O Level Combined Physics Structured

General Wave Properties Test 2.0

Q1

(a) Fig. 11.1 shows the displacement-distance graph of a wave at a particular time.

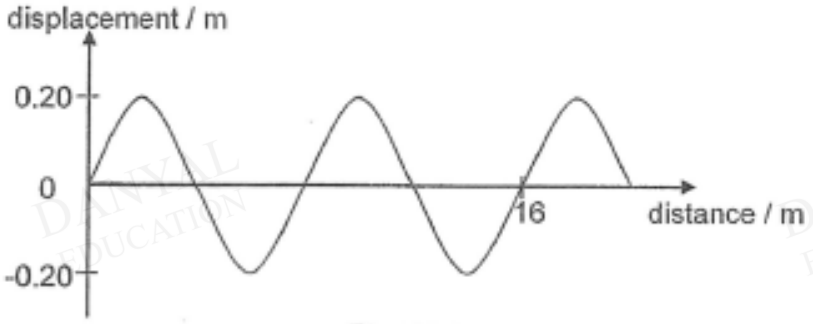


Fig. 11.1

Fig. 11.2 shows the displacement-time graph of the same wave at a particular point along the wave.

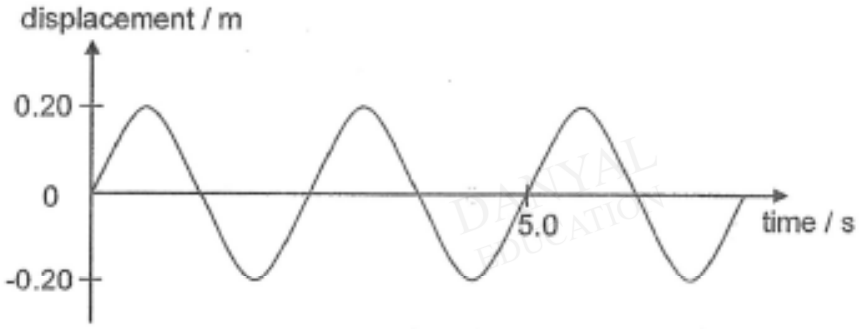


Fig. 11.2

Determine,

(i) the amplitude of the wave.

amplitude = ... [1]

(ii) the wavelength of the wave.

wavelength = ... [1]

(iii) the frequency of the wave.

frequency = ... [2]

(iv) the speed of the wave.

Speed = ... [2]

(b)(i) A particular sound wave is shown on Fig. 11.3. On Fig. 11.3, draw a sound wave which is louder but of the same pitch. [2]

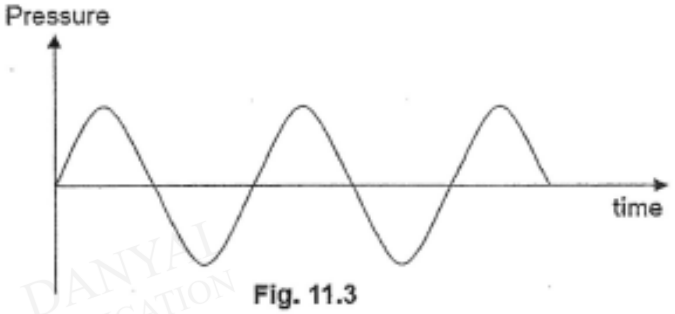


Fig. 11.3

(ii) Another sound wave is shown on Fig. 11.4. On Fig. 11.4, draw a sound wave which is softer and of a lower pitch. [2]

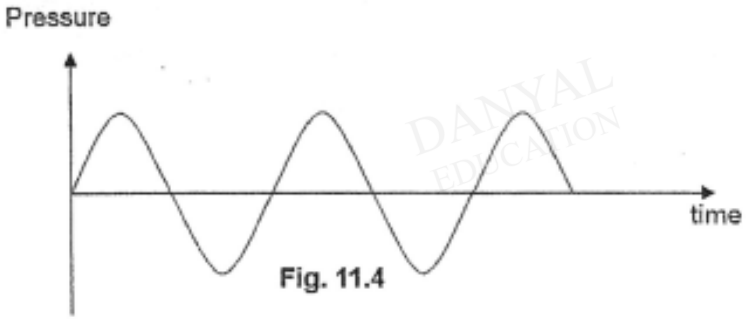


Fig. 11.4

Q2

Fig. 7.1 represents equally spaced beads on a spring. The beads are 1 cm apart.

