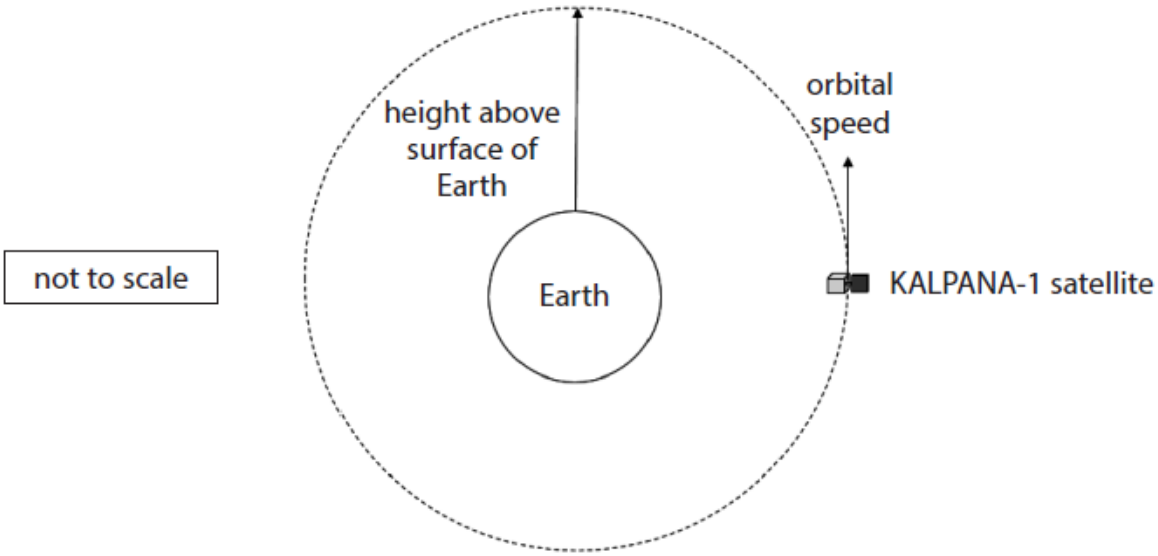
(ii) State a similarity between an artificial satellite's orbit and a moon's orbit.

(1)

.....

(b) KALPANA-1 was an artificial satellite used to monitor the weather.

(i) The diagram shows the orbit of the satellite.



KALPANA-1 has an orbital speed of 3.1 km/s and completes one orbit in 24 hours.

Calculate the height of KALPANA-1's orbit above the Earth's surface.

[radius of Earth = 6400 km]

(4)

height above surface = ... km

(ii) The Doppler effect occurs when there is relative motion between the source of waves and the observer of the waves.

Explain how the Doppler effect causes a change in the observed frequency of the waves.

(3)

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(iii) Suggest why the radio waves from KALPANA-1 detected on the Earth's surface are **not** affected by the Doppler effect.

(2)

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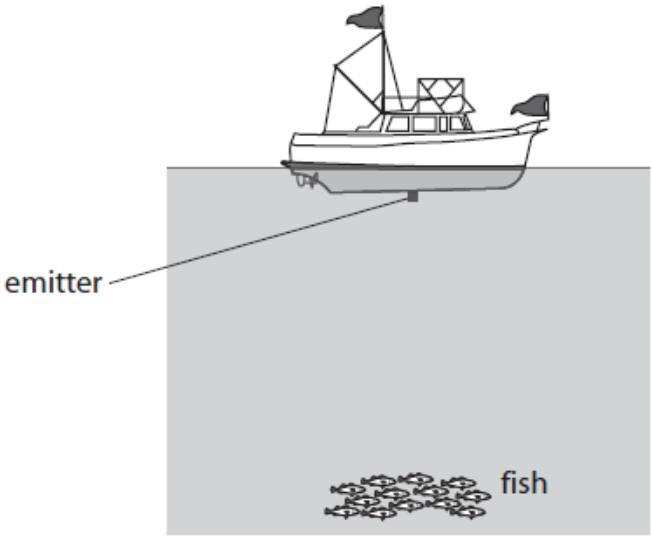
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(Total for question = 11 marks)

Q22.

