PEARSON EDEXCEL GCSE PHYSICS (HIGHER) · 1PH0

PHYSICS



EXAM QUESTION PACK

TOPIC 4: WAVES (PACK 2)

SCORE	PERCENTAGE
/68	%

STEMUP

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Q1.

Figure 4 is a simplified diagram to show radio waves from a transmitter moving upwards, then meeting a boundary between lower and upper layers of the atmosphere.

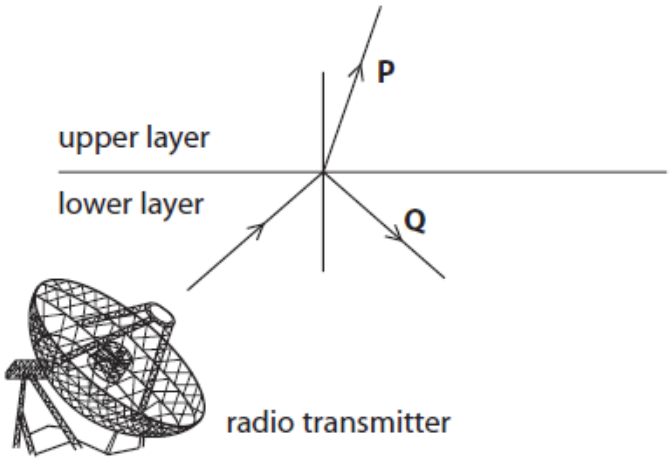


Figure 4

Explain what happens to the radio waves after they meet the boundary between the lower and upper layers as shown in Figure 4.

Your explanation should refer to changes in direction and speed of the waves.

(4)

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(Total for question = 4 marks)

Q2.

The speed of light is 3.0×10^{8} m/s.

The wavelength of yellow light is 5.8×10^{-7} m.

Calculate the frequency of yellow light.

State the unit.

Use the equation

$$\text{frequency} = \frac{\text{speed}}{\text{wavelength}}$$

(3)

frequency = ... unit .....

(Total for question = 3 marks)

Q3.

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

(i) In a controlled chain reaction of uranium-235, which of these could cause a

uranium-235 nucleus to undergo fission?

(1)

☒ **A** an alpha particle

☒ **B** a beta particle

☒ **C** a neutron

☒ **D** a proton

(ii) The kinetic energy of one of the particles released in a fission reaction is 1.2 × 10–11 J.

The mass of the particle is 1.4×10^{-25} kg.

Calculate the velocity of the particle.

(3)

velocity of the particle = ... m/s

(Total for question = 4 marks)

Q4.

Electricity can be generated using a water turbine.

(i) Water gains kinetic energy by falling from the top of a dam.

Calculate the minimum height that 7.0 kg of water must fall to gain 1300 J of kinetic energy.

(3)

minimum height = ... m

(ii) As water enters the turbine at the bottom of the dam, the kinetic energy of 8.0 kg of moving water is 1100 J.

Calculate the speed of the moving water as it enters the turbine.

(3)

speed = ... m/s

(Total for question = 6 marks)

Q5.

Moving air can be used to generate electricity using a wind turbine.

Figure 8 is a graph of kinetic energy against wind speed for a mass of moving air.

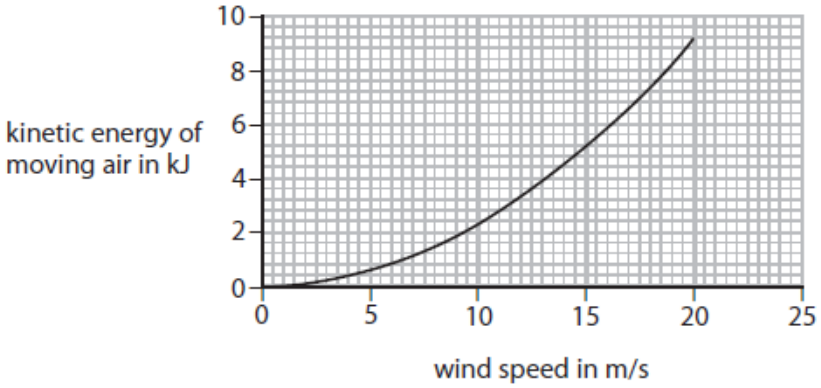


Figure 8

Just before the air reaches a wind turbine it has a wind speed of 15 m/s.

