



2024 Sec 4 Physics Notes Answers Chapter 12 General Wave Properties

1.3 Waves in a ripple tank

Example 1

- Answer: A

2 Wave terms

- distance, crests, troughs
- time
- magnitude, maximum
- distance, per unit time
- number
- line

2.1 Wave equation

- m s^{-1}

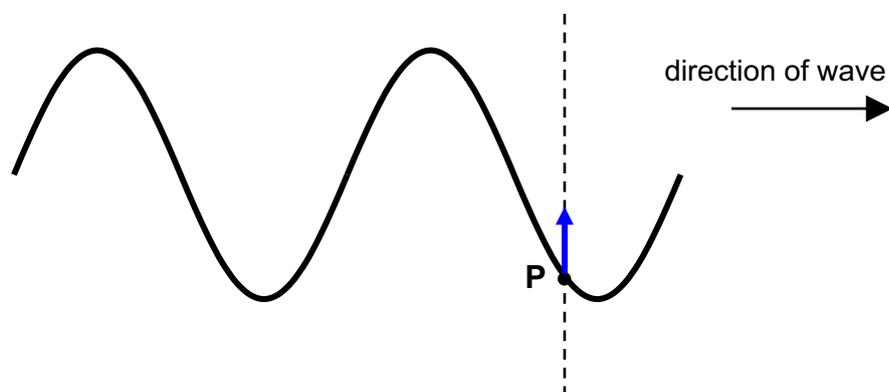
Example 2

(a) $v = f \lambda$
 $= (6.0)(0.500)$
 $= 3.0 \text{ m s}^{-1}$

(b) $\lambda = v / f$
 $= (3.0) / (2.5)$
 $= 1.2 \text{ m}$

2.2 Motion of waves and particles

Example 3



Also see video at <http://www.showme.com/sh/?h=EyApfHs>

3 Longitudinal and transverse waves

3.1 Longitudinal waves

- parallel
- Explore the properties of longitudinal waves and corresponding graphs using the simulation at <http://ngsir.netfirms.com/englishhtm/Lwave.htm>

3.2 Transverse waves

- perpendicular
- Explore the properties of transverse waves and corresponding graphs using the simulation at <http://ngsir.netfirms.com/englishhtm/TwaveA.htm>

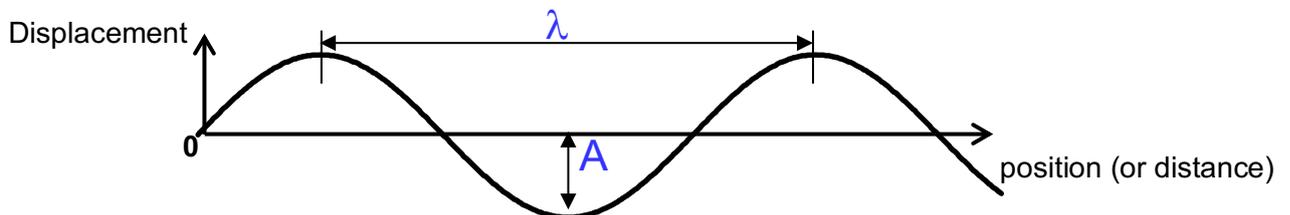
Note: The above simulations are Java applets and may not run on iPads

3.3 Classification of waves

- **Mechanical waves:** medium
- **Electromagnetic waves:** vacuum

3.4 Displacement-position graph

- On the graph below, label clearly the amplitude A and wavelength λ .



Example 4

- (a) Based on the displacement-position graph above, is it possible to determine whether it is for a transverse wave or a longitudinal wave? Explain your answer.

No, displacement-position graph is just a representation of the displacement of the particles with their position as the waves pass through them.

- (b) What is the direction of motion of the particles in the displacement-position graph for

- (i) longitudinal waves?

Direction of motion of particles is parallel to the direction of the wave.

- (ii) transverse waves?

