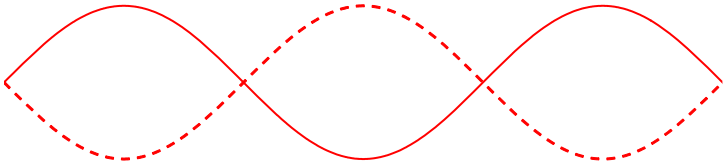
Quiz C15

Standing waves and resonance

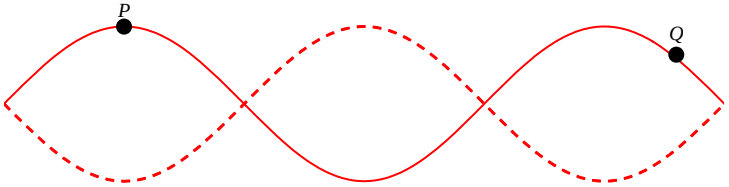
1. A standing wave of frequency 300 Hz is established on a string with both ends fixed.



What is the frequency of the first harmonic on the same string?

A 60 Hz **B** 100 Hz **C** 120 Hz **D** 180 Hz

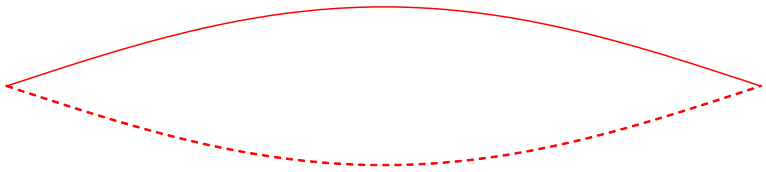
2. A standing wave is established on a string with both ends fixed. Two points of the string are marked P and Q.



What is true about the phase difference and the amplitude of oscillations of P and Q?

	Phase difference	**Amplitude**
A	0	Same
B	0	Different
C	π	Same
D	π	Different

3. The diagram shows a standing wave on a string with both ends fixed.



Which property is **not** the same for all points on the string?

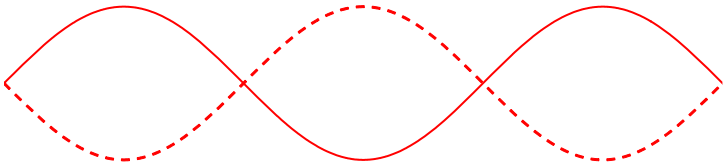
A Frequency

B Phase

C Amplitude

D Period

4. A standing wave is established on a string of length 0.90 m with both ends fixed. The speed of a travelling wave on this string is 180 m s^{-1}.



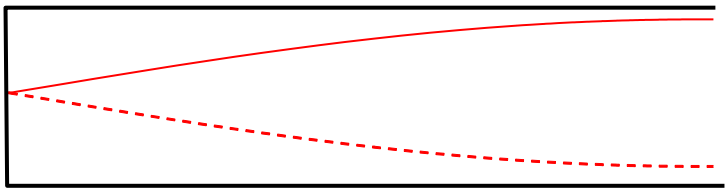
What is the frequency of the standing wave?

A 60 Hz **B** 120 Hz **C** 200 Hz **D** 300 Hz

5. The first harmonic of a standing wave is established in a pipe X with one open and one closed end. The second harmonic of a standing wave is established in a pipe Y that has both ends open. The frequency in X is double that in Y. What is the ratio $\frac{L_X}{L_Y}$ of the lengths of the pipes?

A $\frac{1}{8}$ **B** $\frac{1}{4}$ **C** $\frac{1}{2}$ **D** 1

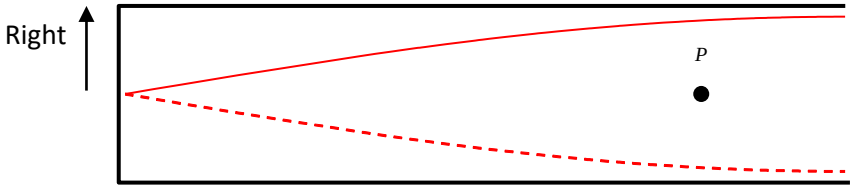
6. A standing wave is established in a tube with one closed and one open end.



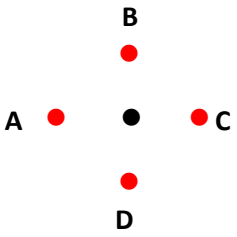
How many nodes will there be when the frequency of the standing wave is tripled?

A 1 **B** 2 **C** 3 **D** 4

7. The diagram shows a standing wave of period T in a pipe with one open and one closed end. The solid line represents the wave at $t = 0$ and the dotted line at $t = \frac{T}{2}$. The dot is the equilibrium position of a particle P in the pipe.



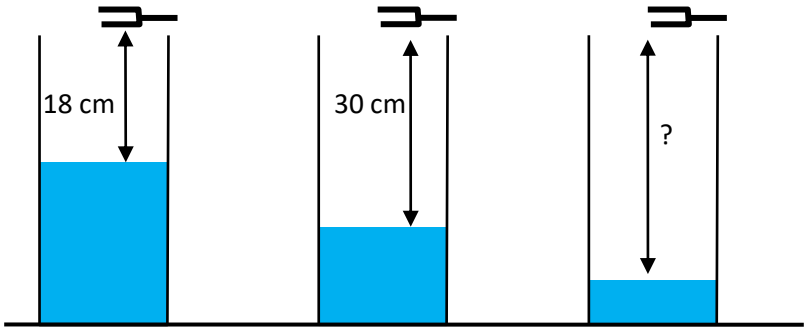
What is the position of P at $t = \frac{T}{2}$? The equilibrium position is the black dot at the centre.



8. Two consecutive harmonics in a pipe with both ends open have frequencies 240 Hz and 320 Hz. What is the frequency of the first harmonic?

A 40 Hz **B** 80 Hz **C** 120 Hz **D** 160 Hz

9. A tuning fork is sounded above a tube partially filled with water. **Consecutive** harmonics are established when the length *L* of the air column is 18 cm and 30 cm.



What is the length of the air column for which the **next** harmonic will be heard?

A 36 cm **B** 42 cm **C** 48 cm **D** 54 cm

10. The natural frequency of an oscillating system is f_0 . The system is being driven by an external periodic force of frequency f_D . What happens to the resonant frequency as the amount of damping on the system increases?

A It stays constant at f_0 .

B It becomes smaller than f_0 .

C It becomes larger than f_0 .

D It becomes the average of f_0 and f_D .

Quiz C15 Answers	
1	B
2	B
3	C
4	D
5	A
6	B
7	A
8	B
9	B
10	B