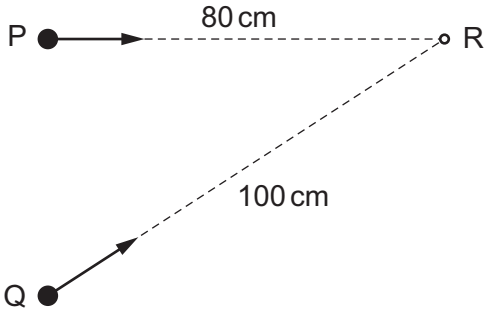
**21** Two identical waves are produced by sources at points P and Q. The waves travel along different paths to reach point R, as shown.




Both waves have a wavelength of 6.0 cm. The waves are in phase at point R.

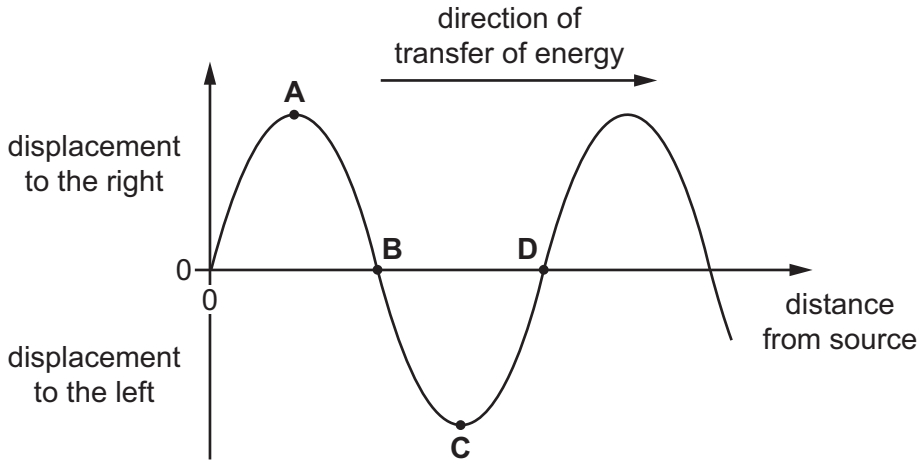
What is the phase difference between the waves as they leave points P and Q?

**A** 0° **B** 60° **C** 90° **D** 120°

**22** A longitudinal wave travelling from left to right has vibrations parallel to the direction of transfer of energy by the wave.

The wave can be represented on a graph showing the variation with distance of the displacement of the particles from their equilibrium positions at one instant.

Which point on the graph is the centre of a compression?




**23** A stationary wave is formed from two identical sound waves.

A microphone is placed at a position of maximum loudness. It is then moved along the stationary wave from this first position of maximum loudness to the fourth position of maximum loudness. The microphone moves a distance of 12 cm.

The speed of sound is 330 m s$^{-1}$.

What is the frequency of the sound waves?

**A** 4100 Hz **B** 5500 Hz **C** 8300 Hz **D** 11 000 Hz