Name: _____

Waves

9-1 Higher

Date:

Time:

Total marks available:

Total marks achieved: _____

Questions

Q1.

There is a piece of music called "The Flight of the Bumble Bee."
This takes 4 minutes to play.
During this time, a bee flies 1608 m.

Calculate the average speed of the bee.

(3)

speed ..... m/s

Q2.

Complete the sentence by putting a cross (☒) in the box next to your answer.

Waves from an earthquake are

(1)

☒ **A** transverse waves only

☒ **B** electromagnetic waves only

☒ **C** both transverse and electromagnetic waves

☒ **D** both transverse and longitudinal waves

Q3.

A wave has a frequency of 15 Hz.
Its wavelength is 125 m.

Calculate the speed of the wave.

State the unit.

(3)

speed of wave = ...

unit = ...

Q4.

The electromagnetic spectrum is continuous.
Different regions of the spectrum have different properties.

An electromagnetic wave has a frequency of 7×10^9 Hz.
The speed of the wave is 3×10^8 m/s.
Calculate the wavelength of the wave.

(3)

wavelength = ...m

Q5.

Light and sound waves are produced at the same time by an explosion on Earth.

(i) The sound of the explosion is heard 1920 metres away 6.0 seconds after the explosion has happened.

Calculate the speed of sound in air.

(2)

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

(ii) A scientist is standing a long way from the explosion.

Explain why he hears the explosion a few seconds after he sees it.

(2)

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Q6.

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

Q7.

(a) Seismic (earthquake) waves can be either P-waves or S-waves.

Which row of the table is correct for P-waves?

Put a cross (☒) in the box next to your answer.

(1)

	type of wave	can they be refracted?
☐ A	longitudinal	yes
☐ B	transverse	no
☐ C	longitudinal	no
☐ D	transverse	yes

(b) Explain why it is difficult to predict when an earthquake will happen.

(2)

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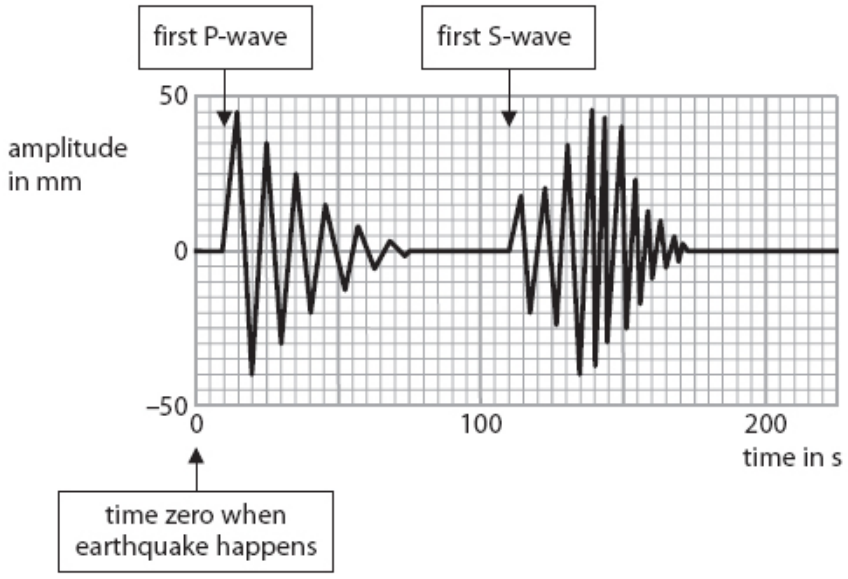
Q8.

The chart shows the arrival of earthquake waves at an earthquake monitoring station.



The S − P time (S minus P time) for earthquake waves is the time difference between the arrival of the first P wave and the first S wave.

Use the chart to estimate the S − P time for the earthquake waves shown.

(2)

S − P time =.....seconds

Q9.

The students produce a different wave.
This wave has a frequency of 1.7 Hz and a wavelength of 8.0 cm.

Calculate the speed of this wave.

(2)

speed of wave = ...cm/s

Q10.

Geologists use sound waves from a small explosion to search for oil underground.

Complete the sentence by putting a cross (☒) in the box next to your answer.

(i) These sound waves are called

(1)

☒ **A** cosmic waves

☒ **B** seismic waves

☒ **C** volcanic waves

☒ **D** tectonic waves

(ii) A small explosion is triggered at the Earth's surface.
The waves reflect back from the top of the oil field.

Suggest why the waves are reflected from the oil field.

(1)

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Q11.

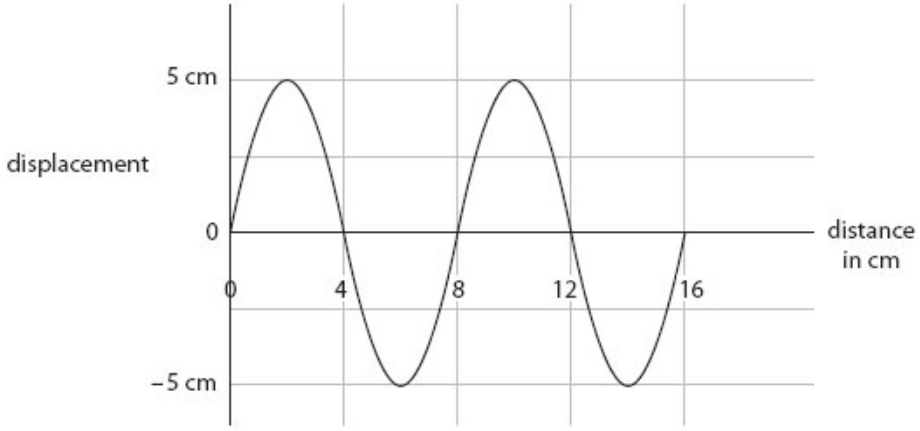
Light travels the 150 million km from the Sun to the Earth in about 500 s.
It takes about 2100 s for light to reach the Earth from Jupiter.
Using this information, calculate the approximate distance of Jupiter from the Earth.

