



Oxford Cambridge and RSA

## **GCSE Physics A (Gateway)**

**J249/04 Physics A P5-P8 and P9 (Higher Tier)**

### **Question Set 15**

1 (a)

A crowd makes a Mexican wave.

A Mexican wave **starts** with people lifting and lowering their arms.



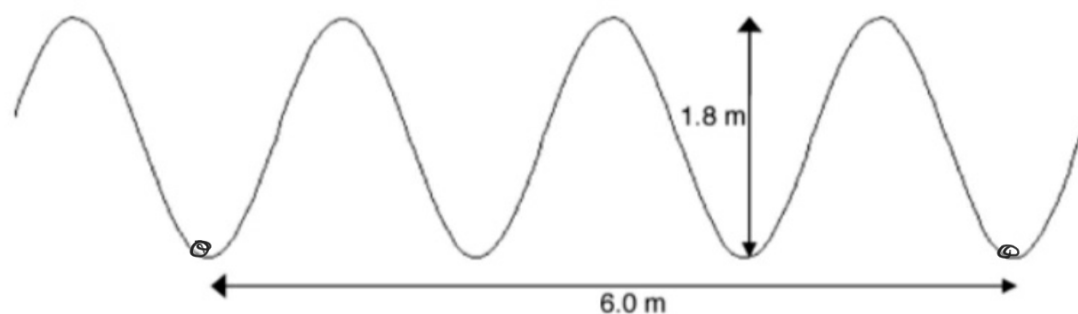
The Mexican wave **continues** by people, next to them, lifting and lowering their arms.

Why is a Mexican wave an example of a transverse wave?

The 'oscillations' (movement of people's arms) are perpendicular to the direction of the wave's movement. [1]

(b) In the classroom a teacher demonstrates waves using a rope. [1]

Look at the diagram of the wave.



(i) The frequency of the wave is 2 Hz.

What does this statement mean?

There is 2 complete cycles / 2 waves passing a fixed point per second. [2]

(ii) How many seconds will it take for this wave to travel 12 m?

Show your working.

$$v = f\lambda$$

$$\lambda = \frac{6.0}{3} = 2.0 \text{ m}$$

$$f = 2 \text{ Hz}$$

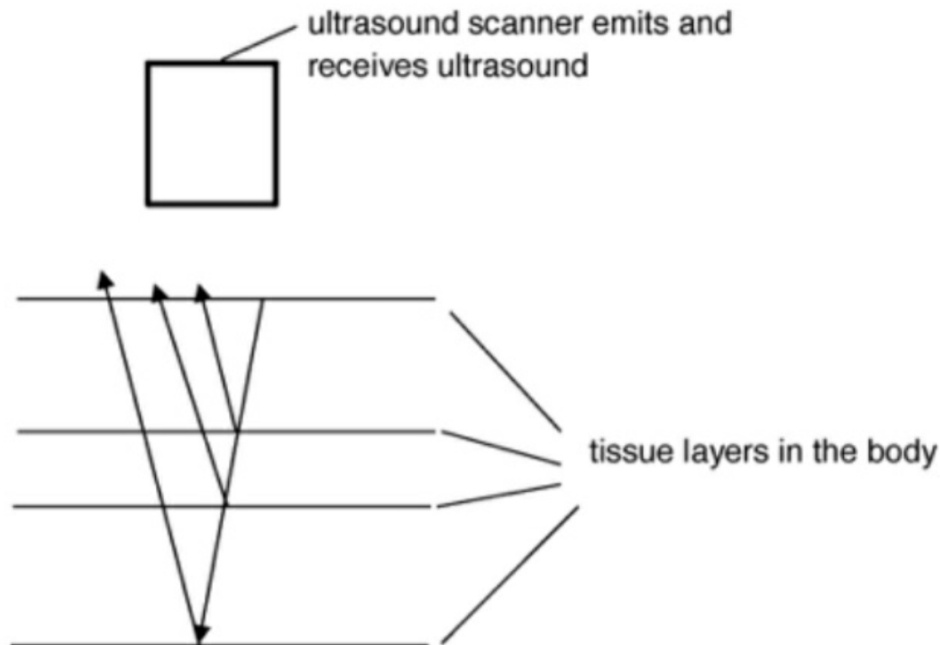
Answer = ..... 3 ..... seconds

[3]

$$2 \times 2 = 4 \text{ m/s.}$$

$$\frac{\text{distance}}{\text{velocity}} = \text{time} \quad \frac{12}{4} = 3 \text{ seconds}$$

(c) Ultrasound scans are used to produce images of tissues inside the body.



Ultrasound waves are emitted.

The waves reflect from layers of tissue inside the body.

Explain how the reflections are used to produce an image of the tissues.

The reflections are detected by the probe. A computer is then used to build images of the tissue from the reflected waves.

[3]

Different layers of tissue have different thickness and density causing the reflections from each layer to be slightly different. These different echos gives the ultrasound image its features.

(d) Ultrasound and X-rays are used to scan patients in hospitals.

Complete the table to show a medical use, benefits and risk of using these waves to scan patients.

Wave	Medical use	Example of a benefit	Risk
X-rays	Shows up hard tissues inside the body.	Takes images of broken bones.	Damages living cells by causing:  mutations..... This can..... cause cancer.
Ultrasound	Shows up soft tissues inside the body.....	Takes images of unborn babies.....	None

[3]

**Total Marks for Question Set 15: 12**