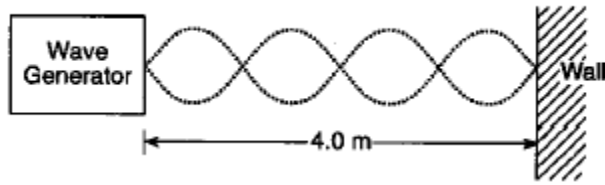


### X. Waves Flash Cards

1. A wave generator located 4.0 meters from a reflecting wall produces a standing wave in a string, as shown in the diagram below.

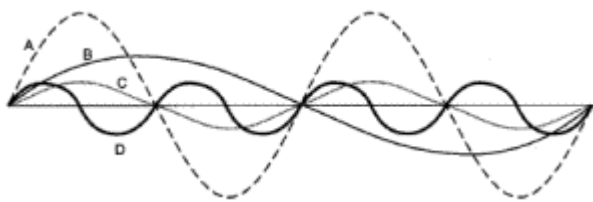


a) What is the wavelength of this standing wave? b) How many nodes does it have? c) How many antinodes does it have? d) If the speed of the wave is 10. meters per second, what is its frequency?

- (1) 0.40 Hz (2) 5.0 Hz (3) 10. Hz (4) 40. Hz

- a) \_\_\_\_\_  
 b) \_\_\_\_\_  
 c) \_\_\_\_\_  
 d) \_\_\_\_\_

2a. Which two waves have the same wavelength?

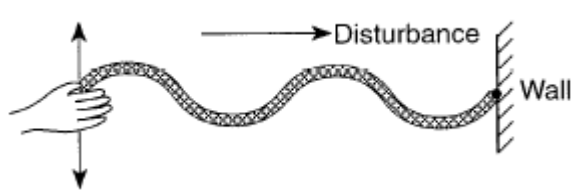


- (1) A&B  
 (2) A&C  
 (3) B&D  
 (4) C&D

- a) \_\_\_\_\_  
 b) \_\_\_\_\_  
 c) \_\_\_\_\_

2b) Which wave has the longest period? 2c) highest frequency?

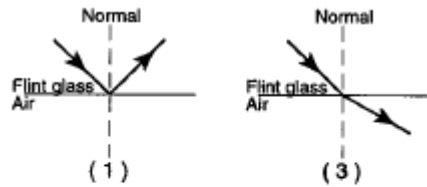
3. The diagram below shows a person shaking the end of a rope up and down, producing a disturbance that moves along the length of the rope.



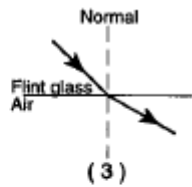
Which type of wave is traveling in the rope?

\_\_\_\_\_

- 1 torsional 2 longitudinal 3 transverse 4 elliptical



(1)



(3)

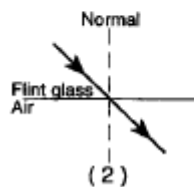
Which choice shows light coming:

4a) greater than the critical angle?

4b) less than the critical angle?

4c) equal to the critical angle?

4d) Which choice is not possible?



(2)



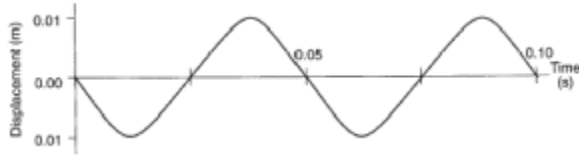
(4)

- a) \_\_\_\_\_  
 b) \_\_\_\_\_  
 c) \_\_\_\_\_  
 d) \_\_\_\_\_

### Waves Flash Cards

**5.** The graph below shows displacement versus time for a particle of a uniform medium as a wave passes through the medium.

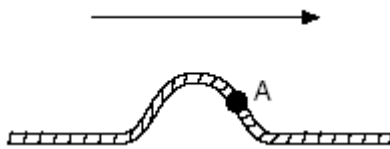
a) What is the frequency of the wave (1) 10 Hz (2) 20 Hz (3) 50 Hz (4) 100 Hz



a) \_\_\_\_\_

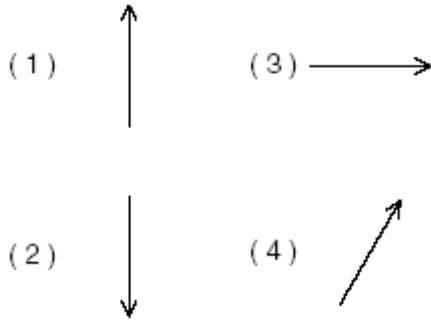
b) \_\_\_\_\_

b) What is the amplitude of the wave?