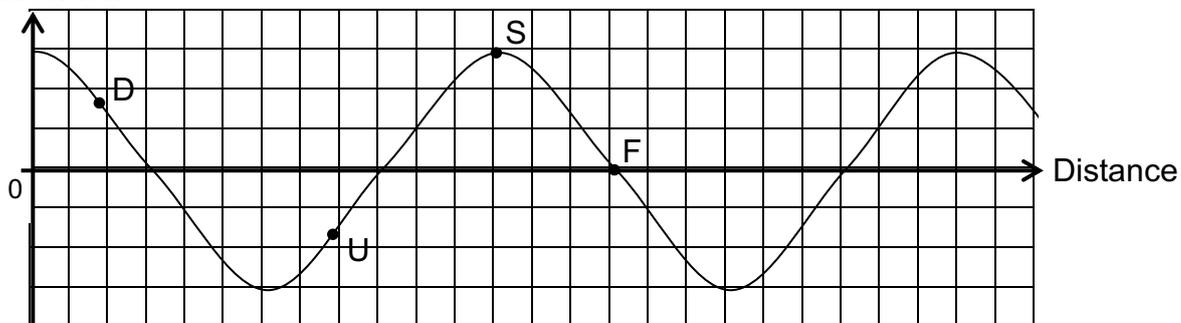
Direction of motion of particles is perpendicular to the direction of the wave.

Example 5

- (a) 5.0 cm
- (b) 20.0 cm

Example 6

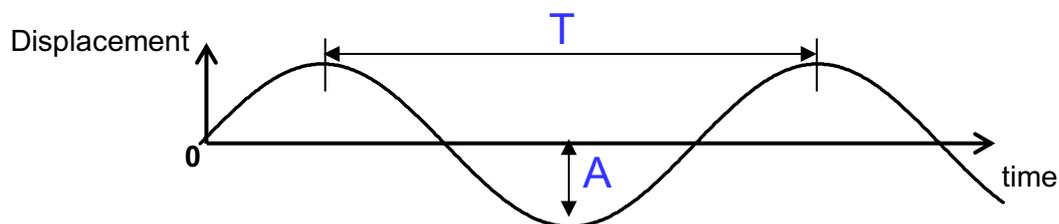
Displacement



Accept other reasonable answers

3.5 Displacement-time graph

- On the graph below, label clearly the amplitude A and period T .

**Example 7**

(a) longitudinal waves?

Direction of motion of particles is parallel to the direction of the wave.

(b) transverse waves?

Direction of motion of particles is perpendicular to the direction of the wave.

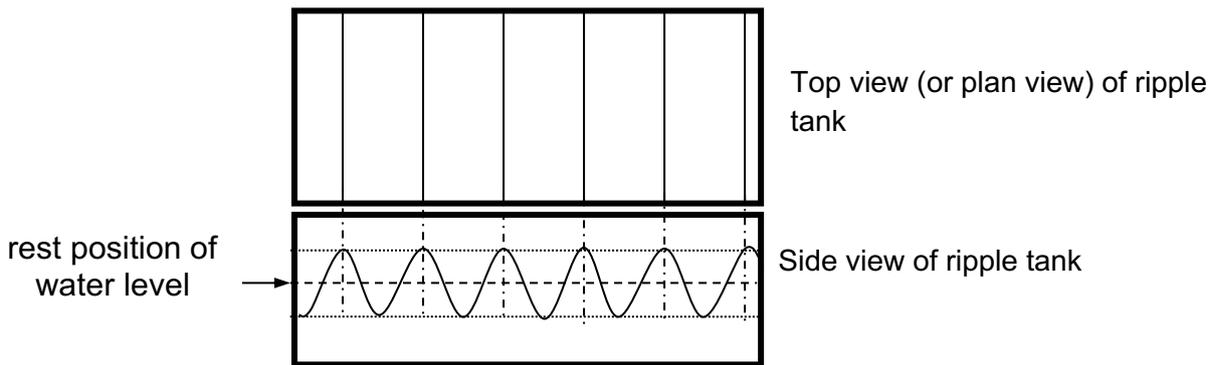
How do the answers above compare to that of the displacement-position graph?

