

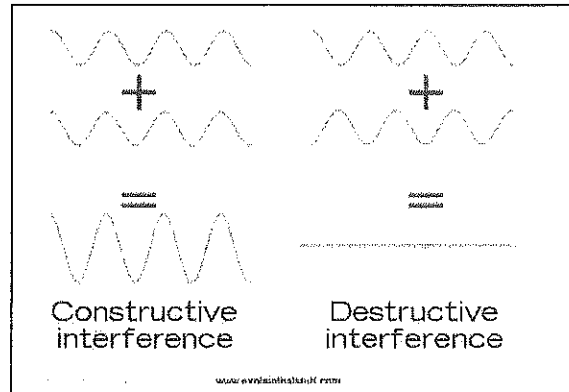
## Skill 53: Interference - When waves meet

238. Fill in the blanks

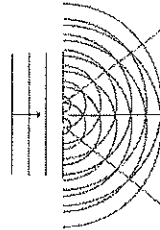
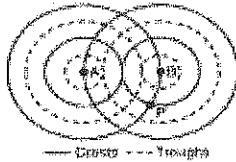
### Interference: When two waves superimpose (same place same time)

When two waves that are in phase (0 or 360 degrees) meet it results in a crest plus crest → Maximum  
Constructive interference.

When two waves that are out of phase (180 degrees) meet it results in a crest plus a trough → Maximum  
destructive interference.

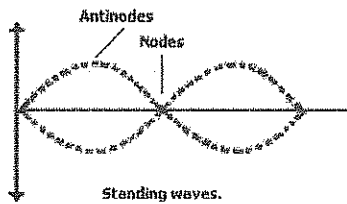


**interference**  
 May be constructive or destructive



Diffraction with interference results in a pattern of maximum and minimums.

**Standing waves** result from the combination of interference and reflection when two waves are moving in opposite directions with the same frequency and amplitude.



Node – (NO Displacement) Destructive interference (always 180° out of phase)

Anti-node – Constructive interference maximum motion (in phase)

**Resonance** – Standing waves produced at or near a medium's natural frequency.

Resonance - Sent wave causes other tuning fork to vibrate



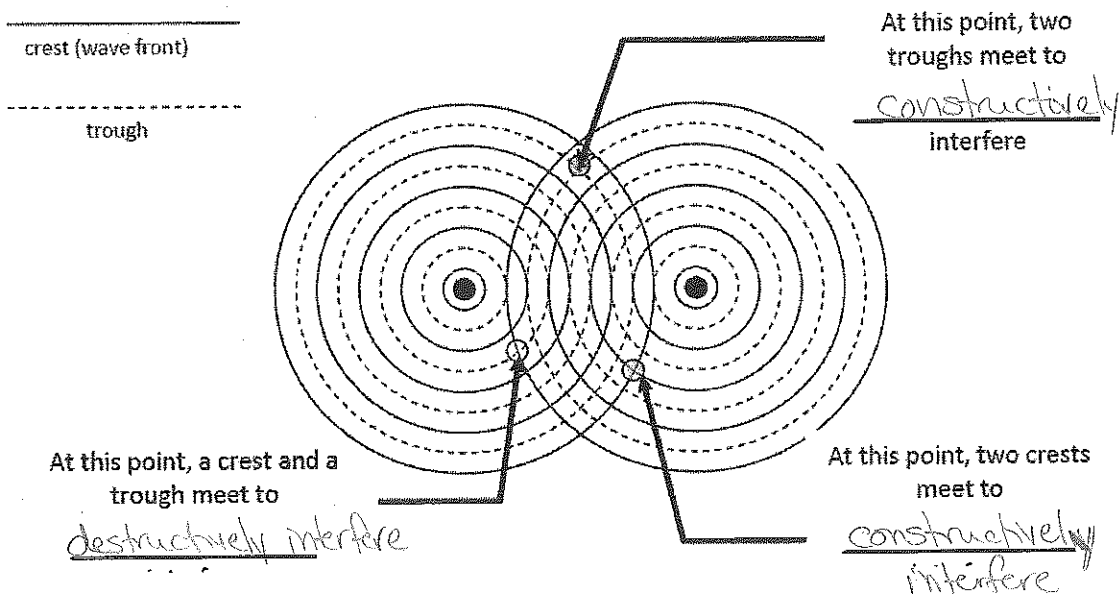
When an object oscillates in response to a wave

