(a) (i) Define the *radian*.

....

....

.... [2]

(ii) State, by reference to simple harmonic motion, what is meant by *angular frequency*.

....

.... [1]

(b) A sphere of mass 120 g is suspended from a fixed point by an inelastic string, as shown in Fig. 2.1.
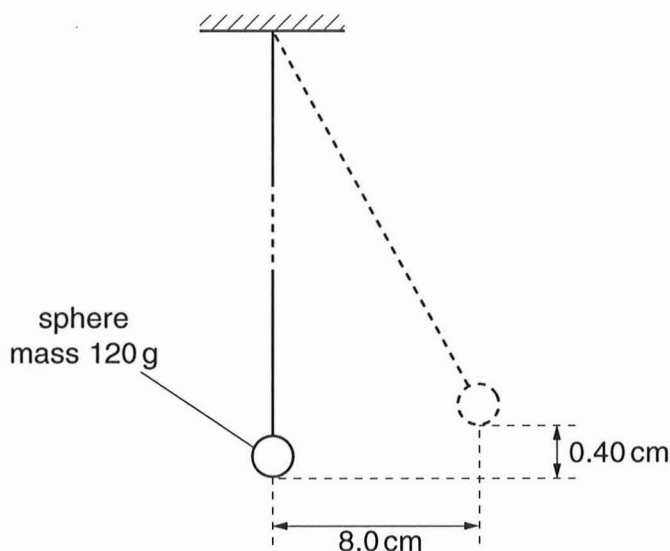

sphere
mass 120 g

0.40 cm

8.0 cm

Fig. 2.1 (not to scale)

The sphere is given a horizontal displacement of 8.0 cm from its rest position. The sphere rises vertically through a distance of 0.40 cm.

When the sphere is released, it swings, performing simple harmonic motion.
For the motion of the sphere,

(i) show that the total energy of the sphere is 4.7×10^{-3} J,

[2]

(ii) calculate the frequency.

frequency = ... Hz [4]