3 **(a)** A mass undergoes simple harmonic motion. For a displacement x that is measured from its equilibrium position, the acceleration a of the mass m is given by the expression

$$a = -\frac{16}{m}x$$

(i) Explain how the expression leads to the conclusion that the mass is performing simple harmonic motion.

……

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……[3]

(ii) Fig. 3.1 shows the variation of the potential energy of the mass with time.

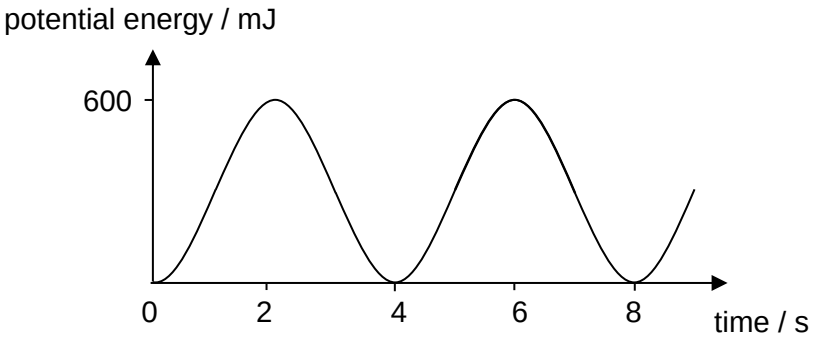

Fig. 3.1

Calculate

1. the frequency for the oscillations of the mass,

frequency = ... Hz [1]

2. the mass,

mass = ... kg [2]

3. the amplitude of the oscillations.

amplitude = ... m [2]

4. Mark a point on Fig. 3.1 between 0 and 4 s and mark it as Z when the mass is exactly mid-way between the equilibrium position and amplitude position. [1]

(b) On Fig. 3.2, sketch a labelled graph of the variation of the velocity with time of the mass for 2 periods.

Fig. 3.2