(a) The diagram shows a fishing boat fitted with a high frequency sound wave emitter.

The boat is above some fish.



The high frequency sound waves travel from the emitter to the fish and then back to the emitter, where they are detected.

(i) Name the wave behaviour that causes the sound waves to change direction when they reach the fish.

(1)

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(ii) The table gives some data about the sound waves used.

frequency of sound waves	4.0 MHz
speed of sound waves in water	1500 m/s
time between emission and detection of sound waves	43 ms

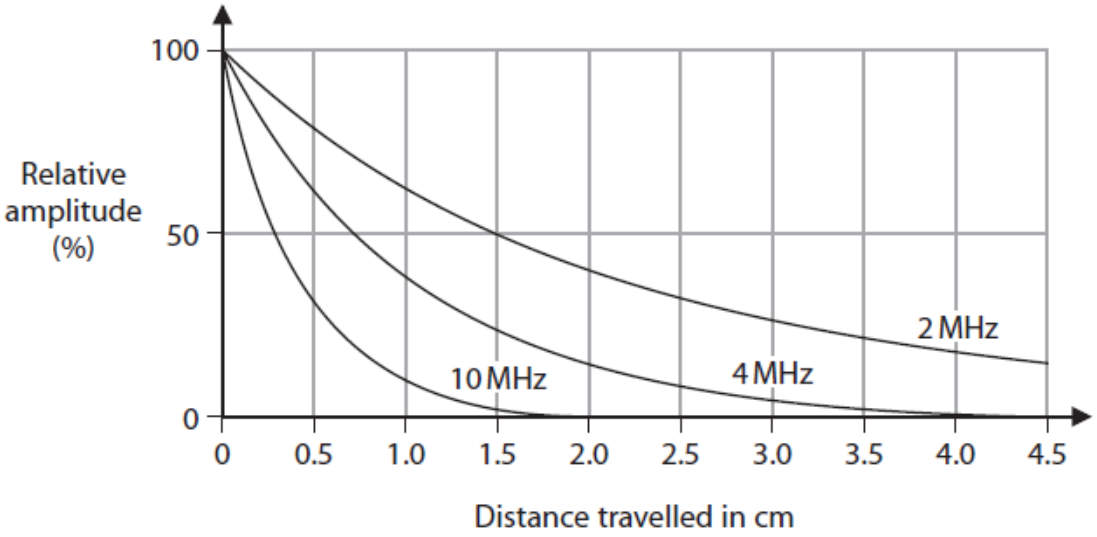
Calculate the distance between the sound wave emitter and the fish.

(4)

distance = ... m

(b) High frequency sound waves decrease in amplitude as they travel through soft tissue in the human body.

The graph shows this decrease in amplitude for three different high frequency sound waves.



(i) Estimate the distance travelled by a 2 MHz wave when its amplitude is 25% of its original value.

(1)

distance = ... cm

(ii) Describe what the graph shows about the penetrating ability of high frequency sound waves as they travel through soft tissue.

(3)

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(Total for question = 9 marks)

Q23.

Sound travels as a wave.

(a) A buzzer produces a sound wave of frequency 2.9 kHz and wavelength 12 cm.

(i) State the equation relating wave speed, frequency and wavelength.

(1)

.....

(ii) Calculate the speed of the sound wave.

(3)

speed = ... m/s

(b) Some electromagnetic waves are dangerous to people.

Describe how the dangers of these electromagnetic waves vary with wavelength.

(4)

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(Total for question = 8 marks)

Q24.

When a meteor explodes, light waves and sound waves are produced at the same time.

(a) (i) State the formula linking average speed, distance moved and time taken.

(1)

(ii) A person standing 1860 m away from the site of a meteor explosion hears the sound of the explosion 5.6 s later.

Calculate the speed of sound in air.

(2)

speed of sound = ... m/s

(iii) A scientist stands a long way from the meteor explosion.

Explain why he hears the explosion at a different time to when he sees it.