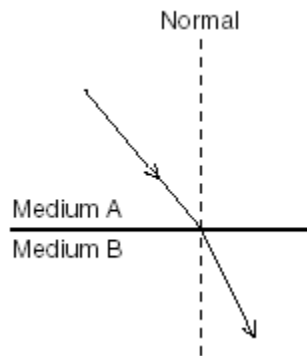


**6.** The diagram below shows a pulse moving to the right in a rope. A is a point on the rope.

Which arrow best shows the direction of movement of point A at this instant?



\_\_\_\_\_



**7a)** Which medium is faster?

**7b)** In which medium would the index of refraction be larger?

**7c)** In which medium would light have a greater wavelength?

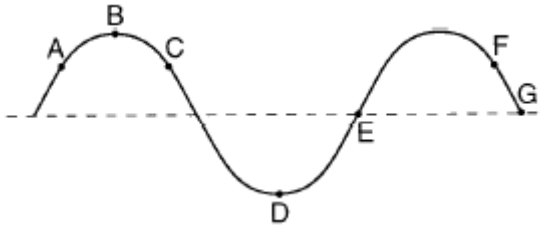
a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

### Waves Flash Cards

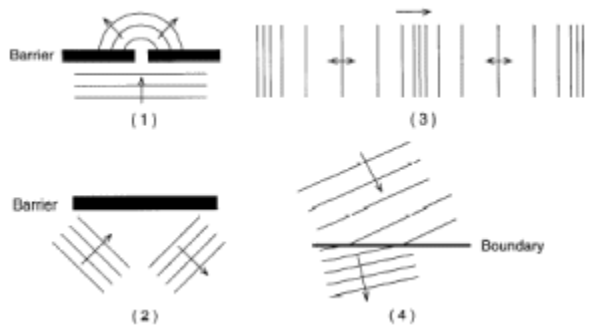
**8.** The diagram below shows a periodic wave.



a) Which two points on the wave are in phase? b) out of phase

- (1) A and C (2) B and D (3) C and F (4) E and G

a) \_\_\_\_\_  
b) \_\_\_\_\_

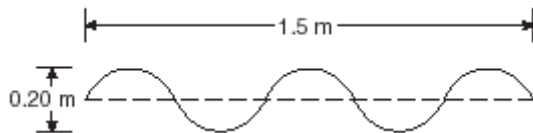


**9.** Match the wave behavior with a picture on the left

- a) diffraction  
b) refraction  
c) reflection  
d) standing wave

a) \_\_\_\_\_  
b) \_\_\_\_\_  
c) \_\_\_\_\_  
d) \_\_\_\_\_

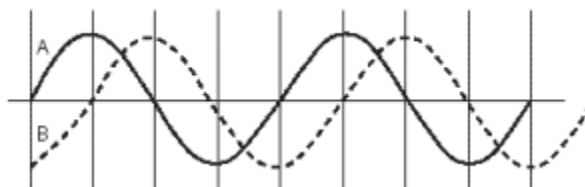
**10.** What are the amplitude and wavelength of the wave shown below?



- (1) amplitude = 0.10 m, wavelength = 0.30 m  
(2) amplitude = 0.10 m, wavelength = 0.60 m  
(3) amplitude = 0.20 m, wavelength = 0.30 m  
(4) amplitude = 0.20 m, wavelength = 0.60 m