239. Define or describe each of the following things that occur with the meeting of wave.

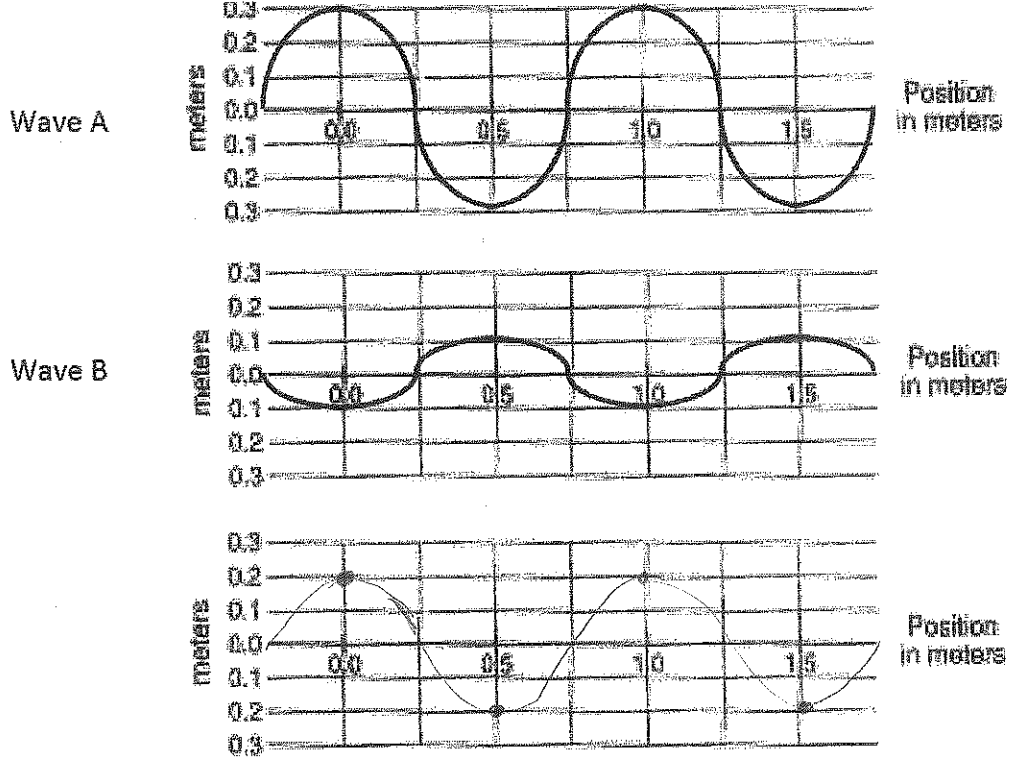
- a) **Superposition** - two waves in the same place at the same time
- b) **Constructive Interference** - two crests (or two troughs) meet to increase amplitude
- c) **Destructive Interference** - two crests (or two troughs) meet to decrease amplitude

240.

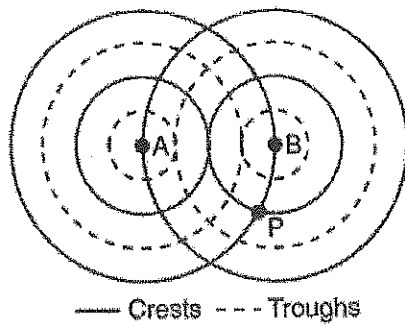
When viewed from above, a wave source makes a circular pattern



241. Sketch the wave interference pattern for the combination of wave A and wave B



242.