- Same answers

Example 8

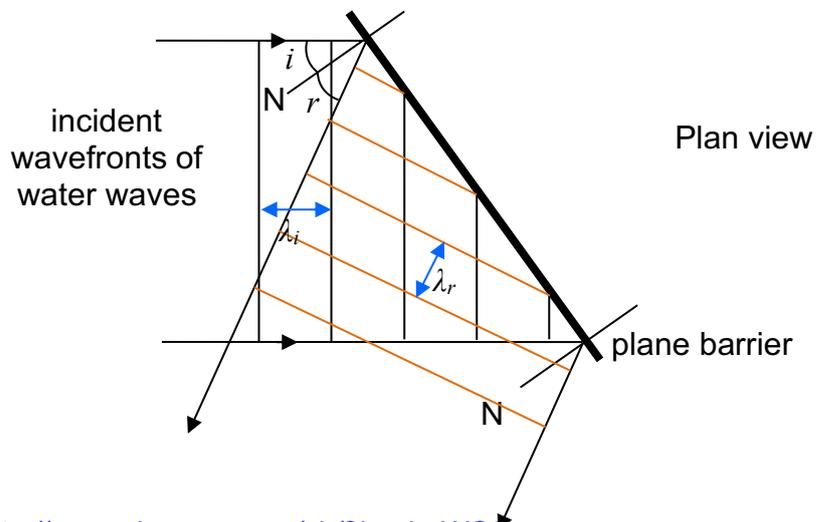
- (i) True
- (ii) False
- (iii) True
- (iv) True

4 Reflection and refraction of plane waves
 4.1 Reflection of plane wavefronts



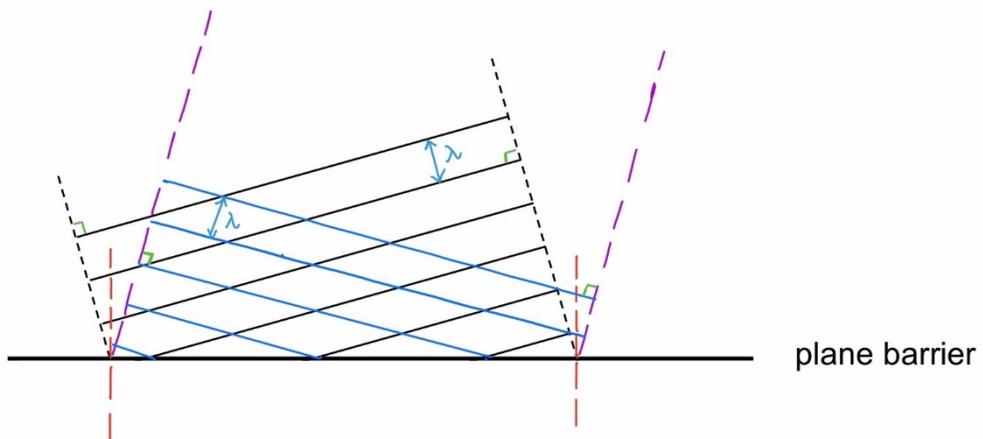
Also see video at <http://www.showme.com/sh/?h=oqBa49o>

• Reflected plane wavefronts



Also see video at <http://www.showme.com/sh/?h=yhaWG3c>

Additional example



angle of incidence = $16^\circ \pm 1^\circ$; angle of reflection = $16^\circ \pm 1^\circ$

4.2 Refraction of plane wavefronts

	Visible Light	Water Waves	Visible Light	Water Waves
Medium	air → glass (increase in refractive index)	deep → shallow (decrease in depth of water)	glass → air	shallow → deep
change in direction of waves (bending)	towards the normal	towards the normal	away from the normal	away from the normal
Wave speed v	decreases	decreases	increases	increases
frequency f	constant	constant	constant	constant
wavelength λ	decreases	decreases	increases	increases

Refracted plane wavefronts

Also see video at <http://www.showme.com/sh/?h=QeedBrs>

Example 9

- (a) 52°
- (b) 20°
- (c) 1.3 cm
- (d) 0.6 cm
- (e) 2.2

Example 10: C

Discussion

1. True or false? Justify your answer.

- (a) False: $v = f \times \lambda$
- (b) False: A slinky spring can be used to produce **both** transverse & longitudinal waves