\_\_\_\_\_

**11.** The diagram below shows two waves, A and B. The phase difference between A and B is



- (1)  $0^\circ$   
(2)  $45^\circ$   
(3)  $90^\circ$   
(4)  $180^\circ$

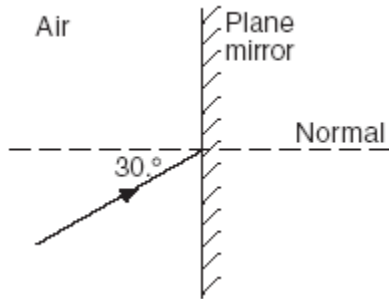
\_\_\_\_\_

### Waves Flash Cards

<p style="text-align: center;">light ray</p> <p style="text-align: center;">↓</p> <p>Air Water</p>	<p><b>12.</b> When the light ray enters the water, in which direction will it point?</p> <p>_____</p>
<p style="text-align: center;">Normal</p> <p>Medium X Fused quartz</p> <p>A B C D</p>	<p><b>13a)</b> Which ray would never be produced when light enters fused quartz ?</p> <p>a) _____</p> <p>b) If medium X is <b>slower</b> than fused quartz , which ray would be produced?</p> <p>b) _____</p> <p>c) if medium X is faster than fused quartz ?</p> <p>c) _____</p> <p>d) if both media have the same speed?</p> <p>d) _____</p>
<p style="text-align: center;">Normal</p> <p>Glycerol Medium X Medium Y</p> <p><math>\theta = 40^\circ</math> <math>\theta = 35^\circ</math> <math>\theta = 35^\circ</math> <math>\theta = 40^\circ</math></p>	<p><b>14.</b> A beam of monochromatic light (<math>f = 5.09 \times 10^{14}</math> hertz) passes through parallel sections of glycerol, medium X, and medium Y as shown in the diagram below.</p> <p>a) _____</p> <p>a) which medium is the fastest?</p> <p>b) _____</p> <p>b) slowest?</p> <p>c) _____</p> <p>c) compare the speed of medium Y and glycerol</p>
	<p><b>15a)</b> How many nodes does it have?</p> <p>a) _____</p> <p>b) How many antinodes does it have?</p> <p>b) _____</p>

### Waves Flash Cards

**16.** A ray of monochromatic light traveling in air is incident on a plane mirror at an angle of  $30^\circ$ , as shown in the diagram below.

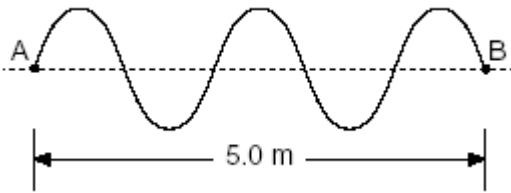


The angle of reflection for the light ray is

- (1)  $15^\circ$  (2)  $30^\circ$
- (3)  $60^\circ$  (4)  $90^\circ$

\_\_\_\_\_

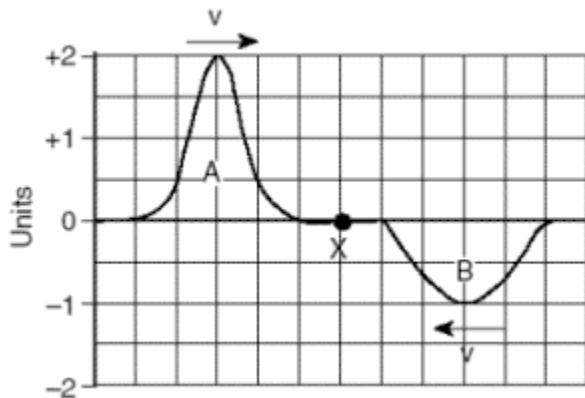
**17.** In the diagram below, the distance between points A and B on a wave is 5.0 meters.



The wavelength of this wave is  
 (1) 1.0 m (2) 2.0 m (3) 5.0 m (4) 4.0 m

\_\_\_\_\_

**18a)** What kind of interference occurs when these waves overlap?  
 b) What is the amplitude of the wave that results when each wave arrives at point X?



a) \_\_\_\_\_

b) \_\_\_\_\_

**19. a)** transverse - particles in a medium vibrate \_\_\_\_\_ to the direction of the wave travels

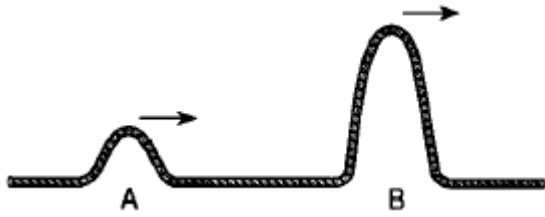
**b)** longitudinal waves - particles in a medium vibrate \_\_\_\_\_ to the direction of the wave travels (ex - \_\_\_\_\_)

\_\_\_\_\_

\_\_\_\_\_

### Waves Flash Cards

**20.** The diagram below shows two pulses, A and B, moving to the right along a uniform rope. Compared to pulse A, pulse B has



- 1 a slower speed and more energy  
 2 a faster speed and less energy  
 3 a faster speed and the same energy  
 4 the same speed and more energy

