4 **(a)** State what is meant by *simple harmonic motion*.

.....

.....

.....[2]

(b) The variation with time t of the displacement x of two oscillators P and Q is shown in Fig. 4.1.

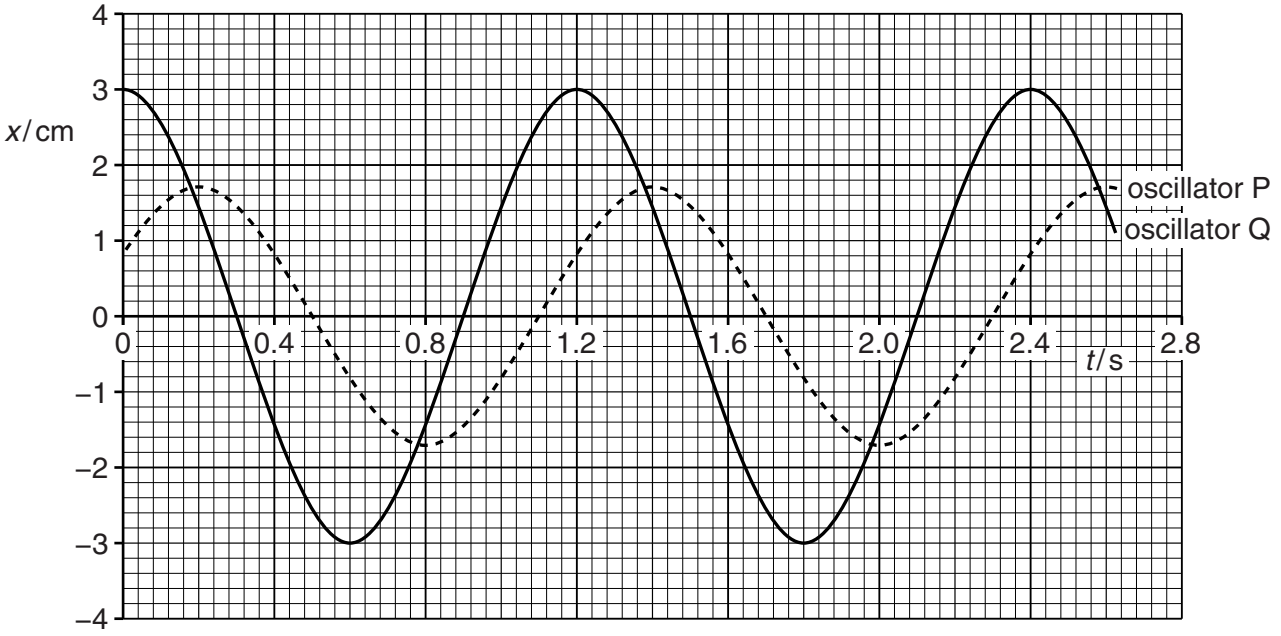

Fig. 4.1

The two oscillators each have the same mass.

Use Fig. 4.1 to determine

(i) the phase difference between the two oscillators,

phase difference = ... rad [1]

(ii) the maximum acceleration of oscillator Q,

maximum acceleration = ... $m\,s^{-2}$ [2]

(iii) the ratio

$$\frac{\text{maximum kinetic energy of oscillations of Q}}{\text{maximum kinetic energy of oscillations of P}}.$$

ratio = ... [2]

(c) Use data from **(b)** to sketch, on the axes of Fig. 4.2, the variation with displacement x of the acceleration a of oscillator Q.

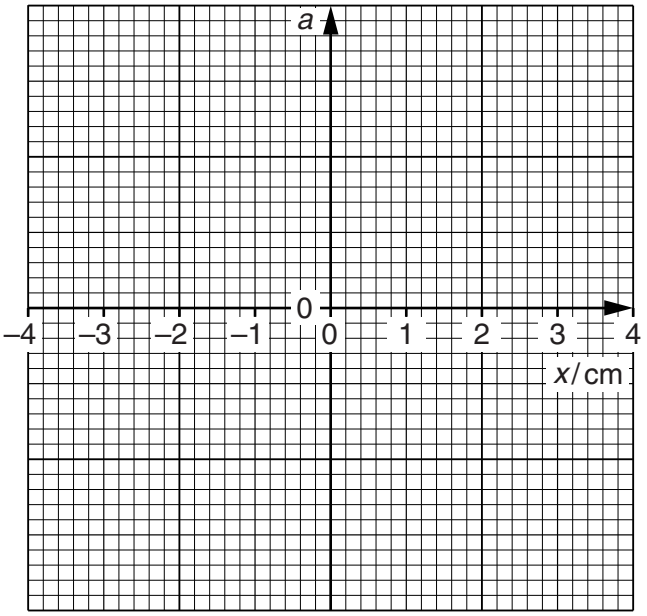

Fig. 4.2

[2]