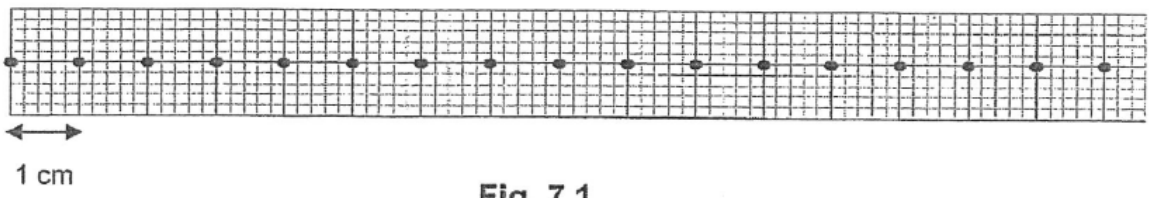


Fig. 7.1

A longitudinal wave propagates along the spring. Fig. 7.2 shows the position of the beads at a particular instant.

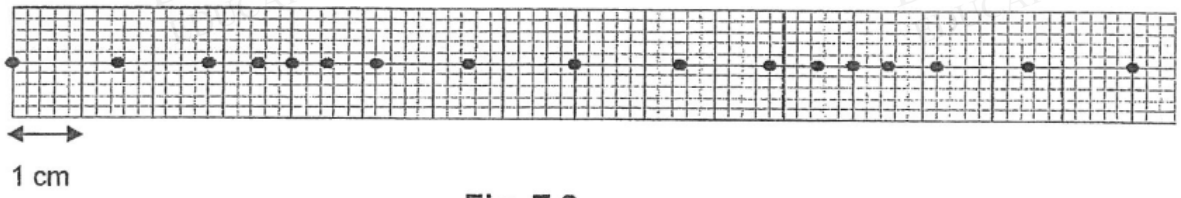


Fig. 7.2

(a) Explain why the wave is a longitudinal wave.

.....

.....

..... [2]

(b) State the meaning of the terms, wavelength and amplitude.

Wavelength is .....

.....

..... [1]

Amplitude is .....

.....

..... [1]

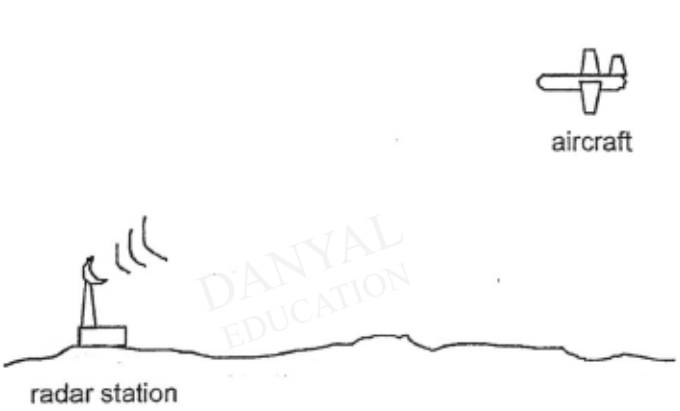
(c) From Fig. 7.2, determine the wavelength and the amplitude of the wave.

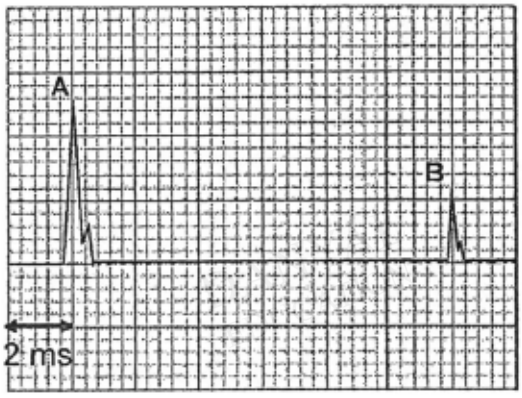
wavelength = ... cm [1]

amplitude = ... cm [1]

Q3

RADAR, short for **RA**dio **D**etection **A**nd **R**anging has many applications. It is a system used to detect and determine the distance of objects such as aircrafts. Strong radio waves are transmitted and a receiver listens for any echoes. The figure shows a radar station that has detected an incoming aircraft.





On the right shows the display of the wave. **A** represents the pulse of the emitted radio waves while **B** represents the pulse of the echo.