\_\_\_\_\_

**21a)** Waves carry only \_\_\_\_\_ and information without transferring mass.

a) \_\_\_\_\_

b) Mechanical waves **require** a **material** medium through which to travel. (ex. \_\_\_\_\_)

b) \_\_\_\_\_

**22a)** The absolute index of refraction is inversely proportional to the \_\_\_\_\_ of a wave.

\_\_\_\_\_

b) When the vibration of one object matches the natural frequency of another object and cause it to vibrate this is called \_\_\_\_\_

\_\_\_\_\_

**23.** What occurs when light passes from water into flint glass?

- (1) Its speed decreases, its wavelength becomes shorter, and its frequency remains the same.
- (2) Its speed decreases, its wavelength becomes shorter, and its frequency increases.
- (3) Its speed increases, its wavelength becomes longer, and its frequency remains the same.
- (4) Its speed increases, its wavelength becomes longer, and its frequency decreases.

\_\_\_\_\_

## Waves Flash Cards

<p><b>24a)</b> Electromagnetic waves <b>can</b> propagate through a _____ . (sound can't)</p> <p>b) All frequencies of electromagnetic radiation travel at the same _____ in a vacuum.</p> <p>An opera singer's voice is able to break a thin crystal glass when the singer's voice and the vibrating glass have the same</p> <p>(1) frequency (2) speed (3) amplitude (4) wavelength</p>	<p>_____</p> <p>_____</p> <p>_____</p>
<p><b>25.</b> As a monochromatic beam of light passes obliquely from flint glass into water, how do the characteristics of the beam of light change?</p> <p>(1) Its wavelength decreases and its frequency decreases.  (2) Its wavelength decreases and its frequency increases.  (3) Its wavelength increases and it bends toward the normal.  (4) Its wavelength increases and it bends away from the normal.</p> <p>What type of wave is sound traveling in water?</p> <p>(1) torsional (3) elliptical  (2) transverse (4) longitudinal</p>	<p>_____</p> <p>_____</p>
<p><b>26.</b> Which phrase best describes a periodic wave?</p> <p>(1) a single pulse traveling at constant speed  (2) a series of pulses at irregular intervals  (3) a series of pulses at regular intervals  (4) a single pulse traveling at different speeds in the same medium</p>	<p>_____</p>
<p><b>27.</b> The hertz is a unit that describes the number of</p> <p>(1) seconds it takes to complete one cycle of a wave  (2) cycles of a wave completed in one second  (3) points that are in phase along one meter of a wave  (4) points that are out of phase along one meter of a wave</p> <p><b>28.</b> As a sound wave travels through air, there is a net transfer of</p> <p>(1) energy, only (2) mass, only  (3) both mass and energy (4) neither mass nor energy</p>	<p>_____</p> <p>_____</p>

## Waves Flash Cards

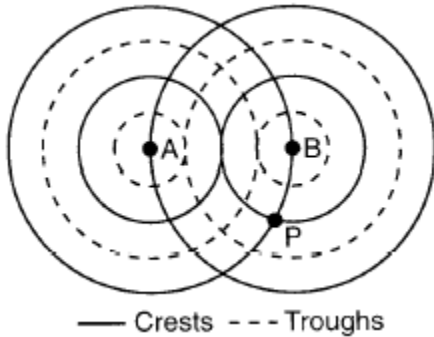
<p><b>29.</b> A nearby object may vibrate strongly when a specific frequency of sound is emitted from a loudspeaker. This phenomenon is called</p> <p>(1) resonance (3) reflection (2) the Doppler effect (4) interference</p> <p><b>30.</b> Two identical guitar strings are tuned to the same pitch. If one string is plucked, the other nearby string vibrates with the same frequency. This phenomenon is called</p> <p>(1) resonance (2) reflection (3) refraction (4) destructive interference</p>	<p>_____</p> <p>_____</p>
<p><b>31.</b> When a student looks into a plane mirror, she sees a virtual image of herself. However, when she looks into a sheet of paper, no such image forms. Which light phenomenon occurs at the surface of the paper?</p> <p>(1) regular reflection (3) polarization (2) diffuse reflection (4) resonance</p> <p><b>32.</b> Light from the star Betelgeuse displays a Doppler red shift. This shift is best explained by assuming that Betelgeuse is</p> <p>(1) decreasing in temperature (2) increasing in temperature (3) moving toward Earth (4) moving away from Earth</p>	<p>_____</p> <p>_____</p>
<p><b>33.</b> A monochromatic beam of light has a frequency of <math>6.5 \times 10^{14}</math> hertz. What color is the light?</p> <p>(1) yellow (3) violet (2) orange (4) blue</p> <p>Two waves having the same amplitude and the same frequency pass simultaneously through a uniform medium. <b>Maximum destructive interference</b> occurs when the phase difference between the two waves is</p> <p>(1) <math>0^\circ</math> (2) <math>90^\circ</math> (3) <math>180^\circ</math> (4) <math>360^\circ</math></p>	<p>_____</p> <p>_____</p>
<p><b>34.</b> The energy of a water wave is most closely related to its</p> <p>(1) frequency (3) period (2) wavelength (4) amplitude</p>	<p>_____</p>