(2)

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(b) Sound is a longitudinal wave.

Describe what is meant by the term **longitudinal wave**.

(2)

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(c) In 2013, a meteor exploded above Russia.

Just before the meteor exploded, it was travelling at a speed of 19.2 km/s.

The mass of the meteor was estimated to be 1.25×10^7 kg.

(i) State the formula linking kinetic energy, mass and speed.

(1)

(ii) Calculate the energy in the kinetic store of the meteor just before the meteor exploded.

(2)

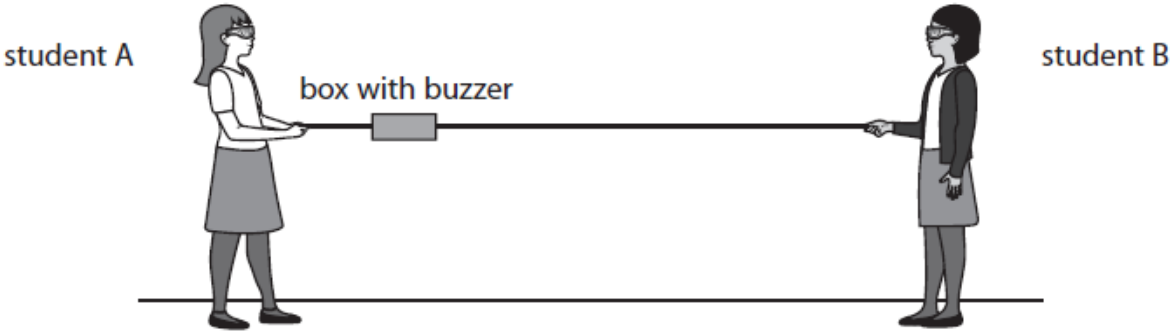
energy in kinetic store = ... J

(Total for question = 10 marks)

Q25.

The diagram shows two students holding a piece of string with a box attached.

The box has a buzzer inside and can move along the string.



The buzzer in the box emits a loud sound of constant frequency.

The box moves **away** from student A at a constant speed.

Explain why the sound heard by student A has a different frequency to the sound emitted by the buzzer.

(5)

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(Total for question = 5 marks)

Q26.

Sound travels as a wave.

(a) Which of these statements about sound waves is **incorrect**?

(1)

☒ **A** they can be reflected

☒ **B** they can travel through a vacuum

☒ **C** they can be refracted

☒ **D** they transfer energy

(b) Sound waves are a type of wave known as longitudinal waves.

(i) Name the other type of wave.

(1)

.....

(ii) Give **one** example of this other type of wave.

(1)

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(c) A buzzer produces a sound wave of frequency 2.9 kHz and wavelength 12 cm.

(i) State the equation relating wave speed, frequency and wavelength.

(1)

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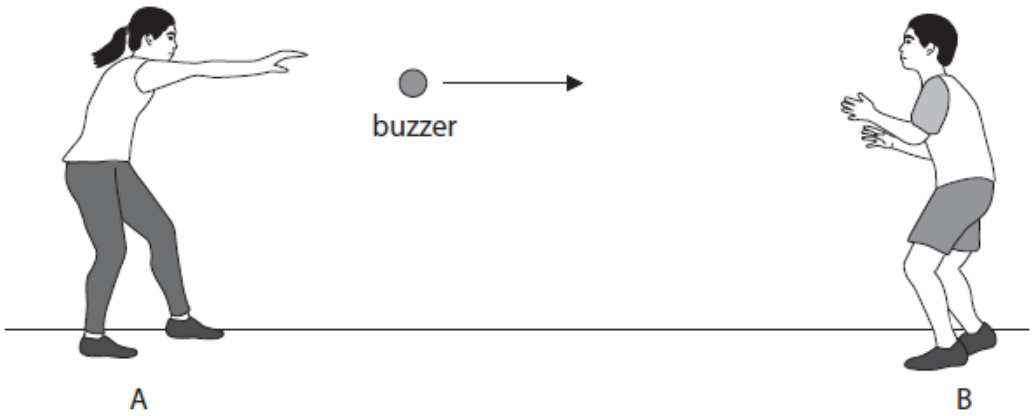
(ii) Calculate the speed of the sound wave.