When the air has gone through the turbine it has a wind speed of 13 m/s.

As the air moves through the turbine some of its kinetic energy is transferred to the turbine.

Use the graph to determine the percentage of the kinetic energy transferred to the turbine from the air.

(3)

percentage of kinetic energy transferred from the air = ... %

(Total for question = 3 marks)

Q6.

Figure 13 shows wind turbines, used to generate electricity for the National Grid.



(Source: © MarcelClemens/Shutterstock)

Figure 13

The wind turns the turbine blades.

The wind is a renewable source of energy.

(i) State **two** other renewable sources of energy.

(2)

1 .....

2 .....

(ii) For one turbine

- the energy input per second from the wind is 6.2 kJ
- the energy output per second to the National Grid is 2.2 kJ.

Calculate the efficiency of this turbine.

(2)

efficiency = ...

(iii) Suggest a reason why it is impossible for the turbine to use all the kinetic energy of the wind.

(1)

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(Total for question = 5 marks)

Q7.

Which of these is a non-renewable source of energy?

(1)

- ☒ **A** geothermal
- ☒ **B** natural gas
- ☒ **C** tidal
- ☒ **D** solar

(Total for question = 1 mark)

Q8.

Explain why renewable sources provide an increasing fraction of the electricity supply for many countries.

(2)

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(Total for question = 2 marks)

Q9.

When white light crosses the boundary between air and glass, it can split up into the colours of the spectrum.

Explain, in terms of speed, why the light behaves like this.

(3)

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(Total for question = 3 marks)

Q10.

A student lifts a toy car from a bench and places the toy car at the top of a slope as shown in Figure 2.

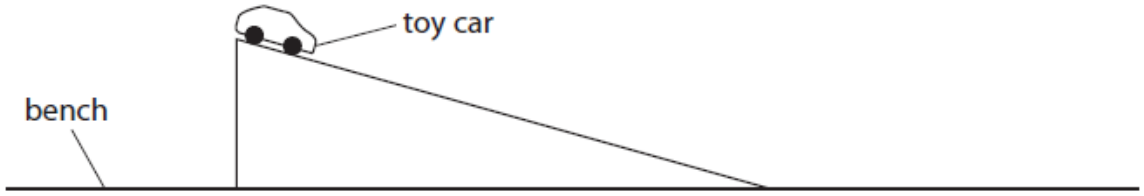


Figure 2

When the toy car rolls down the slope, some energy is transferred to the surroundings as thermal energy.

State how the student could calculate the amount of energy transferred to the surroundings.

(1)

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(Total for question = 1 mark)

Q11.

Figure 5 shows a way of projecting a small trolley up a sloping track.

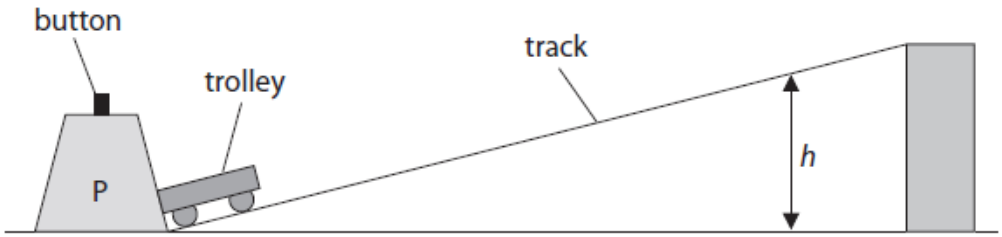


Figure 5

When the button is pressed, a spring is released in P that projects the trolley up the track.

The trolley travels up the track, stops and then rolls back down.

The spring in P always exerts the same force when projecting the trolley.

A student investigates how the mass of the trolley affects the maximum vertical height, *h*, reached by the trolley.

State the measurements the student should make to complete the investigation.

You should make use of the equipment shown in Figure 5 and any other equipment that is needed.

(4)

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(Total for question = 4 marks)

Q12.

A student lifts a toy car from a bench and places the toy car at the top of a slope as shown in Figure 2.

