3 A sound wave that is **propagating towards the left** is represented by the two graphs below.

Fig. 3.1 shows the variation with position along the wave of the displacement of the air particles from their equilibrium position at time $t = 0$. Fig. 3.2 shows the variation with time t of the displacement of an air particle from its equilibrium position.

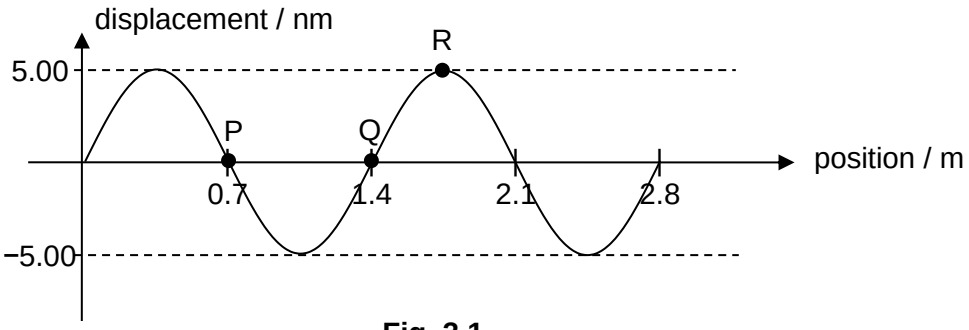

Fig. 3.1

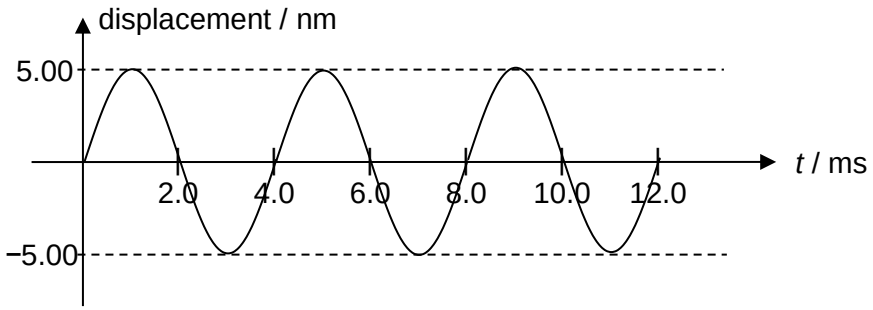

Fig. 3.2

(a) Calculate the speed of the sound wave.

speed = ... m s^{-1} [2]

(b) Fig. 3.1 shows three particles P, Q and R along the sound wave.
Taking rightwards to be positive, identify the particle that is

(i) instantaneously at rest at $t = 0$.

particle : ..... [1]

(ii) at the centre of a rarefaction at $t = 0$.

particle : ..... [1]

(iii) represented by Fig. 3.2.

particle : ..... [1]

(c) Particle S is 0.70 m to the right of particle R.

(i) Determine the phase difference between particle S and R.

phase difference = ... [2]

(ii) Sketch in Fig. 3.1 the graph of the wave 1.0 ms later. Label the graph Y. [2]

(iii) Sketch in Fig. 3.2 the graph that corresponds to particle S. Label the graph Z. [1]

[Total: 10]