(3)

speed = ...m/s

(d) Two students investigate the Doppler effect by throwing a buzzer to each other.

Student A throws the buzzer to student B.



When the buzzer is thrown, student A notices that the sound produced changes.

Explain how the sound heard by student A changes.

You may include a diagram in your answer.

(3)

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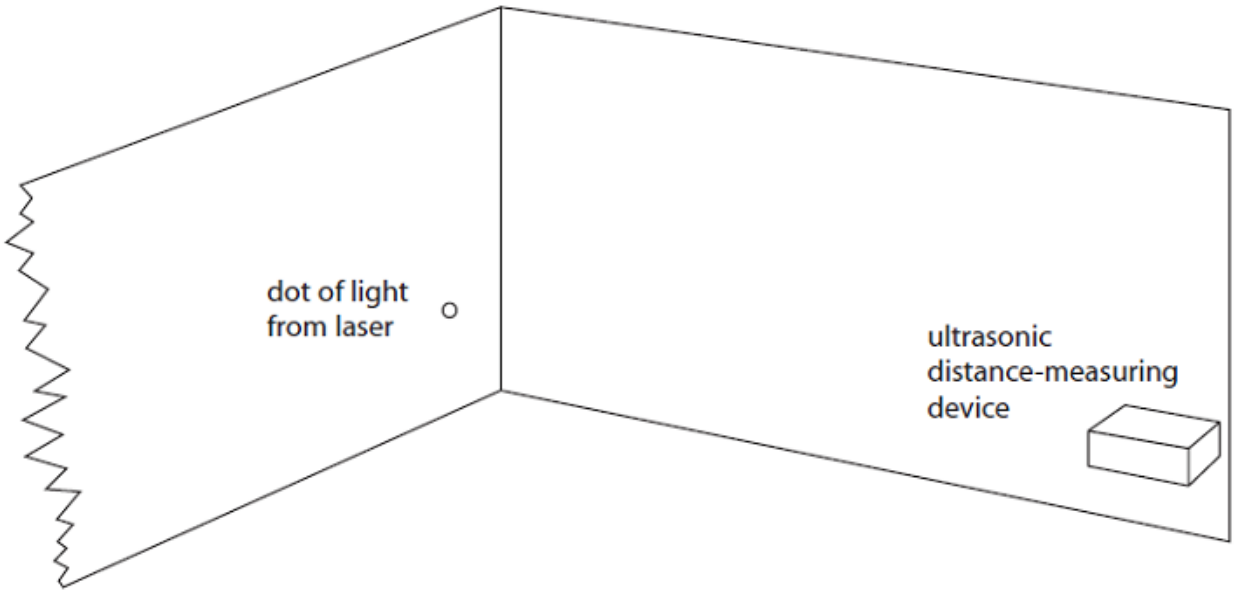
(Total for question = 10 marks)

Q27.

An ultrasonic distance-measuring device can be used to measure the length of a room.

The device emits a pulse of sound with a frequency of 40 kHz.

The device also emits a bright beam of red visible light.



(a) Explain what is meant by a frequency of 40 kHz.

(2)

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(b) A sound wave from the device travels at 345 m / s.

(i) State the formula linking wave speed, frequency and wavelength.

(1)

(ii) Calculate the wavelength of the sound wave.

(3)

wavelength = ... m

(iii) The device emits a sound wave.

The sound wave travels to the wall, reflects back to the device and is received by the device.

The distance from the device to the wall is 2.35 m.

Calculate the time between the sound wave being emitted and received by the device.

(4)

time = ... s

(c) Suggest why the device emits visible light.

(1)

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(d) Sound waves and light waves can have different frequencies and wavelengths.

Describe three other differences between sound waves and light waves.

You may draw diagrams to support your answer.

(3)

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(Total for question = 14 marks)

Q28.

A car is moving along a road.

(a) The car has an initial velocity of 26 m / s.