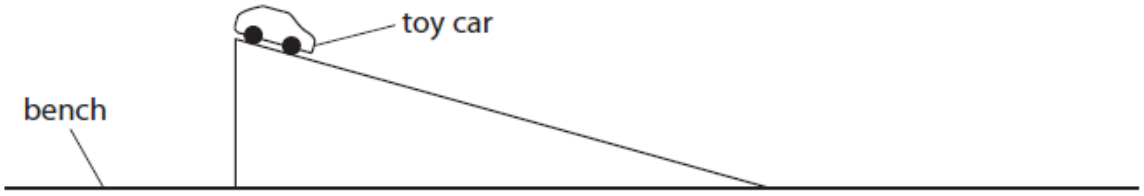


Figure 2

The student needs to develop the experiment to determine the loss in potential energy and the gain in kinetic energy as the toy car is rolling down the slope.

State the other measurements the student must make.

(2)

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(Total for question = 2 marks)

Q13.

State **three** differences between radio waves and sound waves.

(3)

1 .....

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2 .....

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3 .....

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(Total for question = 3 marks)

Q14.

Before a car brakes it has kinetic energy.
The kinetic energy decreases as it brakes.

State what happens to the kinetic energy during braking.

(1)

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(Total for question = 1 mark)

Q15.

Figure 7 shows a submarine being propelled forward underwater.

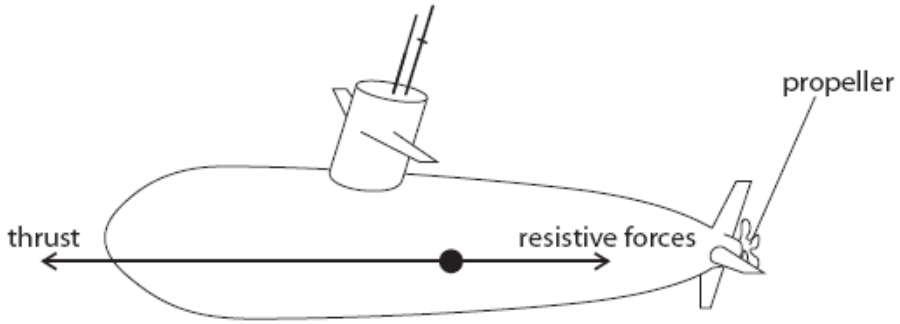


Figure 7

The thrust and the resistive forces are represented in magnitude and direction by the arrows in Figure 7.

Suggest **two** advantages of using nuclear-powered submarines compared to diesel-powered submarines.

(2)

1 .....

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2 .....

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(Total for question = 2 marks)

Q16.

Figure 5 shows how a glass prism is used to produce a spectrum from a beam of sunlight.

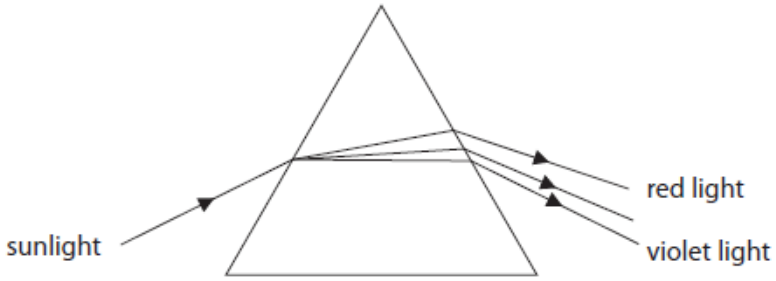


Figure 5

(i) Explain, in terms of refraction and wavelength, the paths taken by the light through the prism.

(3)

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(ii) Describe how a student could develop the procedure shown in Figure 5 to search for

evidence that sunlight consists of additional electromagnetic waves with frequencies lower than visible light.

(2)

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(Total for question = 5 marks)

Q17.

Figure 6 is a graph of the student's results.

