



QUESTION WORKBOOK

# Mass and weight

Mechanics · Year 12

AQA 3.4.1.1 · CIE 3.1 · OCR A 3.2.1

9 questions · 27 marks

NAVY SCREEN EDITION

**SECTION A** · Warm-up

**A1** Distinguish between the mass and the weight of an object, including the unit of each. [2]

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**A2** Calculate the weight of a 5.0 kg object on Earth, where  $g = 9.81 \text{ m s}^{-2}$ . [2]

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**A3** State what a chemical balance and a newton meter (spring balance) each actually measure. [2]

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**SECTION B** · Standard

**B1** The same 5.0 kg object is taken to the Moon, where  $g = 1.62 \text{ N kg}^{-1}$ . State its mass there and calculate its weight. [3]

- B2** An astronaut has a mass of 80 kg. Calculate their weight (a) on Earth ( $g = 9.81 \text{ m s}^{-2}$ ) and (b) on Mars ( $g = 3.70 \text{ m s}^{-2}$ ). [4]

- B3** A person of mass 60 kg stands on a set of scales in a lift. Taking  $g = 9.81 \text{ m s}^{-2}$ , calculate the reading (the normal force) when the lift accelerates downwards at  $3.0 \text{ m s}^{-2}$ , and comment on how it compares with their true weight. [4]

### SECTION C · Stretch

- C1** A planet has mass  $6.0 \times 10^{24} \text{ kg}$  and radius  $6.4 \times 10^6 \text{ m}$ . Using  $g = GM/r^2$  with  $G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$ , calculate the gravitational field strength at its surface. [4]

- C2** In the absence of air resistance, a hammer and a feather dropped together on the Moon land at the same time. Explain why, referring to mass and weight. [3]

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- C3** A student says 'the object weighs 5 kg'. Explain what is wrong with this statement and give the correct way to express it. [3]

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