The car then accelerates at 1. 2 m / s^2 until it reaches a velocity of 35 m / s.

(i) State the formula linking acceleration, change in velocity and time taken.

(1)

(ii) Calculate the time taken for the car to accelerate to 35 m/s.

(3)

time = ... s

(b) A radar speed gun is used to measure the speed of the moving car.



© Petar An/Shutterstock

The radar speed gun emits radio waves towards the moving car.

The moving car reflects the radio waves back to a detector on the gun.

The detected radio waves have a different frequency from the emitted radio waves.

This change in frequency is used to measure the speed of the moving car.

Explain this change in frequency when the car is moving towards the radar speed gun.

(4)

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(Total for question = 8 marks)

Q29.

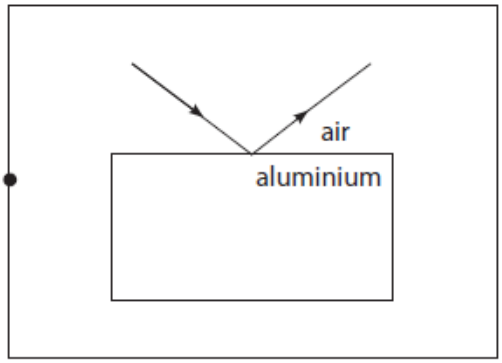
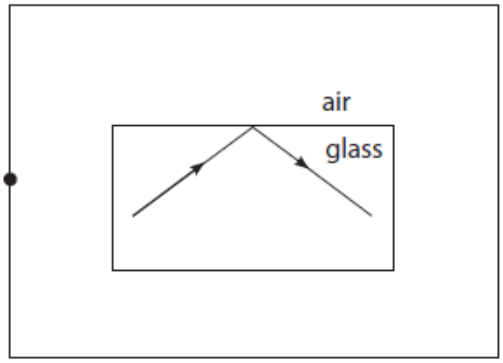
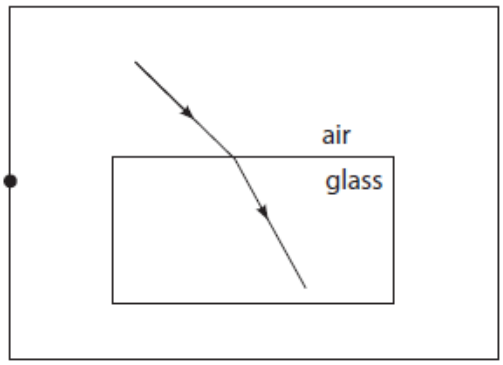
This question is about wave behaviour.

(a) The boxes give three types of wave behaviour and the diagrams give three examples of

wave behaviour.

Draw one straight line from each wave behaviour to the example that best shows that behaviour.

(3)

Wave behaviour	Example
total internal reflection	
refraction	
reflection	

(b) State two properties that all waves have in common.

(2)

1 .....

2 .....

(Total for question = 5 marks)

Q30.

Wi-Fi signals are electromagnetic waves that can be transmitted at frequencies of 2.4 GHz and 5.2 GHz.

(a) (i) State a similarity of the Wi-Fi signals at 2.4 GHz and 5.2 GHz.

(1)

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(ii) The two Wi-Fi signals have different frequencies.

State another difference between the Wi-Fi signals.

(1)

.....

(b) (i) State the formula linking speed, frequency and wavelength.

(1)

(ii) Calculate the wavelength of Wi-Fi signals transmitted at 5.2×10^9 Hz.

[speed of light = 3.0×10^8 m / s]

(2)

wavelength = ... m

(c) (i) Which type of wave is a Wi-Fi signal?

(1)

☒ **A** longitudinal

☒ **B** mechanical

☒ **C** sound

☒ **D** transverse

(ii) Describe the difference between a transverse wave and a longitudinal wave. You may draw a diagram to help your answer.

(2)

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(Total for question = 8 marks)

Q31.

Wind speed affects the wavelength of water waves on the surface of the sea.

The table shows the wavelength of waves on the surface of the sea for different wind speeds.

