Oxford Cambridge and RSA

A Level Physics A

H556/01 Modelling physics

Question Set 16

1 (a) Use the equations for momentum and kinetic energy to derive an expression for the kinetic energy E_k of a particle in terms of its momentum p and mass m. **[2]**

(b) Fig. 20.1 shows an electric motor used to lift and lower a load.

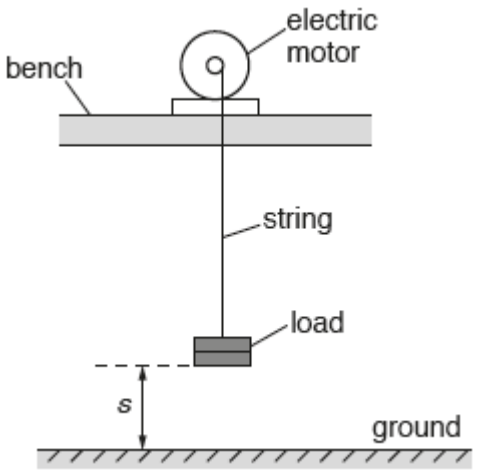

Fig. 20.1

At time $t = 0$ the load is on the ground with displacement $s = 0$.
Fig. 20.2 shows the variation of the displacement s of the load with time t.

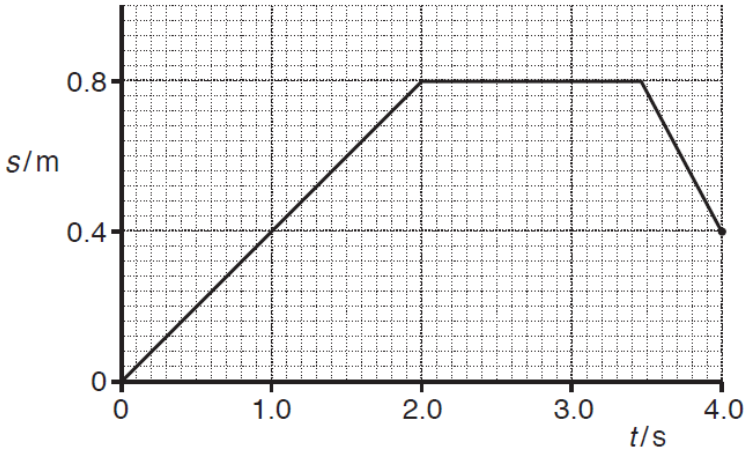

Fig. 20.2

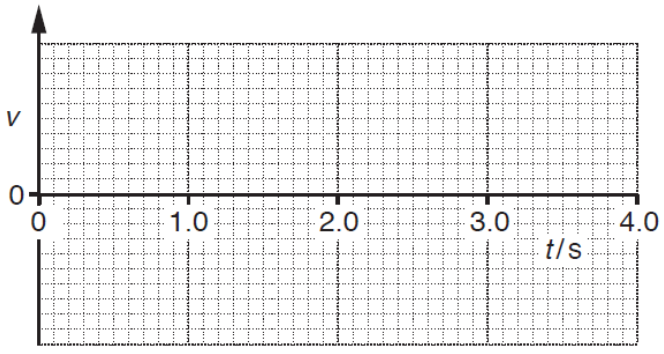

Fig. 20.3

(i) On Fig. 20.3, sketch a graph to show the variation of the velocity v of the load with time t. You do not need to insert a scale on the v axis. **[3]**

(ii) Describe how the kinetic energy and the gravitational potential energy of the load varies from $t = 0$ to $t = 2.0\,s$. **[2]**

(iii) During the **downward** journey of the load, the string breaks at $t = 4.0\,s$. It then falls vertically towards the ground. The mass of the load is 120 g.
Air resistance is negligible.

1 Calculate the velocity V of the load just before it hits the ground.

V = …….. $m\,s^{-1}$ **[2]**

2 The load hits the ground and comes to **rest** in a time interval of 25 ms.

Calculate the average force F exerted by the ground on the load.

F = …….. N **[2]**

Total Marks for Question Set 16: 11