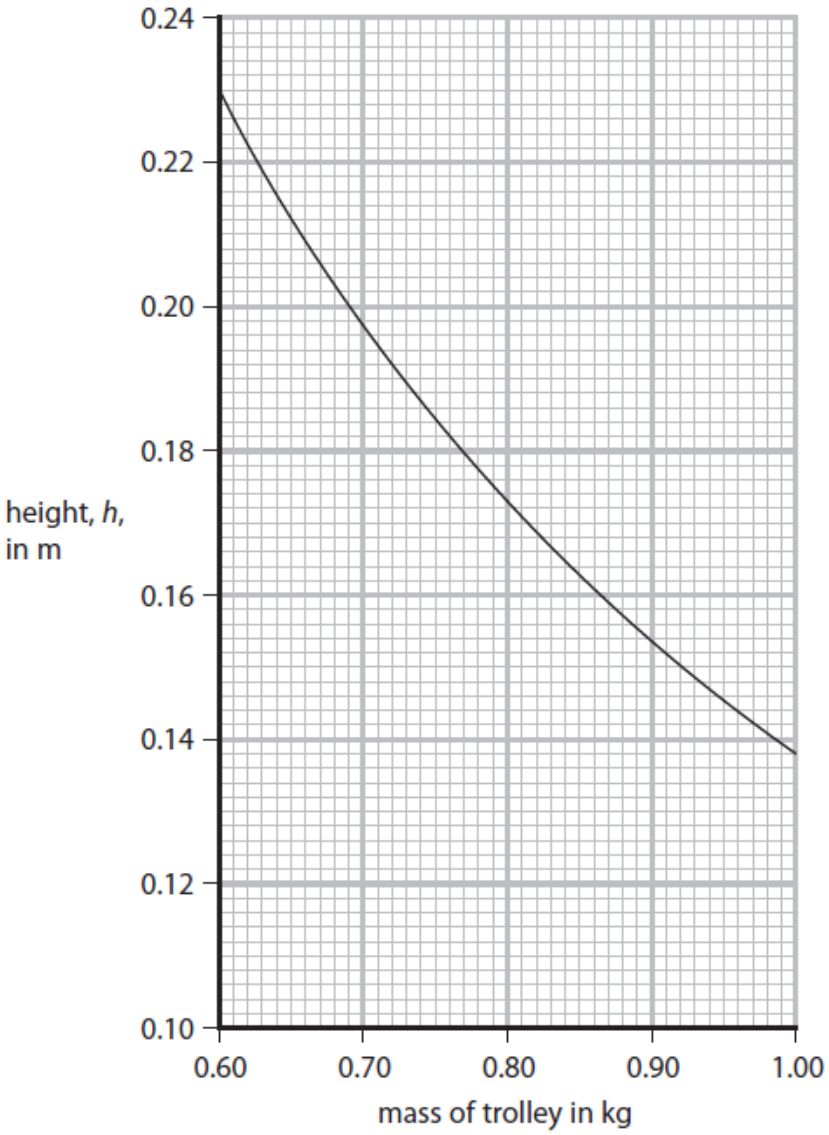


Figure 6

The student states that the energy transferred by the spring is the same each time it is used.

Use data from any two points on the graph in Figure 6 to support this statement.

(3)

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(Total for question = 3 marks)

Q18.

Sound travels slower in cold air than it does in warm air.

The equation relating the speed of sound in air to the density of the air is

$$\text{speed of sound} = \frac{K}{\sqrt{(\text{density})}} \qquad \text{where K is a constant.}$$

The table in Figure 7 gives some data about the speed of sound in air and the density of air.

	speed of sound in m/s	density of air in kg / m^3
in cold air	331	1.29
in warm air		1.16

Figure 7

Use the equation and the data in the table in Figure 7 to calculate the speed of sound in warm air.

Give your answer to an appropriate number of significant figures.

(3)

speed of sound in warm air = ... m/s

(Total for question = 3 marks)

Q19.

Figure 1 is a diagram of a water wave.

A cork is floating on the water.

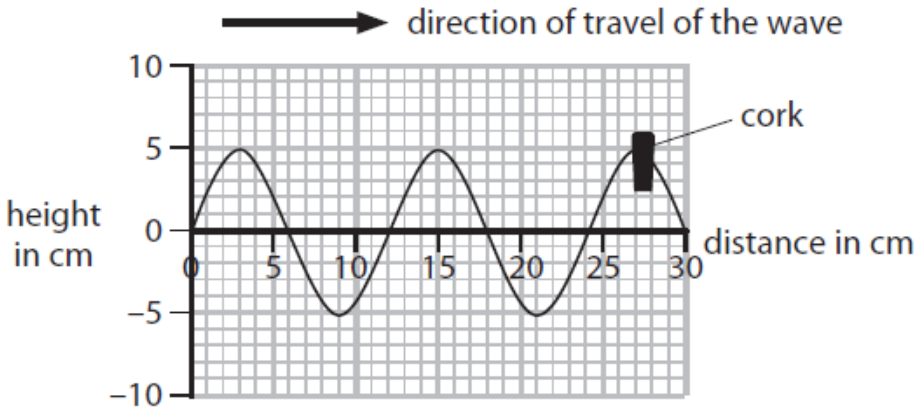


Figure 1

(i) Use the scale on the diagram to measure the wavelength of the wave.

