InkPhysics

QUESTION WORKBOOK

Work, energy and power

Mechanics · Year 12

AQA 3.4.1.7 · CIE 5.1 · OCR A 3.3.1, 3.3.3

10 questions · 29 marks

NAVY SCREEN EDITION

inkphysics.co.uk

SECTION A · Warm-up

A1 A force of 20 N moves an object 3.0 m in the direction of the force. Calculate the work done. [2]

A2 Define power and state its SI unit. [2]

A3 State the equations for kinetic energy and for the change in gravitational potential energy near the Earth's surface. [2]

SECTION B · Standard

B1 A force of 50 N pulls a crate 4.0 m along the ground, acting at 30° above the horizontal. Calculate the work done by the force. [3]

B2 A 2.0 kg object moves at 6.0 m s^{-1}. Calculate (a) its kinetic energy and (b) the distance it travels before stopping if a constant 12 N resistive force acts on it. [4]

B3 A motor raises a 20 kg load through a height of 5.0 m in 4.0 s at steady speed. Taking g = 9.81 m s^{-2}, calculate the useful output power of the motor. [3]

B4 A machine has an input power of 800 W and a useful output power of 600 W. Calculate its efficiency. [2]

SECTION C · Stretch

C1 A car engine develops a useful output power of 40 kW while the car travels at a steady 25 m s^{-1}. Calculate the driving force provided by the engine. [3]

C2 A 10 kg box is pushed at steady speed a distance of 4.0 m up a slope inclined at 30° to the horizontal, against a constant frictional force of 15 N. Taking $g = 9.81\ \text{m s}^{-2}$, calculate (a) the gain in gravitational potential energy, (b) the work done against friction, and (c) the force applied parallel to the slope. [5]

C3 Explain why the efficiency of a real machine is always less than 100%, and where the 'lost' energy goes. [3]