## Waves Flash Cards

<p><b>35.</b> If all parts of a light beam have a constant phase relationship, with the same wavelength and frequency, the light beam is</p> <p>(1) monochromatic and coherent  (2) monochromatic and incoherent  (3) polychromatic and coherent  (4) polychromatic and incoherent</p>	<p>_____</p>
<p><b>36.</b> A light spring is attached to a heavier spring at one end. A pulse traveling along the light spring is incident on the boundary with the heavier spring. At this boundary, the pulse will be</p> <p><b>1</b> totally reflected    <b>2</b> totally absorbed  <b>3</b> totally transmitted into the heavier spring  <b>4</b> partially reflected and partially transmitted into the heavier spring</p>	<p>_____</p>
<p><b>37.</b> As a wave travels through a medium, the particles of the medium vibrate in the direction of the wave's travel. What type of wave is traveling through the medium?</p> <p>1 longitudinal 2 torsional 3 transverse 4 hyperbolic</p> <p><b>38.</b> The driver of a car blows the horn as the car approaches a crosswalk. Compared to the actual pitch of the horn, the pitch observed by a pedestrian in the crosswalk is</p> <p>1 lower 2 higher 3 the same</p>	<p>_____</p> <p>_____</p>
<p><b>39.</b> Compared to wavelengths of visible light, the wavelengths of ultraviolet light are</p> <p>1 shorter 2 longer 3 the same</p> <p><b>40.</b> As a pulse travels along a rope, the pulse loses energy and its amplitude</p> <p>1 decreases 2 increases 3 remains the same</p>	<p>_____</p> <p>_____</p>

### Waves Flash Cards

**41.** The diagram below shows two sources, A and B, vibrating in phase in the same uniform medium and producing circular wave fronts.



Which phenomenon occurs at point P?

1 destructive interference

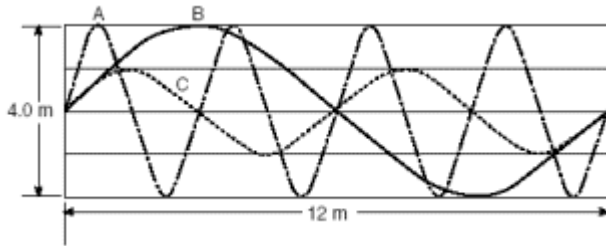
2 constructive interference

3 reflection

4 refraction

\_\_\_\_\_

**42.** Three waves, A, B, and C, travel 12 meters in 2.0 seconds through the same medium as shown in the diagram below.



a) \_\_\_\_\_

b) \_\_\_\_\_

c) \_\_\_\_\_

**a)** What is the amplitude of wave C? **b)** What is the period of wave A?  
**c)** What is the speed of wave B?

**43.** What occurs as a ray of light passes from air into water?

- (1) The ray must decrease in speed.
- (2) The ray must increase in speed.
- (3) The ray must decrease in frequency.
- (4) The ray must increase in frequency.

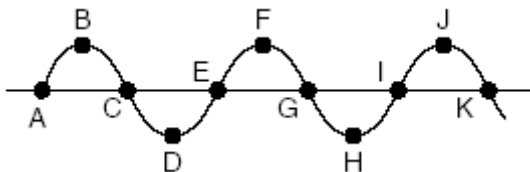
In which part of the electromagnetic spectrum does a photon have the greatest energy?

- (1) red (2) infrared (3) violet (4) ultraviolet

\_\_\_\_\_

\_\_\_\_\_

**44.** The diagram below represents a periodic wave. Which two points on the wave are in phase?



- (1) A and D (2) A and G (3) C and K (4) D and I

\_\_\_\_\_