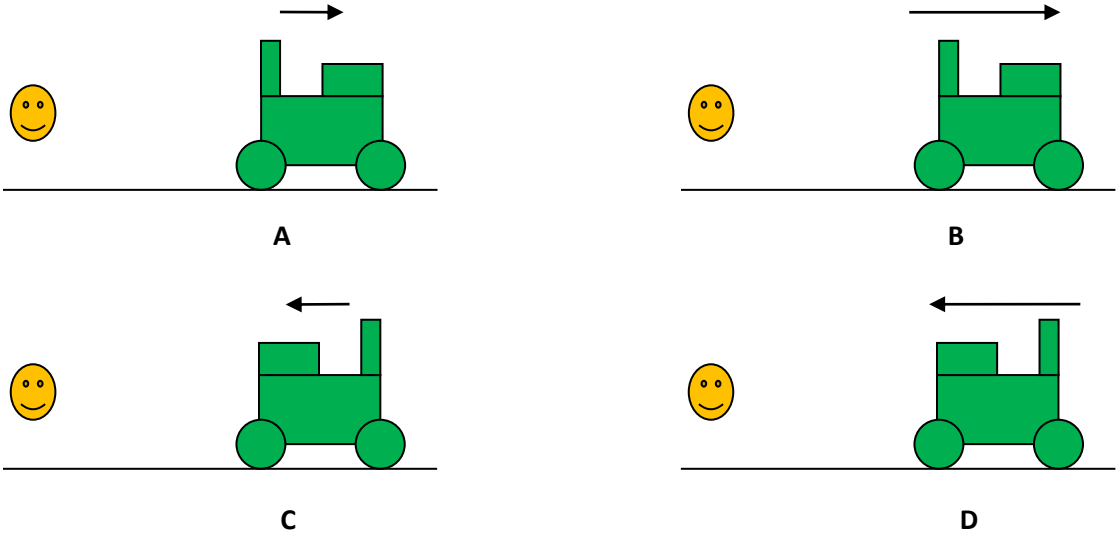
Quiz C16.1

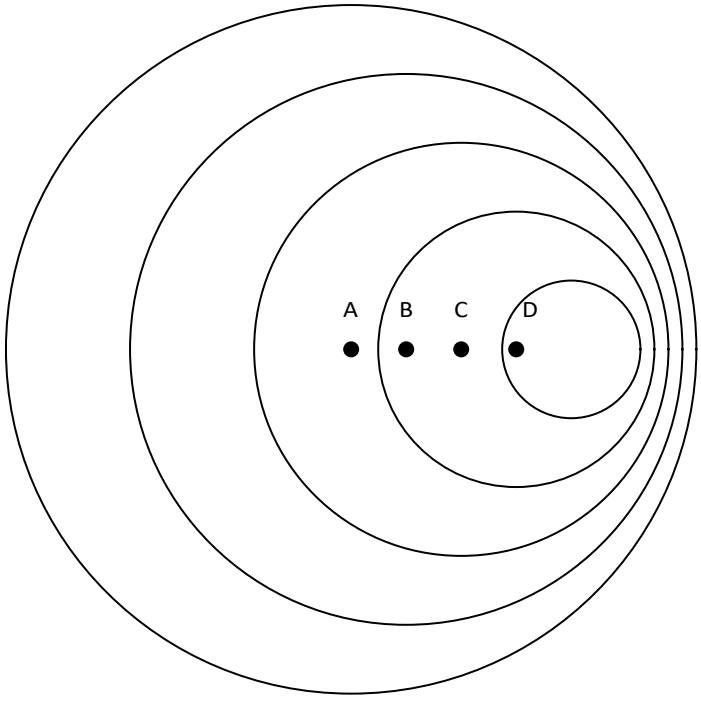
The Doppler effect

1. The moving source produces sound of constant frequency.



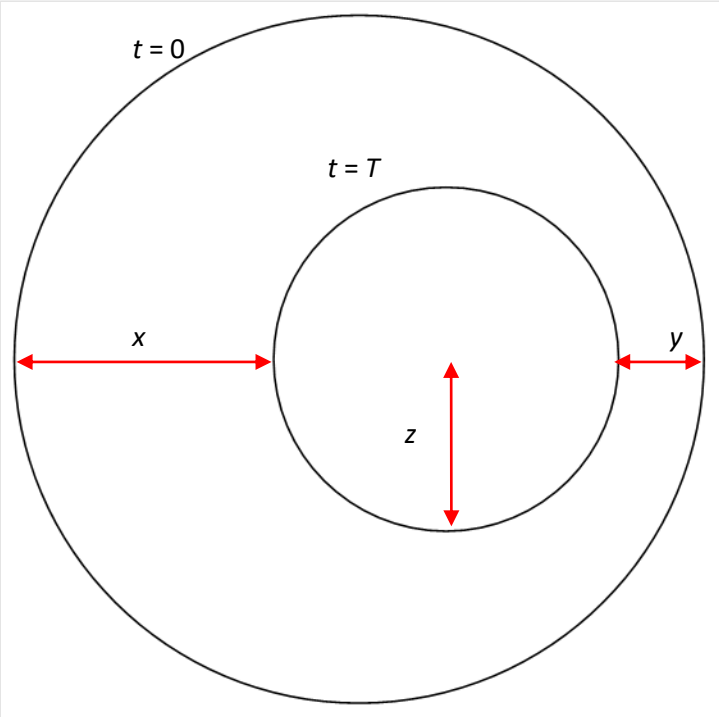
In which case does the stationary observer ( ) receive the largest frequency?

