



ANSWER BOOK

Mass and weight

Mechanics · Year 12

AQA 3.4.1.1 · CIE 3.1 · OCR A 3.2.1

9 questions · 27 marks

NAVY EDITION

SECTION A · Warm-up

A1 Mass is the amount of matter in an object, a scalar measured in kilograms (kg). Weight is the gravitational force on it, a vector measured in newtons (N).

A2 $W = mg = 5.0 \times 9.81 = 49.1 \text{ N}$. [2]

A3 A balance compares mass (in kg); a newton meter measures force, so it reads weight (in N). [2]

SECTION B · Standard

B1 Mass is unchanged at 5.0 kg. $\text{Weight} = mg = 5.0 \times 1.62 = 8.1 \text{ N}$. [3]

B2 (a) $W = 80 \times 9.81 = 784.8 \text{ N}$. (b) $W = 80 \times 3.70 = 296 \text{ N}$. [4]

B3 $mg - N = ma$, so $N = m(g - a) = 60 \times (9.81 - 3.0) = 408.6 \text{ N}$. This is less than their true weight of 588.6 N, so they feel lighter. [4]

SECTION C · Stretch

C1 $g = GM/r^2 = (6.67 \times 10^{-11} \times 6.0 \times 10^{24}) / (6.4 \times 10^6)^2 = 9.77 \text{ N kg}^{-1}$. [4]

C2 Acceleration = weight/mass = $mg/m = g$, independent of mass. Both objects fall with the same acceleration g , so with no air resistance they land together, even though the hammer has far more mass and weight. [3]

C3 Kilograms measure mass, not weight. The object has a mass of 5 kg; its weight is a force of about 49 N on Earth (mg). Weight should be quoted in newtons. [3]