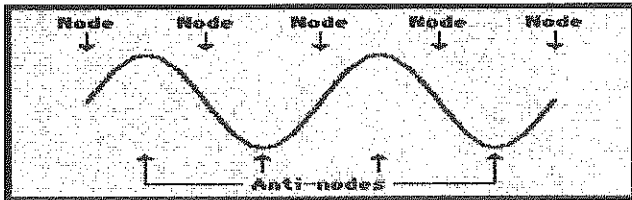


What phenomenon occurs at point P?

constructive interference

243. Standing Waves result from a combination of reflective and interference.

Standing waves contain a pattern of Nodes and antinodes.



Where crests meet crest or troughs meet troughs antinodes are formed. (super crests, super troughs)

Constructive

Where crests meet troughs nodes are formed.

Destructive

244. Standing waves are produced by the interference of two waves with the same:

- (1) frequency and amplitude, but opposite directions <sup>reflection</sup>
- (2) frequency and direction, but different amplitudes
- (3) amplitude and direction, but different frequencies
- (4) frequency, amplitude, and direction

245. What is the phase difference between two standing waves at a node?

- (1)  $0^\circ$
- (2)  $180^\circ$
- (3)  $90^\circ$
- (4)  $360^\circ$

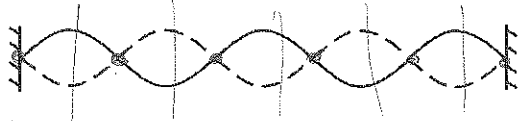
246. Describe or define Resonance -

Standing waves produced at a medium's natural frequency

## Topic 5C: Wave Interference

### Skill 53

247. The diagram below represents a standing wave.

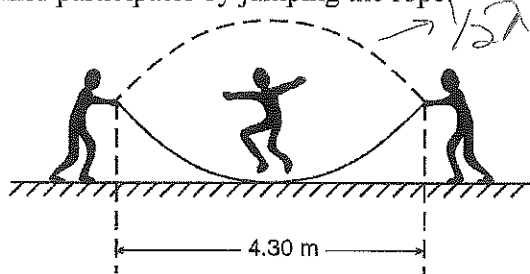


The number of nodes and antinodes shown in the diagram is

- A) 4 nodes and 5 antinodes
- B) 5 nodes and 6 antinodes
- C) 6 nodes and 5 antinodes**
- D) 6 nodes and 10 antinodes

*ends count*

248. While playing, two children create a standing wave in a rope, as shown in the diagram below. A third child participates by jumping the rope.



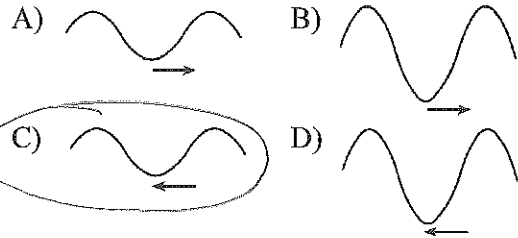
What is the wavelength of this standing wave?

- A) 2.15 m
- B) 4.30 m
- C) 6.45 m
- D) 8.60 m**

249. The diagram below represents a wave moving toward the right side of this page.



Which wave shown below could produce a standing wave with the original wave?



250. The superposition of two waves traveling in the same medium produces a standing wave pattern if the two waves have

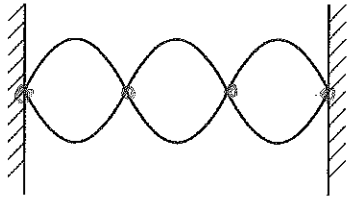
- A) the same frequency, the same amplitude, and travel in the same direction
- B) the same frequency, the same amplitude, and travel in opposite directions**
- C) the same frequency, different amplitudes, and travel in the same direction
- D) the same frequency, different amplitudes, and travel in opposite directions

251. Standing waves in water are produced most often by periodic water waves

- A) being absorbed at the boundary with a new medium
- B) refracting at a boundary with a new medium
- C) diffracting around a barrier
- D) reflecting from a barrier**

## Topic 5C: Wave Interference

252. How many nodes are represented in the standing wave diagram below?



- A) 1    B) 6    C) 3    **D) 4**

253. Two waves traveling in the same medium interfere to produce a standing wave. What is the phase difference between the two waves at a node?