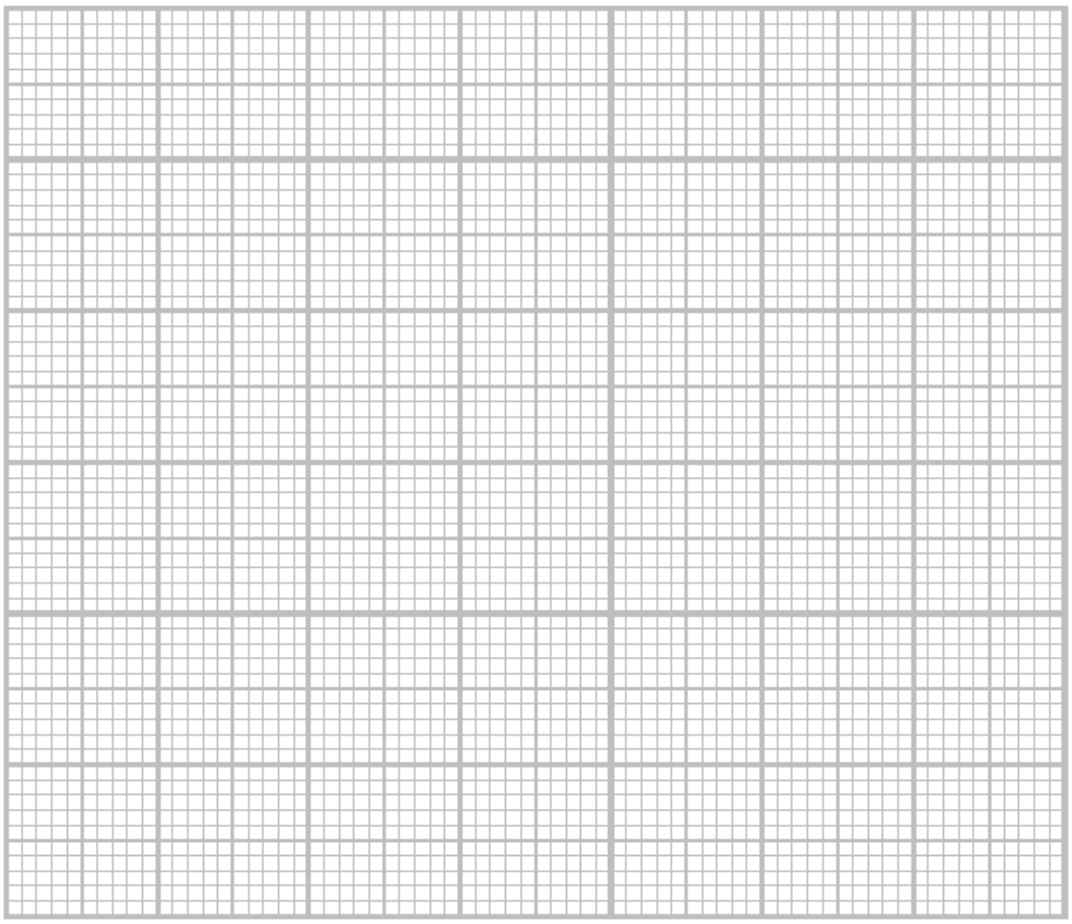
Wind speed in m / s	Wavelength of waves on the surface of the sea in m
0	0
5	12
10	49
15	110
20	196
25	306
30	441
35	600

(a) Plot a graph of this data.

(3)

(b) Draw the curve of best fit.

(1)



(c) Describe the relationship between wind speed and the wavelength of waves on the surface of the sea.

(2)

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(d) A student claims that ships are most likely to be damaged by water waves that have a wavelength equal to the length of the ship.

Based on the student's claim, determine whether a ship of length 350 m is likely to be damaged by water waves if the wind speed is 29 m / s.