(2)

distance of Jupiter from the Earth =.....million km

Q12.

(i) The diagram represents a wave.



State the amplitude and wavelength of the wave.

(2)

amplitude of the wave = ... cm

wavelength of the wave = ... cm

(ii) 20 waves are sent out in 4 seconds.

Complete the sentence by putting a cross (☒) in the box next to your answer.

The frequency of the wave is

(1)

☒ **A** 0.2 Hz

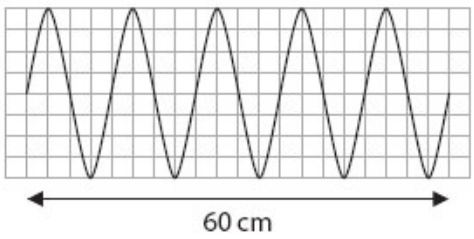
☒ **B** 5 Hz

☒ **C** 20 Hz

☒ **D** 80 Hz

Q13.

Some students are investigating waves.
They produce waves by moving a piece of wood up and down in a tank of water.
The diagram shows the waves over a distance of 60 cm.



(i) State the number of wavelengths shown on the diagram.

(1)

number of wavelengths = ...

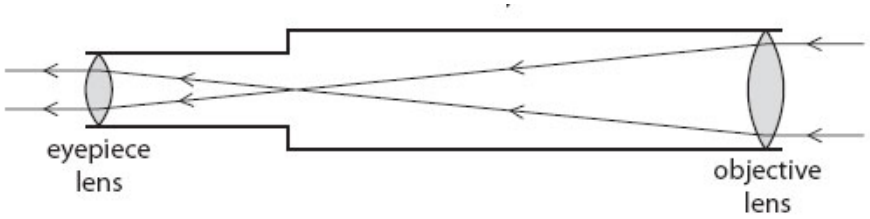
(ii) Calculate the wavelength of the waves.

(1)

wavelength of waves = ...cm

Q14.

The diagram shows a simple telescope which uses two lenses to look at stars.



(i) Explain what the eyepiece lens does.

(2)

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(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The light that travels from the stars transfers

(1)

☒ **A** charge

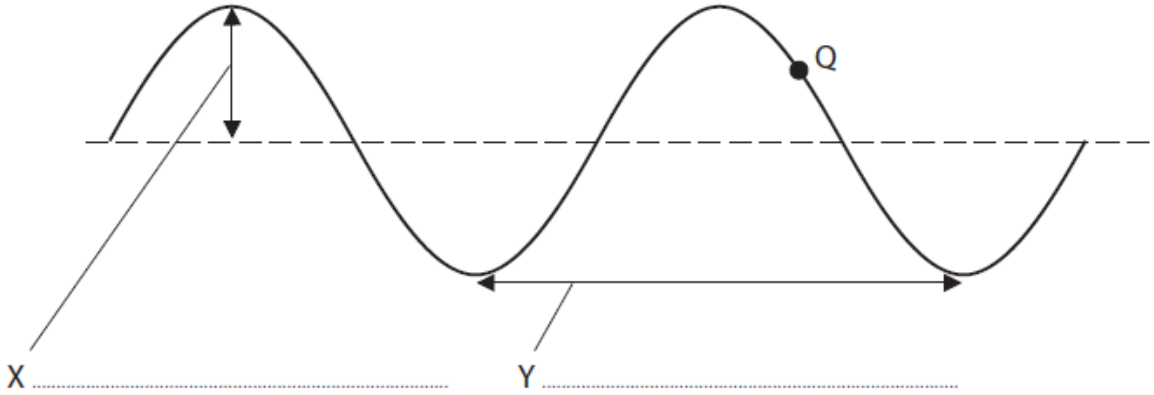
☒ **B** energy

☒ **C** mass

☒ **D** matter

Q15.

The diagram shows a transverse wave.



(i) Use words from the box to label the distances X and Y.

amplitude	frequency	magnification	speed	wavelength

(2)

(ii) Q is a particle in the wave.

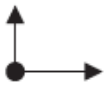
Which of these shows the way in which particle Q moves?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A**

☒ **B**



☒ **C**

☒ **D**

Q16.

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

(6)

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Q17.

The photograph shows a pulse oximeter. This is used to show the heart rate and the amount of oxygen in the blood.

(a) (i) Where is the oximeter usually placed to take measurements?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** on the finger

☒ **B** over the heart

☒ **C** on the neck

☒ **D** on the wrist

(ii) There are two LEDs used in an oximeter.
One emits visible light.
State what type of radiation the other LED emits.

(1)

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(iii) The oximeter shows a heart rate of 89 beats per minute.
Calculate the frequency in beats per second.

(2)

frequency =.....beats/second

(iv) Calculate the time between each heartbeat.

Use the equation

$$\text{time between heartbeats} = \frac{1}{\text{frequency}}$$

(2)

time between heartbeats =..... .s

*(b) Doctors use an electrocardiogram (ECG) machine to monitor the action of a person's heart.

Describe how a doctor can use an ECG machine to collect and display information from a person's beating heart in order to check heart action.

You may draw a labelled diagram to help with your answer.

(6)

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(Total for Question = 12 marks)