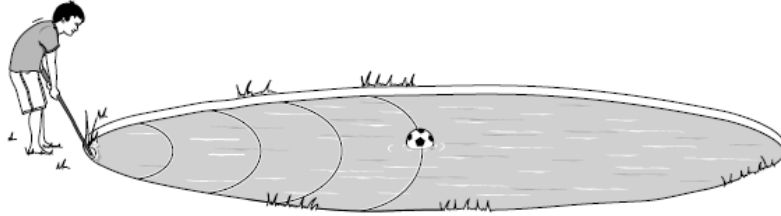


Waves

1.

This question is about the properties of waves.

Bobby has kicked his ball into the middle of a pond.



The ball is 10 m from the edge of the pond.

He tries to move the ball by making waves on the water with a stick.

**(a)** Bobby hits the edge of the pond with the stick. He makes 6 complete waves in 12 seconds.

He counts exactly 4 complete waves between his stick and the ball.

The waves are all equal.

**(i)** What is the frequency of Bobby's wave?

Show your working.

frequency = ..... hertz [2]

**(ii)** What is the wavelength of Bobby's wave?

Show your working.

wavelength = ..... m [2]

**(b) (i)** Calculate the speed of the wave.

Show your working.

speed = ..... m/s [2]

(ii) Bobby thinks his ball will be carried by the waves to the shore.

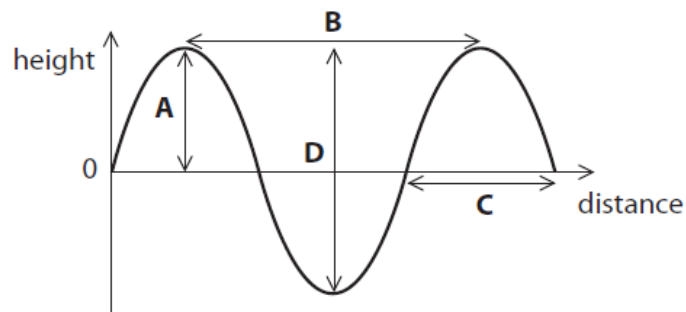
Is Bobby right?

Explain your answer.

.....  
.....  
..... [2]

2.

The diagram shows part of a water wave.



(i) Which letter represents the wavelength? (1)

- A
- B
- C
- D

(ii) Which letter represents the amplitude? (1)

- A
- B
- C
- D

(iii) This water wave is transverse. Other waves can be longitudinal.

State a similarity and a difference between a transverse wave and a longitudinal wave.

(2)

similarity .....

.....

difference .....

.....

---

3.

Some waves travel across the sea. They all have the same wavelength.

(a) What is meant by the term **wavelength**?

(1)

.....

.....

(b) The waves travel across the sea at 3.0 m/s and have a frequency of 1.5 Hz.

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

(1)

(ii) Calculate the wavelength of the waves.

wavelength ..... m

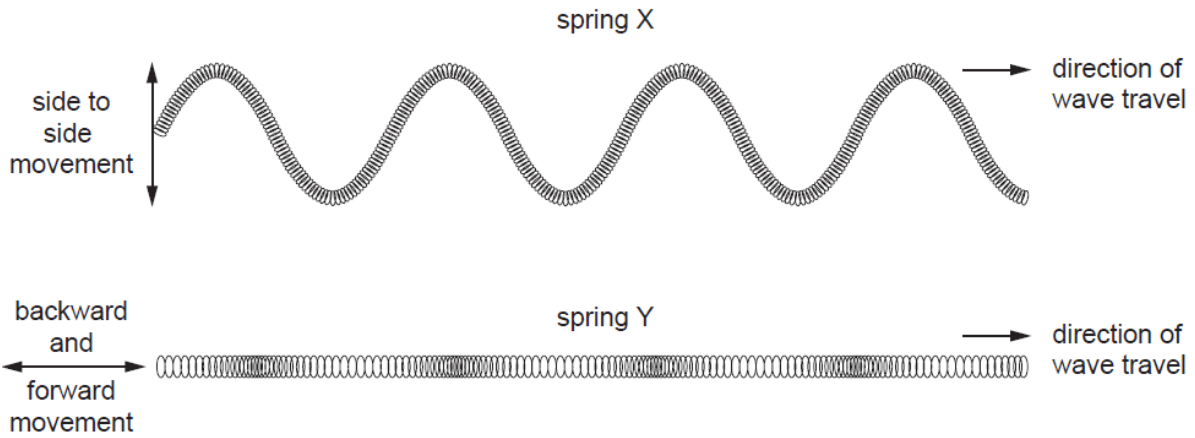
(2)

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**(Question 4 is on the next page)**

4.