- A)  $0^\circ$     B)  $90^\circ$     **C)  $180^\circ$**     D)  $360^\circ$

*crest meets trough*

254. In order for standing waves to form in a medium, two waves must

- A) have the same frequency**  
 B) have different amplitudes  
 C) have different wavelengths  
 D) travel in the same direction

255. When an opera singer hits a high-pitch note, a glass on the opposite side of the opera hall shatters. Which statement best explains this phenomenon?

- A) The frequency of the note and natural vibration frequency of the glass are equal.**  
 B) The vibrations of the note are polarized by the shape of the opera hall.  
 C) The amplitude of the note increases before it reaches the glass.  
 D) The singer and glass are separated by an integral number of wavelengths.

*resonance*

256. One vibrating 256-hertz tuning fork transfers energy to another 256-hertz tuning fork, causing the second tuning fork to vibrate. This phenomenon is an example of

- A) diffraction    B) reflection  
 C) refraction    **D) resonance**

257. Resonance occurs when one vibrating object transfers energy to a second object causing it to vibrate. The energy transfer is most efficient when, compared to the first object, the second object has the same natural

- A) frequency**    B) loudness  
 C) amplitude    D) speed

258. The phenomenon in which one vibrating object causes another to vibrate is called

- A) rarefaction    B) reflection  
 C) refraction    **D) resonance**

259. After a guitar string is set into vibration, it causes a string on a nearby guitar to begin to vibrate. This characteristic of sound waves is known as

- A) reflection    B) refraction  
**C) resonance**    D) interference

260. There are places where the reflected sound waves reinforce each other as well as places where the reflected sound waves produce near silence. This phenomenon is known as

- A) refraction    B) diffraction  
 C) amplitude    **D) interference**

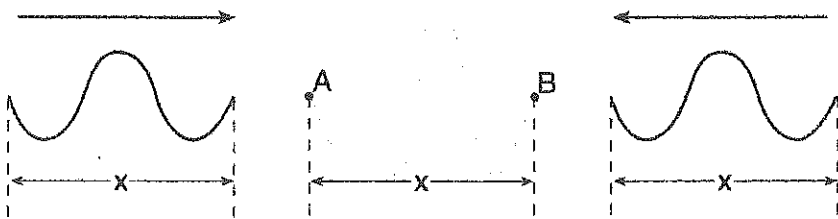
## Topic 5C: Wave Interference

261. The distance between two consecutive nodes in a standing sound wave is

- A) one wavelength
- B) two wavelengths
- C) one-half wavelength**
- D) one-quarter wavelength



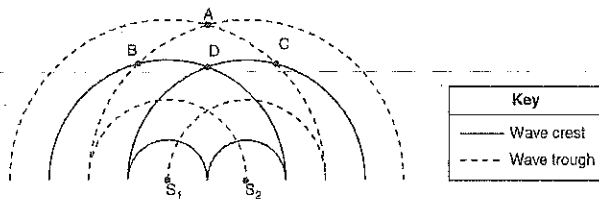
262. The diagram below shows two waves traveling toward each other at equal speed in a uniform medium.



When both waves are in the region between points *A* and *B*, they will undergo

- A) diffraction
- B) the Doppler effect
- C) destructive interference
- D) constructive interference**

263. Two speakers, *S*<sub>1</sub> and *S*<sub>2</sub>, operating in phase in the same medium produce the circular wave patterns shown in the diagram below.



At which two points is constructive interference occurring?