2. The diagram shows wavefronts emitted by a moving source.



What was the position of the source when the largest wavefront was emitted.

3. The diagram shows, at $t = 2T$, two consecutive wavefronts emitted by a moving source. The period of the wave measured by the source is T. The time of **emission** of each wavefront is shown. Three distances are indicated.



I x is the wavelength measured by an observer the source is moving away from
II y is the wavelength measured by an observer the source is approaching
III z is the wavelength measured by the source

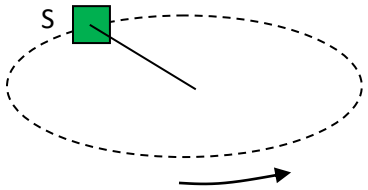
Which statements are correct?

A I and II
B I and III
C II and III
D I, II and III

4. A galaxy emits light of wavelength 680 nm. The light received on Earth is measured to have wavelength 660 nm. What is correct about the velocity of the galaxy?

	Magnitude	Direction
A	$\frac{c}{34}$	Away from Earth
B	$\frac{c}{34}$	Towards Earth
C	$\frac{c}{33}$	Away from Earth
D	$\frac{c}{33}$	Towards Earth

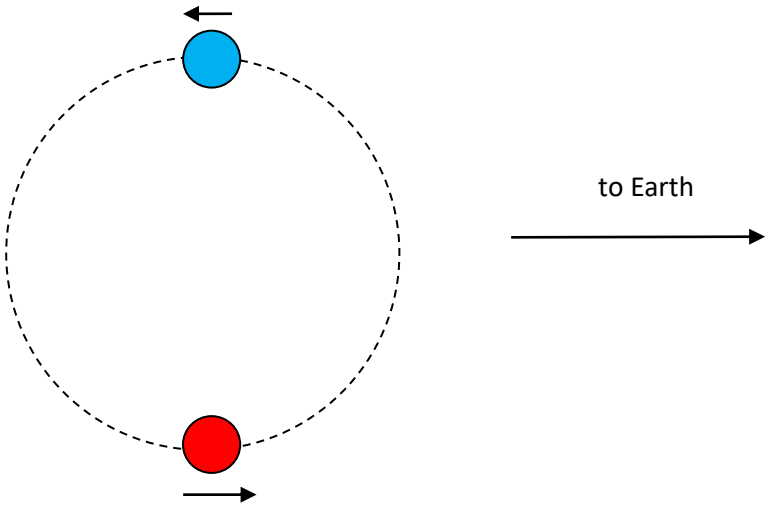
5. A device S emits sound of frequency 500 Hz in all directions. The device is attached to a string and made to rotate along a horizontal circle with constant speed.



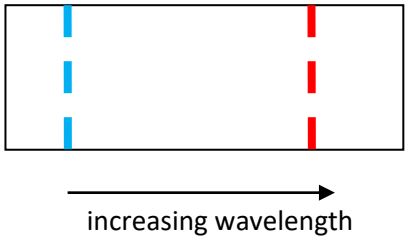
What does the observer hear?

A One frequency higher than 500 Hz for half the period and one frequency less than 500 Hz in the next half of a period.
B Sound with a range of frequencies, from below 500 Hz to above 500 Hz
C One frequency higher than 500 Hz
D One frequency less than 500 Hz

