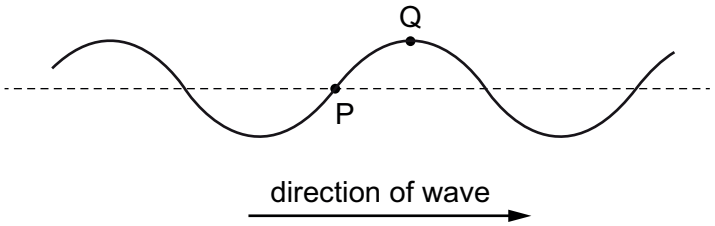
21 The diagram shows a transverse wave on a rope. The wave is travelling from left to right.

At the instant shown, the points P and Q on the rope have zero displacement and maximum displacement respectively.



Which row describes the direction of motion, if any, of the points P and Q at this instant?

	point P	point Q
A	downwards	stationary
B	stationary	downwards
C	stationary	upwards
D	upwards	stationary

22 The period of an electromagnetic wave in a vacuum is 1.0 ns.

What are the frequency and wavelength of the wave?

	frequency / Hz	wavelength / m
A	1.0	3.0×10^{8}
B	1.0×10^{6}	300
C	1.0×10^{9}	0.30
D	1.0×10^{12}	3.0×10^{-4}

23 An observer is standing on a railway platform. A train passes the observer at constant speed while emitting sound of constant frequency *f* from its whistle.

What does the observer hear?

A sound of a decreasing frequency as the train approaches and of an increasing frequency as it moves away

B sound of a higher frequency than *f* as the train approaches and of a lower frequency than *f* as the train moves away

C sound of a lower frequency than *f* as the train approaches and of a higher frequency than *f* as the train moves away

D sound of an increasing frequency as the train approaches and as it moves away