(2)

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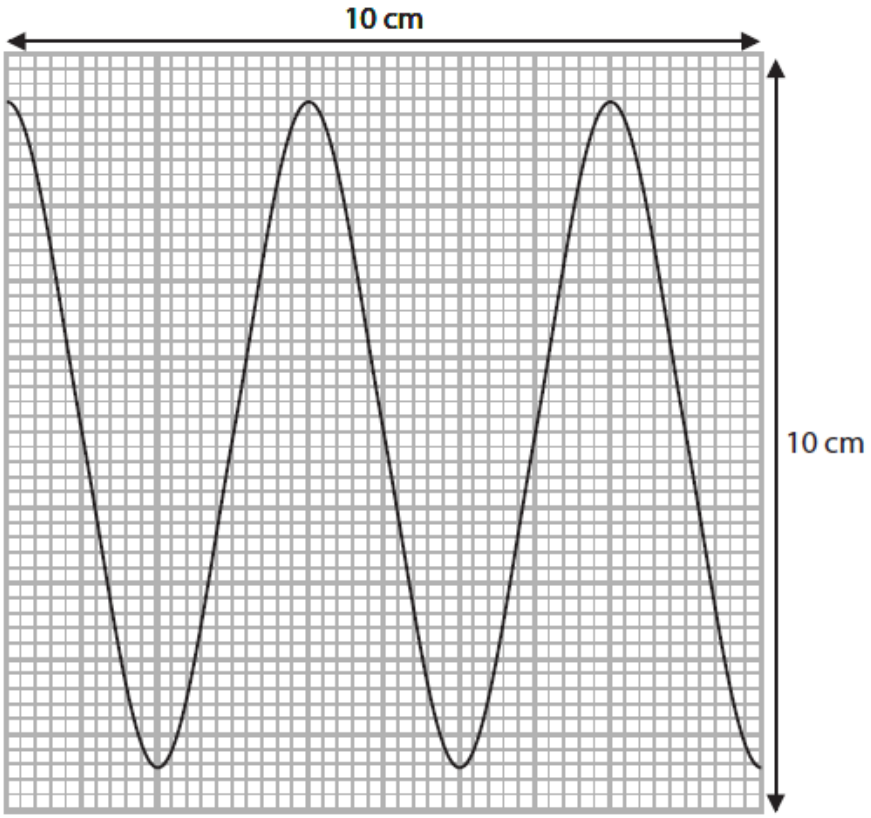
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(Total for question = 8 marks)

Q32.

This question is about waves.

(a) The diagram shows a wave.



(i) What is the wavelength of the wave?

(1)

☒ **A** 4.0 cm

☒ **B** 4.4 cm

☒ **C** 5.0 cm

☒ **D** 8.8 cm

(ii) What is the amplitude of the wave?

(1)

☒ **A** 4.0 cm

☒ **B** 4.4 cm

☒ **C** 5.0 cm

☒ **D** 8.8 cm

(b) The diagram shows the types of radiation in the electromagnetic spectrum.

radio waves	microwaves	infrared	visible light	ultraviolet	x-rays	gamma rays

(i) Which of the following statements about electromagnetic waves is correct?

(1)

☒ **A** they all have the same amplitude

☒ **B** they all have the same frequency

☒ **C** they all have the same speed in free space

☒ **D** they all have the same wavelength

(ii) Electromagnetic waves have many different uses.

Explain the uses of **three** different radiations in the electromagnetic spectrum.

(6)

1 .....

Use .....

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2 .....

Use .....

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3 .....

Use .....