Waves are sent along two long springs X and Y as shown.

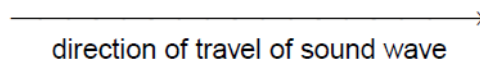


How should the wave motions in X and Y be described?

	spring X	spring Y
<b>A</b>	longitudinal	longitudinal
<b>B</b>	longitudinal	transverse
<b>C</b>	transverse	longitudinal
<b>D</b>	transverse	transverse

5.

A sound wave passes through the air, in the direction shown.

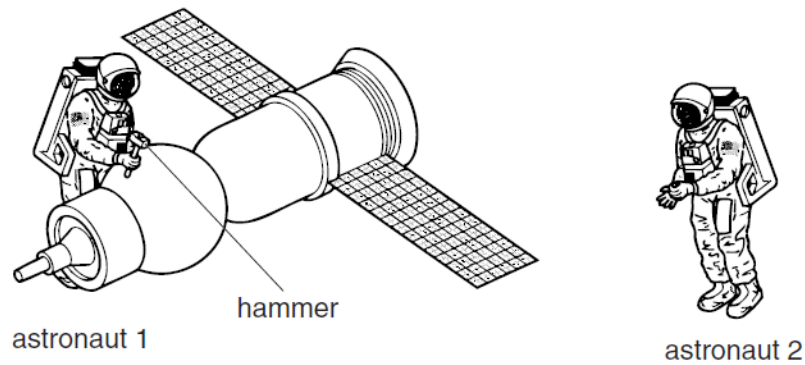


How does a particle of air move as the sound wave passes?

- A** moves to the right and stays there      • →
- B** moves left and right                      ← • →
- C** moves up and stays there                •
- D** moves up and down                        ↑  
•  
↓

6.

Astronaut 1 uses a hammer to mend a satellite in space. Astronaut 2 is nearby. There is no atmosphere in space.



Compared with the sound heard if they were working on Earth, what does astronaut 2 hear?

- A no sound at all
  - B a quieter sound
  - C a sound of the same loudness
  - D a louder sound
- 

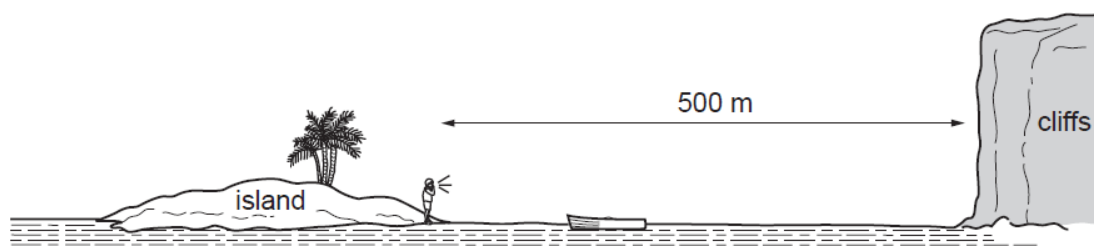
7.

Which of the following can be heard by the human ear?

- A A whistle emitting a wave of frequency 50 kHz.
  - B A bat emitting a wave of frequency of 30 kHz.
  - C An insect emitting a wave of 300 Hz.
  - D A vibrating spring emitting a wave of frequency of 5 Hz.
- 

8.

A boy is stranded on an island 500 m from the shore.



He shouts for help, but all he can hear in reply is the echo of his shout from some cliffs.

Sound travels at 340 m/s through the air.

What is the time interval between the boy shouting and hearing the echo?

- A  $\frac{500}{340}$  s
  - B  $\frac{2 \times 500}{340}$  s
  - C  $\frac{340}{500}$  s
  - D  $\frac{2 \times 340}{500}$  s
-

9.

Which change will lower the pitch of a sound?