(a) Using information in the display, find the time taken for the radar waves to go out to the aircraft and back.

time taken = ... [1]

(b) Determine the distance of the aircraft from the radar station.
(Radio waves travels at a speed of 3×10^8 m/s)

distance = ... [2]

(c) One minute later, pulses **A** and **B** are only 5 divisions apart. Determine the speed of the aircraft.

speed = ... [2]

Q4

A sound wave of speed 330 m /s in air has a wavelength of 120 m.

Calculate the period of this sound wave.

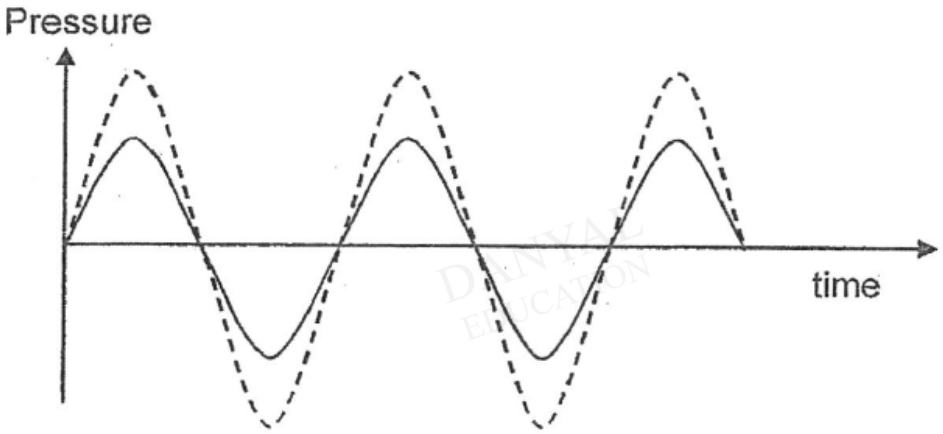
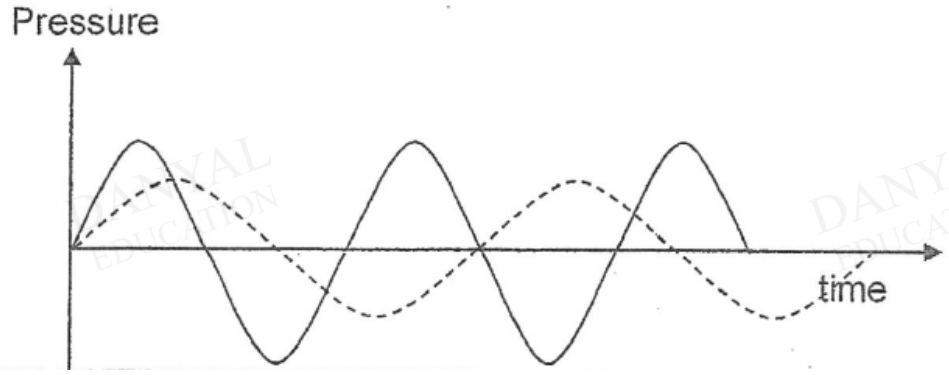
period = ... s [2]

Q5

Answers

General Wave Properties Test 2.0

Q1

I(a)(i)	Amplitude = 0.20 m	[1]
(ii)	Wavelength = 16 / 2 = 8.0 m	[1]
(iii)	Period, T = 5 / 2 = 2.5 s Frequency , f = 1/T = 1 / 2.5 = 0.40 Hz	[1] [1]
(iv)	Speed, v = f λ = 0.40 x 8.0 = 3.2 m/s	 [1] [1]
(b)(i)		Amplitude larger [1] Same period [1]
(b)(ii)		Amplitude smaller [1] Period longer [1]

Q2

(a) The wave is a longitudinal wave because the particles are vibrating parallel to the direction in which the sound wave is travelling.	1 1
(b) Wavelength is the distance between two consecutive particles that are in phase. Amplitude is the maximum displacement from the rest position.	1 1
(c) Wavelength = 8.0 cm Amplitude = 0.8 cm	1 1

Q3

(a)	Time = $6 \times 2 \times 10^{-3}$ = 0.012 s	1
(b)	Distance = speed x time = $3 \times 10^{8} \times 0.012/2$ = 1 800 000 m	1 1
(c)	Distance after one minute = $(3 \times 10^{8}) \times (5 \times 2 \times 10^{-3}) / 2$ = 1 500 000 m Speed = (1 800 000 – 1 500 000) / 60 = 5000 m/s	1 1

Q4

$v = f \times \lambda = \lambda / T$ $T = \lambda / v$ T = 120 m / 330 m/s T = 0.364 s	[1] [1]

Q5