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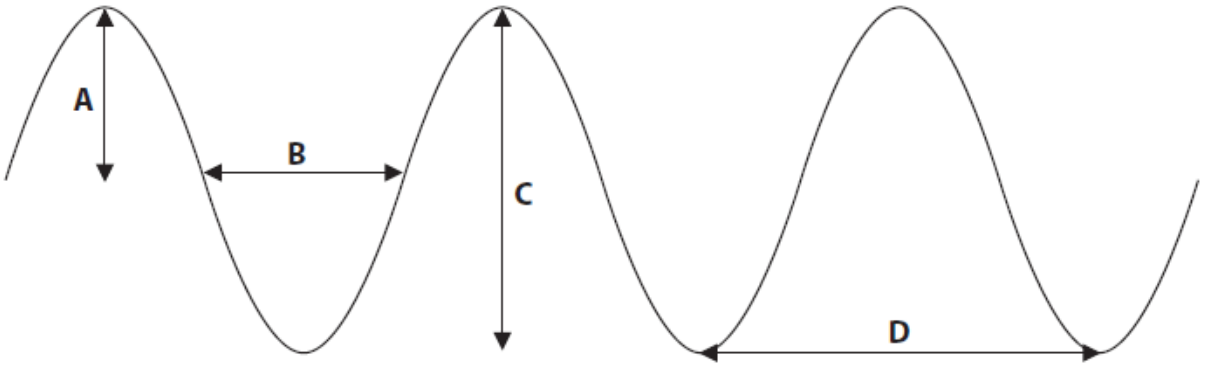
(Total for question = 9 marks)

Q33.

Answer the questions with a cross in the boxes you think are correct ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

This question is about waves.

(a) The diagram shows a wave at an instant in time.



(i) Which arrow on the diagram shows the wavelength of the wave?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Which arrow on the diagram shows the amplitude of the wave?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(b) The boxes give some properties of waves, and definitions of these properties.

Draw a straight line linking each wave property to its correct definition.

(2)

Wave property	Definition
frequency	the time taken for one complete vibration of the wave
period	a line along which all waves are at the same stage of their vibration
wavefront	the number of complete vibrations of the wave each second

(c) Light and sound are two examples of waves.

The table shows whether waves can transfer energy and whether they can be reflected and refracted.

Which row of the table is correct for light waves and for sound waves?

(1)

	Both can transfer energy	Both can be reflected and refracted
☒ **A**	no	no
☒ **B**	yes	no
☒ **C**	no	yes
☒ **D**	yes	yes

(Total for question = 5 marks)

Q34.

This question is about waves.

(a) (i) Which of these waves is longitudinal?

(1)

☒ **A** infrared

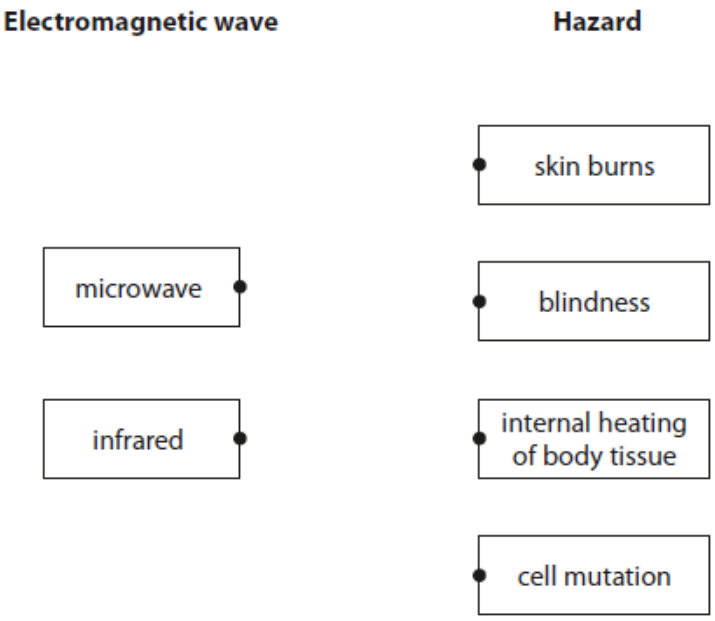
☒ **B** radio

☒ **C** sound

☒ **D** ultraviolet

(ii) Draw a straight line linking each electromagnetic wave to its correct hazard.

(2)



(b) (i) Which of these is a use for x-rays?

(1)

☒ **A** checking for broken bones

☒ **B** cooking food

☒ **C** detecting forged banknotes

☒ **D** smoke detectors

(ii) Which of these is a use for infrared waves?

(1)

☒ **A** checking for broken bones

☒ **B** cooking food

☒ **C** detecting forged banknotes

☒ **D** sterilising medical instruments

(Total for question = 5 marks)