



QUESTION WORKBOOK

Conservation of energy

Mechanics · Year 12

AQA 3.4.1.8 · CIE 5.1, 5.2 · OCR A 3.3.1, 3.3.2

10 questions · 31 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

A1 State the principle of conservation of energy. [2]

A2 Describe the main energy transfer that takes place as a ball falls freely towards the ground. [2]

A3 Calculate the kinetic energy of a 4.0 kg object moving at 5.0 m s⁻¹. [2]

SECTION B · Standard

B1 An object is dropped from rest and falls 1.8 m. Using energy conservation and taking $g = 9.81 \text{ m s}^{-2}$, calculate its speed just before it lands (ignore air resistance). [3]

- B2** A 0.20 kg ball is dropped from a height of 2.5 m. Taking $g = 9.81 \text{ m s}^{-2}$, calculate (a) its gravitational potential energy at the start and (b) its speed just before impact. [4]

- B3** A ball leaves the ground moving vertically upwards at 6.0 m s^{-1} . Using energy conservation with $g = 9.81 \text{ m s}^{-2}$, calculate the maximum height it reaches. [3]

- B4** A 5.0 kg block slides 4.0 m down a slope inclined at 30° , against a constant frictional force of 10 N. Taking $g = 9.81 \text{ m s}^{-2}$, use an energy budget to find its kinetic energy and speed at the bottom. [4]

SECTION C · Stretch

- C1** A roller-coaster car starts from rest at the top of a 25 m drop and passes a point 10 m above the ground. Ignoring friction and taking $g = 9.81 \text{ m s}^{-2}$, calculate its speed at that point. [4]

- C2** A ball is dropped from a height of 2.0 m and bounces back to a height of 1.5 m. Taking $g = 9.81 \text{ m s}^{-2}$, calculate (a) the fraction of its energy retained in the bounce and (b) its speed just after leaving the ground. [4]

- C3** Energy is always conserved, yet we still talk about 'wasting' energy. Explain this apparent contradiction. [3]