

- 2 (a) Explain what is meant by *work done by a force*.

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[1]

- (b) Derive, from the definition of work done by a force, the equation $E_p = mgh$ for gravitational potential energy changes near the Earth's surface.

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[3]

- (c) A metal block of mass 650 kg is released from a height of 1.2 m above the top of a 140 kg metal pole, as shown in Fig. 2.1.

The block then collides with the pole and drives it vertically into the soil for a distance d as shown in Fig. 2.2, and stops.

For the entire process, the rope remains slack and viscous forces can be taken to be negligible.

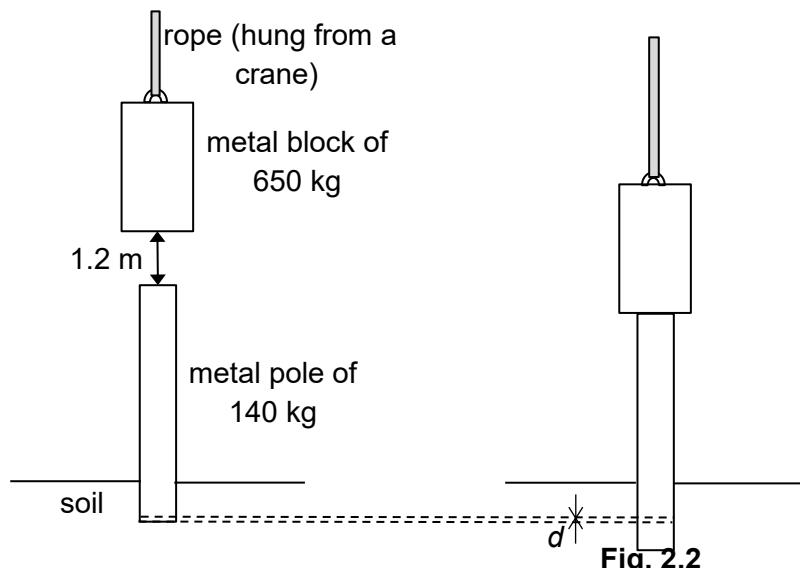


Fig. 2.1

Fig. 2.2

- (i) The average resistance from the ground against the vertical penetration by the pole is 50 kN.

Assuming all energy is transferred from the block to the pole, calculate d .

$$d = \dots \text{m} \quad [3]$$

- (ii) In real-life scenarios, the distance d will be smaller than what is calculated in (c)(i). Suggest a reason why.

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$$\dots \quad [1]$$