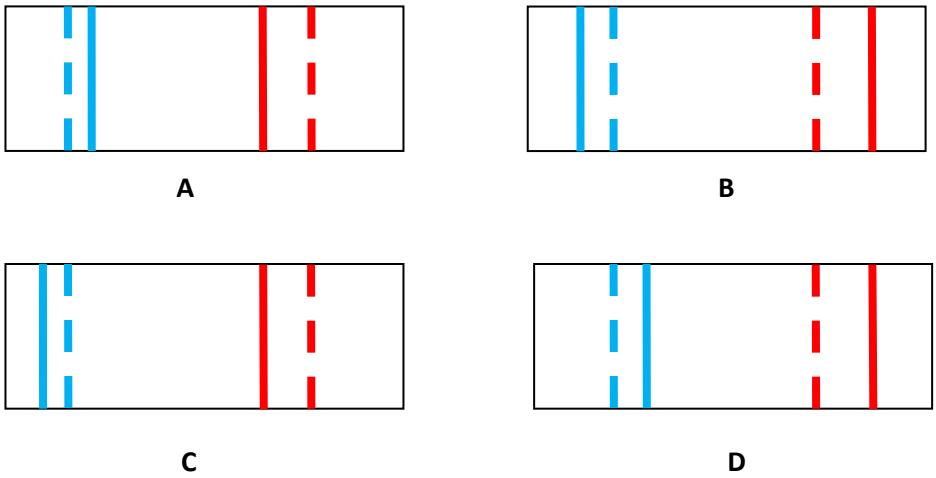
6. Two stars orbit the same centre in the same circular orbit. One star emits blue light and the other red.



The diagram below shows the position of the wavelengths emitted by the two stars on a wavelength scale according to an observer at the centre of the orbit.



What is the position of the wavelengths on the same scale when light from the stars is observed on Earth? The light is emitted when the stars are in the positions shown.



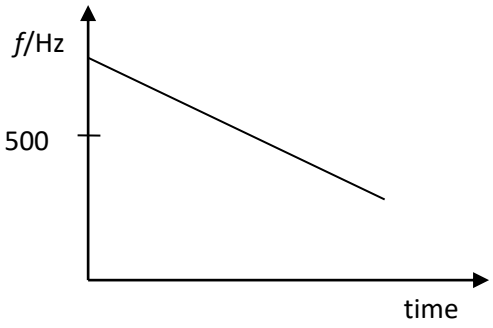
7. A stationary source emits sound of speed c and wavelength λ. What is the wavelength measured by an observer who approaches the source at speed v?

A $\lambda(1+\frac{v}{c})$ **B** $\lambda(1-\frac{v}{c})$ **C** λ **D** $\lambda\frac{v}{c}$

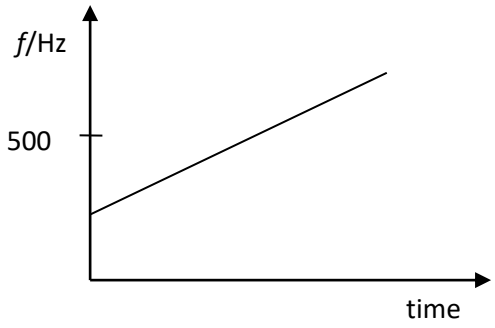
8. A source of sound moves away from a stationary observer with speed v. The speed of sound measured by the source is c. What is the speed of sound measured by the observer?

A $c+v$ **B** c **C** $c-v$ **D** $\frac{cv}{c-v}$

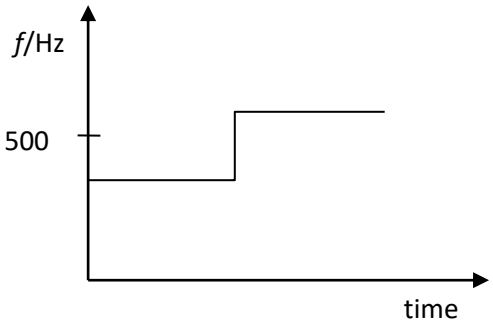
9. A train moving at constant speed approaches and then moves past a train station. The train horn emits sound of frequency 1000 Hz.
What is the variation with time of the frequency heard by an observer at the train station.



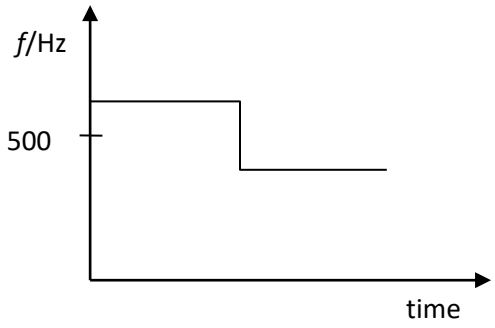
A



B



C



D

10. Ultrasound of frequency *f* and speed *c* is emitted from a stationary source towards an approaching car of speed $v << c$. The ultrasound is reflected by the car. What is the frequency of the reflected ultrasound received at the source?

A $f(1+\frac{v}{c})$ **B** $f(1+\frac{2v}{c})$ **C** $f(1-\frac{v}{c})$ **D** $f(1-\frac{2v}{c})$

Quiz C16.1 Answers	
1	D
2	A
3	D
4	B
5	B
6	A
7	C
8	B
9	D
10	B