- A decreasing its amplitude
  - B decreasing its frequency
  - C increasing its amplitude
  - D increasing its frequency
- 

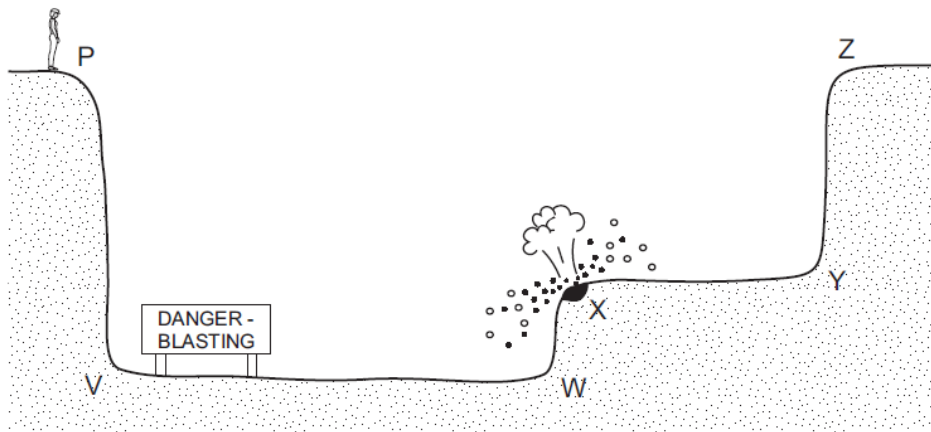
10.

What is the approximate range of audible frequencies for most humans?

- A 10 Hz to 10 000 Hz
  - B 20 Hz to 20 000 Hz
  - C 10 kHz to 10 000 kHz
  - D 20 kHz to 20 000 kHz
- 

11.

An engineer standing at P hears the sound of an explosion at X.



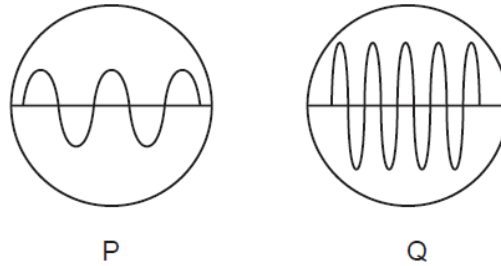
After the explosion, she hears two bangs. One bang is heard a fraction of a second after the other.

The second bang is an echo from

- A XY.
  - B PV.
  - C ZY.
  - D WX.
-

12.

Two sound waves P and Q are displayed on an oscilloscope with the same time-base and Y-plate settings for each.



Which statement correctly describes the pitch and the loudness of the two sounds?

- A P has a higher pitch and is louder than Q.
- B P has a higher pitch and is quieter than Q.
- C P has a lower pitch and is louder than Q.
- D P has a lower pitch and is quieter than Q.

13.

A student writes some sentences about electromagnetic waves.

His teacher circles a mistake in each sentence.

In the table, write a suitable correction for each mistake.

The first one has been done for you.

Sentence	Correction
Electromagnetic waves travel at $3 \times 10^2$ m/s in a vacuum.	$10^8$
Sound waves are electromagnetic.	
Infra-red waves are the most harmful to people.	
Gamma waves are used for heating up food.	
Radio waves have the highest frequency.	
Gamma waves have a very long wavelength.	

14.

Which type of wave **cannot** travel through a vacuum?

- A infra-red radiation
  - B microwaves
  - C sound waves
  - D X-rays
- 

15.

Which of these waves is longitudinal?

- A light waves
  - B sound waves
  - C water waves
  - D X-ray waves
- 

16.

(a)

State two properties that are the same for all electromagnetic waves.

(2)

.....

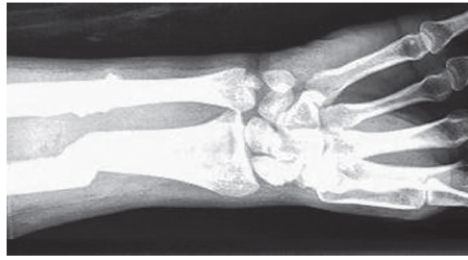
.....



(b)

Some types of wave are used in hospitals.

(i) A scanner uses one type of wave to check for broken bones.



The type of wave emitted by the scanner is

(1)

- A** infrared
- B** microwaves
- C** sound
- D** X rays

(ii) An image of the bone is seen because the waves from the scanner are

(1)

- A** absorbed by the bone
- B** reflected by the bone
- C** refracted by the bone
- D** transmitted by the bone

(iii) Name one type of wave that is used in cancer treatment and explain what it does during the treatment.

(2)

Type of wave .....

