3 **(a)** **(i)** Define potential energy.

.....

..... [1]

(ii) Distinguish between *gravitational* potential energy and *elastic* potential energy.

gravitational potential energy .....

.....

elastic potential energy .....

..... [2]

(b) A small sphere of mass 51 g is suspended by a light inextensible string from a fixed point P.
The centre of the sphere is 61 cm vertically below point P, as shown in Fig. 3.1.

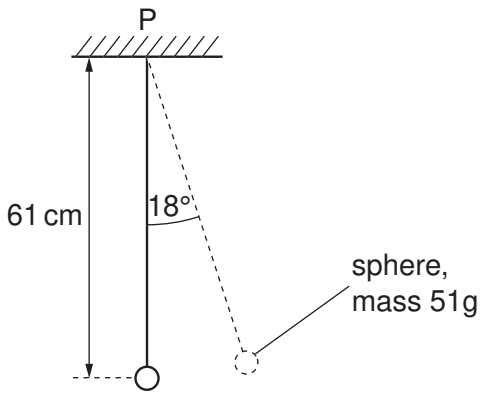

Fig. 3.1

The sphere is moved to one side, keeping the string taut, so that the string makes an angle of 18° with the vertical. Calculate

(i) the gain in gravitational potential energy of the sphere,

gain = …….. J [2]

(ii) the moment of the weight of the sphere about point P.

moment = ... N m [2]

3 A stone on a string is made to travel along a horizontal circular path, as shown in Fig. 3.1.

For Examiner's Use

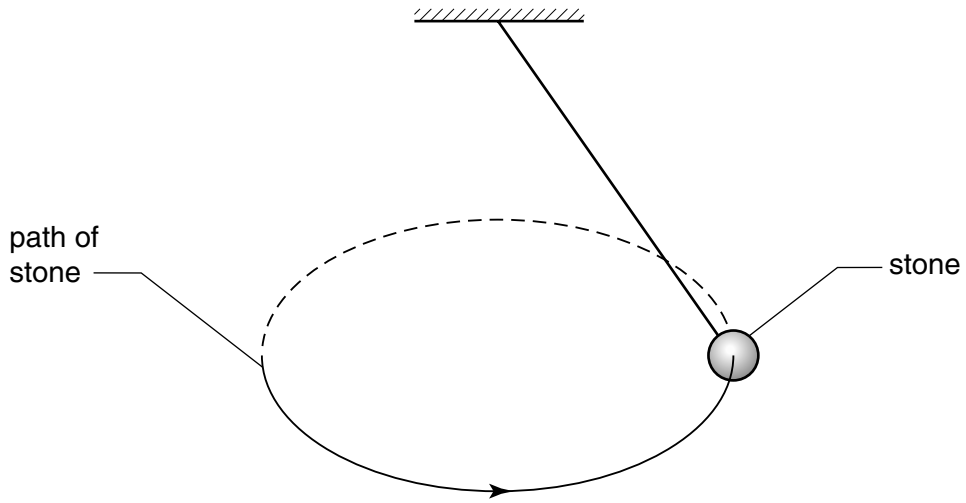

Fig. 3.1

The stone has a constant speed.

(a) Define *acceleration*.

.....

..... [1]

(b) Use your definition to explain whether the stone is accelerating.

.....

.....

..... [2]

(c) The stone has a weight of 5.0 N. When the string makes an angle of 35° to the vertical, the tension in the string is 6.1 N, as illustrated in Fig. 3.2.

For Examiner's Use

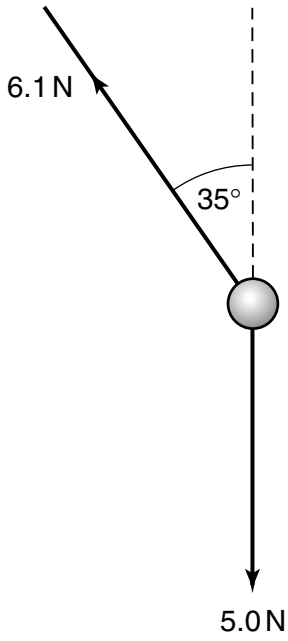

Fig. 3.2

Determine the resultant force acting on the stone in the position shown.

magnitude of force = ……..…….. N

direction of force…..……..…….. [4]

(b) the change in momentum of the ball, of mass 45 g, during contact of the ball with the surface,

change = …….. N s [4]

(c) the average force acting on the ball during contact with the surface.

force = ……. N [2]

4 **(a)** Explain what is meant by the concept of *work*.

.....

.....

.....[2]

(b) Using your answer to **(a)**, derive an expression for the increase in gravitational potential energy ΔE_p when an object of mass m is raised vertically through a distance Δh near the Earth's surface.

The acceleration of free fall near the Earth's surface is g. [2]