(2)

wavelength = ... cm

(ii) Describe the motion of the cork.

You should include how the cork moves relative to the direction of travel of the wave.

(2)

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(Total for question = 4 marks)

Q20.

A student uses a solar powered battery charger to charge some batteries.

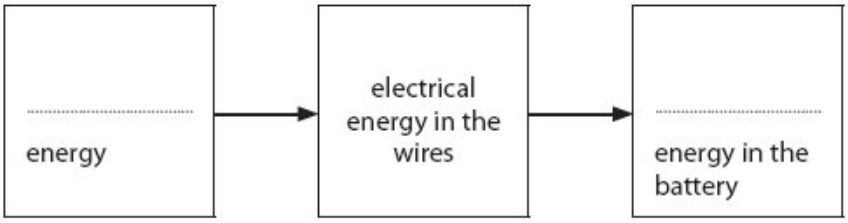


(a) The diagram is an energy transfer diagram for a battery being charged.

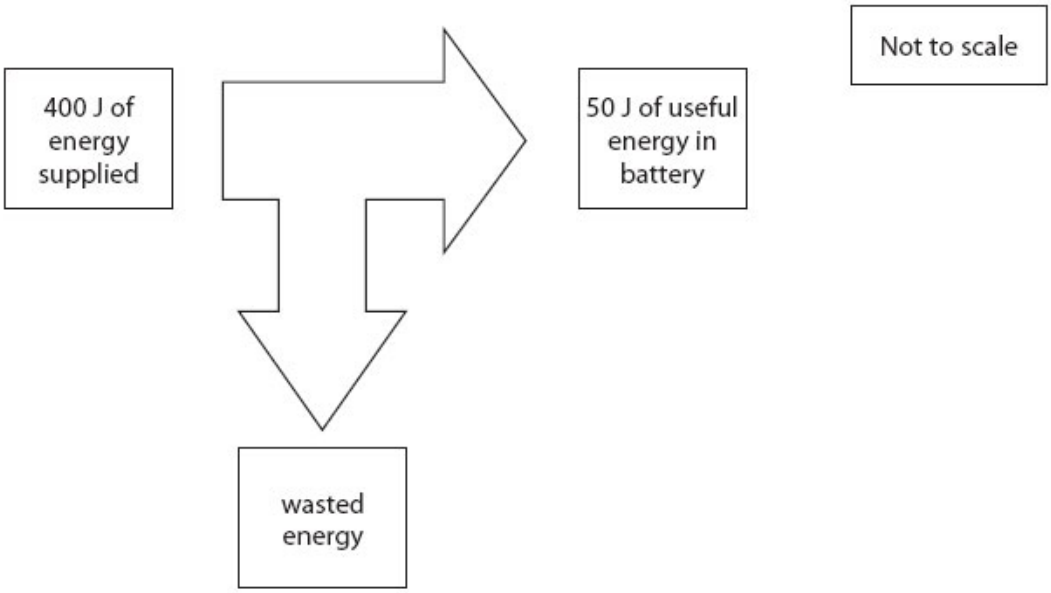
Use words from the box to complete the energy transfer diagram.

light	kinetic	sound
electrical	chemical	

Energy transfer diagram



(b) The diagram shows how much energy is usefully transferred by the battery charger.



(i) Calculate the amount of wasted energy.