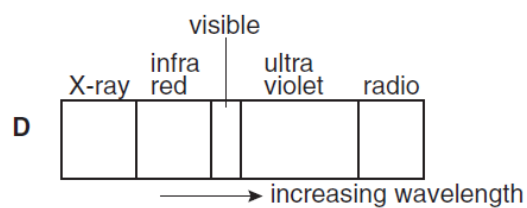
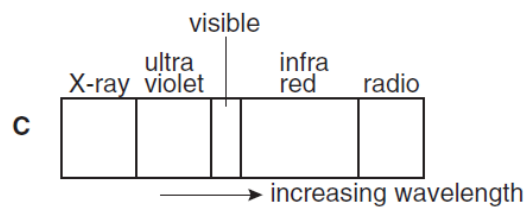
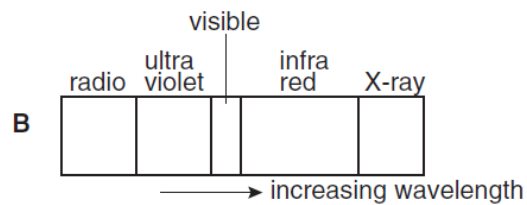
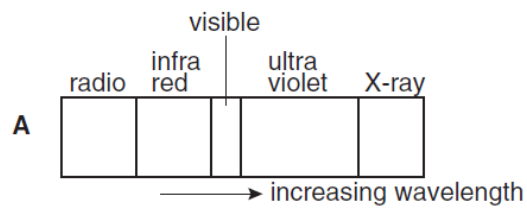
Explanation of what it does .....

.....

.....

17.

Which diagram shows the correct order of the waves in the electromagnetic spectrum?



18.

Which statement is correct about the speed of electromagnetic waves in a vacuum?

- A** Ultra-violet waves have the greatest speed.
- B** Visible light waves have the greatest speed.
- C** Infra-red waves have the greatest speed.
- D** All electromagnetic waves have the same speed.

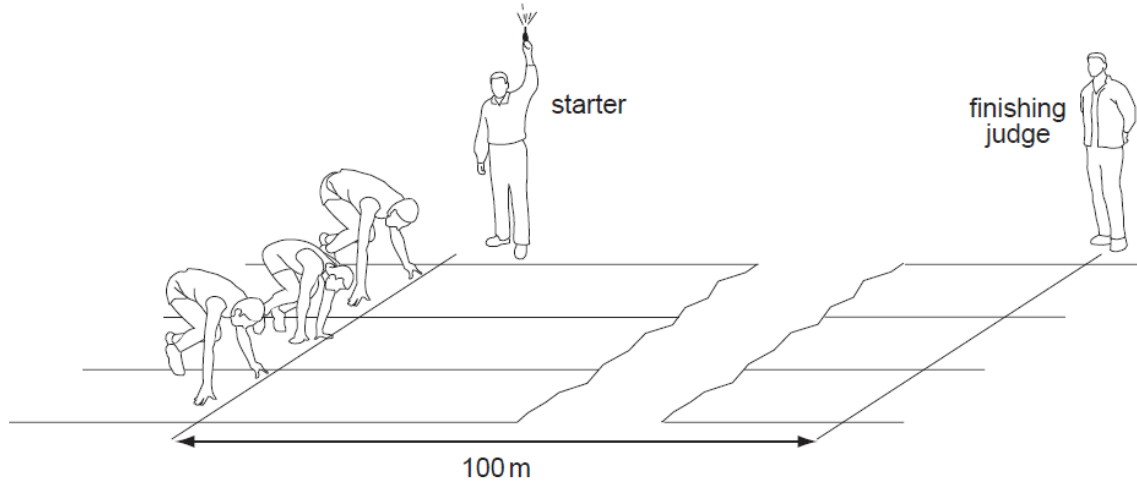
19.

Which type of radiation lies between visible light and microwaves in the electromagnetic spectrum?

- A** infra-red
- B** radio waves
- C** ultra-violet
- D** X-rays

20.

A 100 metre race is started by firing a gun. The gun makes a bang and a puff of smoke comes out of the gun as shown.



When does the finishing judge see the smoke and hear the bang?

	sees the smoke	hears the bang
<b>A</b>	immediately	immediately
<b>B</b>	immediately	after about 0.3 s
<b>C</b>	after about 0.3 s	immediately
<b>D</b>	after about 0.3 s	after about 0.3 s