- A) *A* and *B*
- B) *A* and *D***
- C) *B* and *C*
- D) *B* and *D*

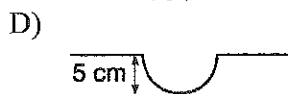
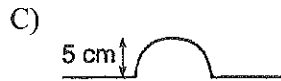
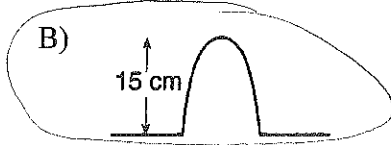
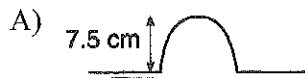
*A* two troughs  
*D* two crests

## Topic 5C: Wave Interference

264. The diagram below shows two pulses approaching each other in a uniform medium.



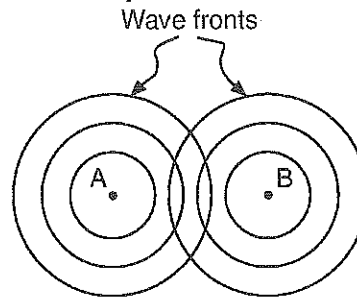
Which diagram best represents the superposition of the two pulses?



265. Two waves having the same frequency and amplitude are traveling in the same medium. Maximum constructive interference occurs at points where the phase difference between the two superposed waves is

- A)  $0^\circ$  B)  $90^\circ$  C)  $180^\circ$  D)  $270^\circ$

266. The diagram below represents the wave pattern produced by two sources located at points *A* and *B*.



Which phenomenon occurs at the intersections of the circular wave fronts?

- A) diffraction B) interference  
C) refraction D) reflection

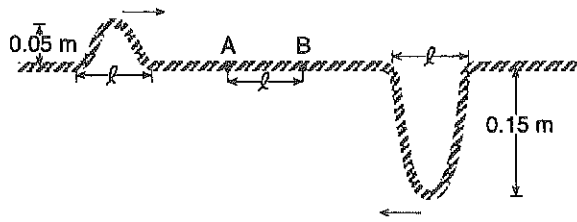
267. Two waves having the same amplitude and the same frequency pass simultaneously through a uniform medium. Maximum destructive interference occurs when the phase difference between the two waves is

- A)  $0^\circ$  B)  $90^\circ$  C)  $180^\circ$  D)  $360^\circ$



## Topic 5C: Wave Interference

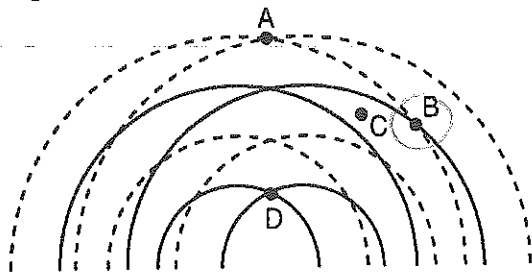
268. The diagram below shows two pulses, each of length  $l$ , traveling toward each other at equal speed in a rope.



Which diagram best represents the shape of the rope when both pulses are in region  $AB$ ?

- A) B)   
 C) D)

269. Two wave sources operating in phase in the same medium produce the circular wave patterns shown in the diagram below. The solid lines represent wave crests and the dashed lines represent wave troughs.

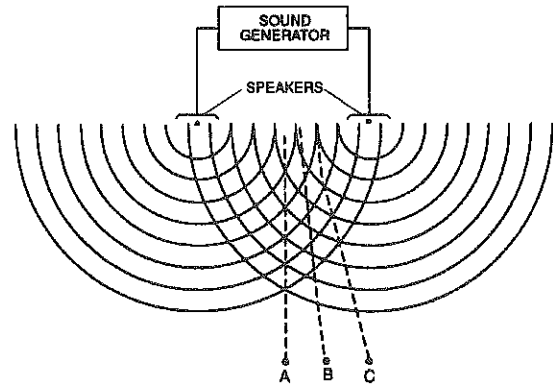


Which point is at a position of maximum destructive interference?

- A) A   **B) B**   C) C   D) D

*crest & trough*

270. In the diagram below, two speakers are connected to a sound generator. The speakers produce a sound pattern of constant frequency such that a listener will hear the sound very well at  $A$  and  $C$ , but not as well at point  $B$ .



Which wave phenomenon is illustrated by this experiment?

- A) interference**   B) polarization  
 C) reflection   D) refraction

271. Which pair of waves will produce a resultant wave with the smallest amplitude?

- A)
- B)
- C) Destructive**
- D)