(1)

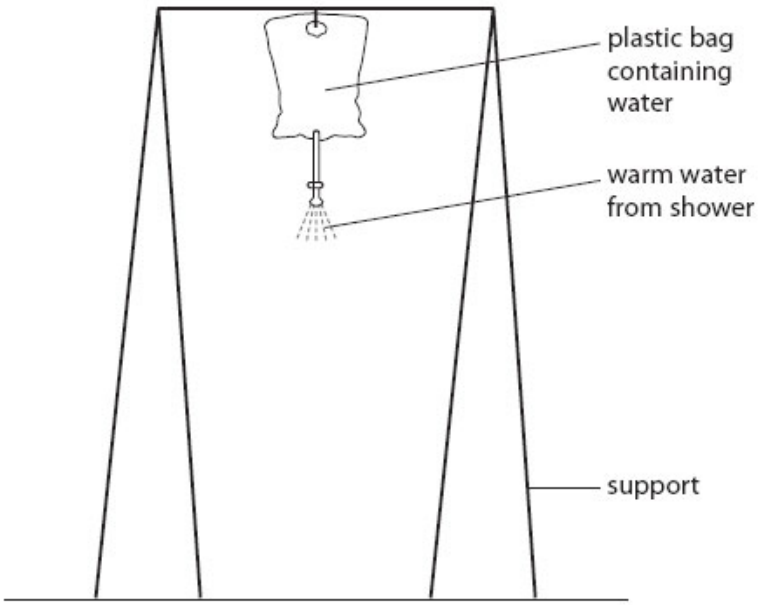
wasted energy = ...J

(ii) Calculate the efficiency of the battery charger.

(2)

efficiency of the battery charger = ...%

(c) The following arrangement is used as a solar powered shower.



The bag is left out in the sunlight during the day.

(i) Explain what colour the bag should be to heat the water to the highest temperature.

(2)

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(ii) On a sunny day the bag is filled with cold water.
Explain why the temperature of the water increases and then stays constant.

(3)

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(Total for Question = 10 marks)

Q21.

Figure 7 shows a tuning fork.

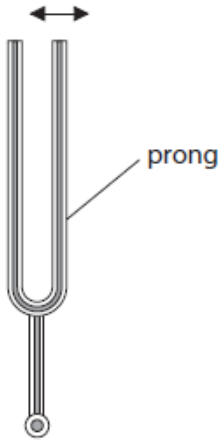


Figure 7

When the prongs of the tuning fork are struck, the prongs vibrate in the directions shown by the arrows on Figure 7.

Describe how the vibrating tuning fork causes a sound wave to travel through the air.

You may add to the diagram if it helps your answer.

(2)

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(Total for question = 2 marks)

Q22.

(i) Figure 2 shows a student sitting on the shore of a lake watching ripples on the surface of the water moving past a toy boat.

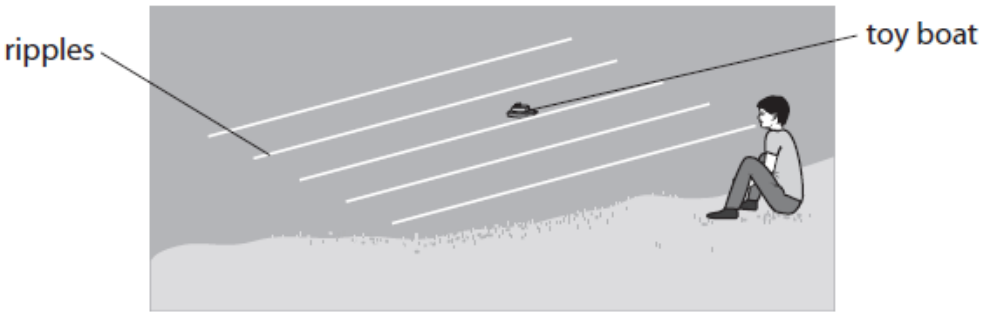


Figure 2

The student has a stopwatch.

Describe how the student could determine the frequency of the ripples on the lake.

(3)

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(ii) The speed of a water wave is 1.5 m/s.

The frequency of the wave is 0.70 Hz.

Calculate the wavelength of this wave.

Use the equation

$$v = f \times \lambda$$

(2)

wavelength = ... m

(iii) Water waves are transverse waves.

Describe the difference between transverse waves and longitudinal waves.

(2)

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(Total for question = 7 marks)

Q23.

* Explain the differences between longitudinal and transverse waves.
Your explanation should refer to ultraviolet, ultrasound and seismic waves.

(6)

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Q24.

A light wave from a star has a frequency of 6.67×10^{14} Hz and a wavelength of 4.50×10^{-7} m.

The star is 4.00×10^{16} m away from Earth.

Calculate the time it takes light from the star to reach the Earth.

(3)

time to reach Earth = ... s