A Level · OCR · Physics

11 mins 1 question

Structured Questions

# Kinematics

Displacement, Velocity & Acceleration / Motion Graphs / Displacement & Velocity-Time Graphs

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**Total Marks** **/11**

**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 marks)**

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

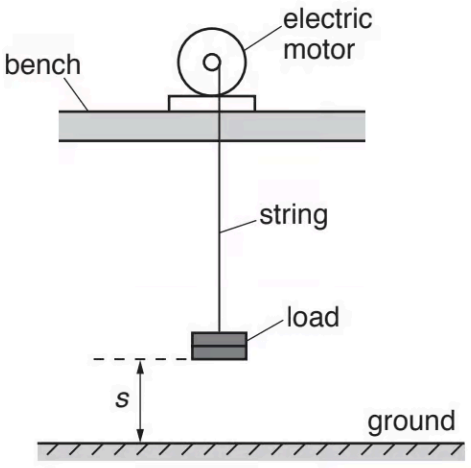


**Fig. 20.1**

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*.

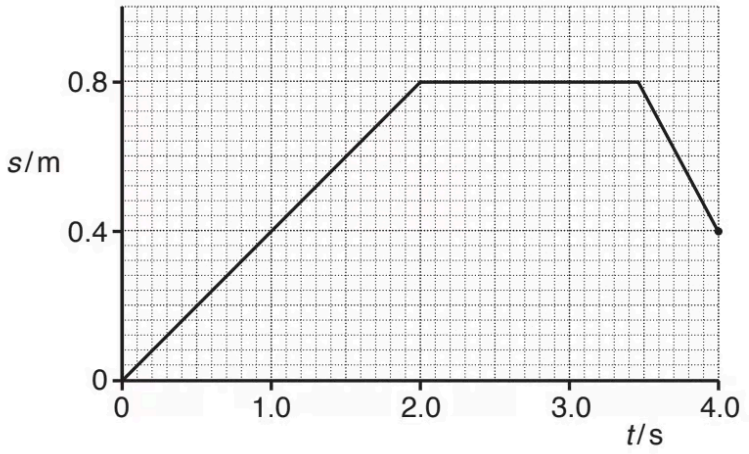


**Fig. 20.2**

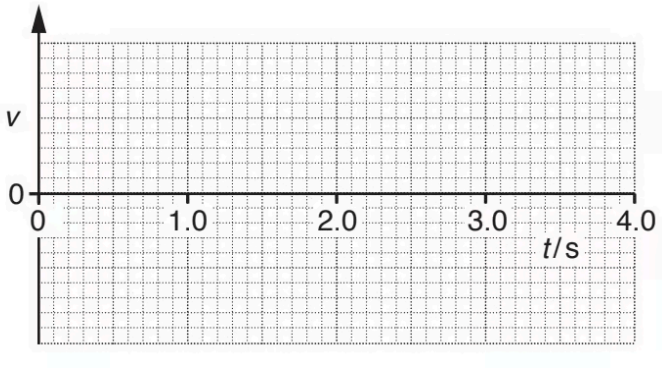


**Fig. 20.3**

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 toward 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]**

**(9 marks)**