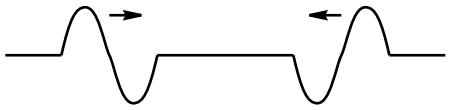
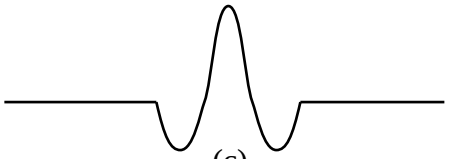
1. Two wave pulses of symmetrical shape approach one another on a string, as shown in the diagram.



Which one of the following diagrams could not be observed at a later time?

(a)

(b)



(c)

(d)

Answer (b). The displacement in the middle of the combined pulse is half rather than double the two individual displacements.

2. A wave of frequency 5.0 Hz travels along a string with a speed of 20 m/s. The phase difference between the oscillations of the string separated by 1.0 m along the wave is

(a) $\pi/4$ (b) $\pi/2$ (c) π (d) 2π

Answer (b). The wavelength is $20/5 = 4$ m. 1 m separation is one quarter of a wavelength which is 90^0 or $\pi/2$ out of phase.

3. Two strings, one thick and the other thin, are connected to form one long string. A wave travels along the string and passes the point where the two strings are connected. Which of the following does not change at that point:

(a) frequency

(b) propagation speed

(c) amplitude

(d) wavelength

Answer (a). Frequency depends only on the source. The speed changes in a new medium and as a result all other variables will change.

4. In a standing wave

   (a) the nodes are positions of maximum amplitude.

   (b) all points of the wave vibrate with the same amplitude.

   (c) the distance between successive nodes is one wavelength.

   (d) all the points between a pair of nodes vibrate in phase.

   Answer (d).

5. Two sinusoidal waves travel in the same medium but one with twice the wavelength of the other. Which of the following statements is true? The wave with the longer wavelength has

   (a) higher speed.

   (b) lower speed.

   (c) higher frequency.

   (d) lower frequency.

   Answer (d). The medium remains the same so the speed is unchanged and hence the frequency must decrease

6. A rescue vehicle rapidly approaches a casualty who has had a mishap at the base of a cliff. The casualty observes that the frequency of the siren has shifted higher due to the Doppler effect. The sound of the siren reflects off the cliff and is heard as an echo by the rescuers. The frequency of the echo that they hear is

   (a) is the same as the sound the casualty hears.

   (b) is higher than the sound the casualty hears.

   (c) is lower than the sound the casualty hears hears, but higher than the sound of the siren.

   (d) is identical to the sound of the siren.

   Answer (b). The sound that reflects off the cliff is Doppler shifted up in frequency since the source is approaching the cliff. The rescue vehicle is approaching this reflected wave so again the sound will be shifted up in frequency – to a frequency even higher than that heard by the casualty.

7. Two identical horns emit sound of frequency 200 Hz. Each horn is mounted on a different car, one car moving towards a stationary observer and the other moving away. The observer will hear

   (a) no sound at all, because the two waves will cancel each other.

   (b) a very loud sound of frequency 200 Hz.

   (c) a sound whose loudness will rise and fall periodically.

   (d) a sound with frequency slightly higher than 200 Hz.

   Answer (c). The approaching and receding car horns will be heard with slightly differing frequency because of the Doppler effect. Those two different waves will interfere and produce beats.