Unit 7: Waves:

Subunit 7.3: Doppler effect for sound waves:

Topical Question No: 1

20 With which types of wave can the Doppler shift be observed?

A all types of wave

B light and sound waves only

C sound waves and water waves only

D sound waves only

Topical Question No: 2

21 A distant star is receding from the Earth with a speed of $1.40 \times 10^{7}\,\text{m s}^{-1}$. It emits light of frequency $4.57 \times 10^{14}\,\text{Hz}$. The speed of light is $3.00 \times 10^{8}\,\text{m s}^{-1}$.

The Doppler effect formula can be used with light waves.

What will be the frequency of this light when detected on Earth?

A $2.04 \times 10^{13}\,\text{Hz}$

B $4.37 \times 10^{14}\,\text{Hz}$

C $4.57 \times 10^{14}\,\text{Hz}$

D $4.79 \times 10^{14}\,\text{Hz}$

Topical Question No: 3

23 Which statement about light waves and sound waves is correct?

A Both light waves and sound waves show the Doppler effect.

B Light waves can be diffracted but sound waves cannot be diffracted.

C Sound waves are transverse waves and light waves are longitudinal waves.

D Sound waves can travel in a vacuum but light waves cannot travel in a vacuum.

Topical Question No: 4

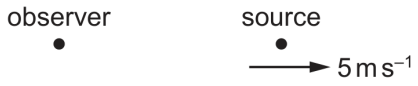
25 A source of sound waves is travelling as shown.

In which situation would the stationary observer detect the largest decrease in the observed frequency?

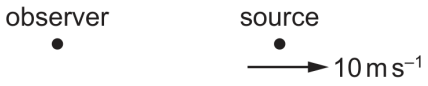
A

B

C



D



Topical Question No: 5

24 A vehicle carries a microwave transmitter that emits microwaves of a constant frequency. A stationary observer has a microwave receiver.

The vehicle moves directly towards the observer at constant speed. The observer detects microwaves of frequency F_o.

The vehicle then accelerates, still moving towards the observer, travels at higher steady speed for a time and then decelerates until it stops.

What is the variation in the frequency of the microwaves that are detected by the observer?

A The observed frequency will fall, then remain steady then return to the frequency F_o.

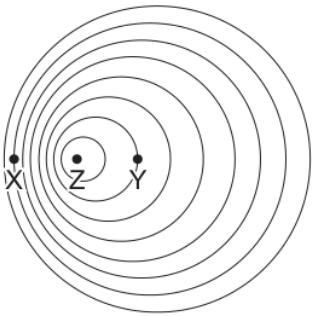
B The observed frequency will fall, then remain steady then rise to a higher frequency than F_o.

C The observed frequency will rise, then remain steady then fall to a lower frequency than F_o.

D The observed frequency will rise, then remain steady then return to the frequency F_o.

Topical Question No: 6

24 A source of sound of frequency *F* at point Z is moving at a steady speed. The pattern of the emitted wavefronts is shown.



Which row describes the frequencies of the sound heard by stationary observers at X and Y?

	frequency heard at X	frequency heard at Y
A	$<F$	$<F$
B	$<F$	$>F$
C	$>F$	$<F$
D	$>F$	$>F$

Topical Question No: 7

22 An observer hears a sound wave emitted from a moving source.

The observed frequency is less than the frequency of sound emitted from the source.

What could be the reason for this?

A The source is moving away from the observer.

B The source is moving towards the observer.

C The speed of the sound wave in air decreases due to the movement of the source.

D The speed of the sound wave in air increases due to the movement of the source.

Topical Question No: 8

26 A source of sound waves with constant frequency moves towards a stationary observer.

The observer compares the sound waves arriving at the observer's position with the waves emitted by the source of sound.

What is detected by the observer?

A a decreased frequency of the sound waves

B no change in frequency of the sound waves

C a decreased wavelength of the sound waves

D no change in wavelength of the sound waves

Topical Question No: 9

26 In one of the first experiments to demonstrate the Doppler effect, a train was filled with trumpeters all playing a note of frequency 440 Hz. The difference in observed frequency of the note as the train directly approached a stationary observer was 22 Hz. The speed of sound was 340 $m\,s^{-1}$.

At which speed was the train moving?

A 15.4 $m\,s^{-1}$ **B** 16.2 $m\,s^{-1}$ **C** 17.0 $m\,s^{-1}$ **D** 17.9 $m\,s^{-1}$

Answer Key

1. N/A
2. N/A
3. N/A
4. N/A
5. N/A
6. C
7. A
8. C
9. N/A