



QUESTION WORKBOOK

# Drag and terminal speed

Mechanics · Year 12

AQA 3.4.1.4 · CIE 3.2 · OCR A 3.2.2

9 questions · 27 marks

PRINT EDITION

**SECTION A** · Warm-up

**A1** Name the resistive or contact forces that act on a solid object moving through air, and state the direction of each relative to the motion. [3]

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**A2** Define terminal speed. [2]

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**A3** State how the drag force on an object depends on its speed, for motion through a fluid. [2]

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**SECTION B** · Standard

**B1** A skydiver of weight 750 N falls at terminal speed. State the size and direction of the drag force on them, and explain your reasoning. [3]

- B2** A small sphere falls at terminal speed through a liquid. Its weight is 0.30 N and the upthrust on it is 0.05 N. Calculate the drag force on the sphere, and explain why it is not accelerating. [4]

- B3** Sketch and describe the shape of the velocity–time graph for an object dropped from rest that reaches terminal speed, explaining the changing gradient. [3]

### SECTION C · Stretch

- C1** A parachutist is falling at terminal speed when the parachute opens. Explain, in terms of the forces, why the speed decreases and how a new, lower terminal speed is reached. [4]

- C2** Assuming the drag force is proportional to the square of the speed, an object experiences a drag of 20 N at  $5.0 \text{ m s}^{-1}$ . Calculate the drag force at  $10 \text{ m s}^{-1}$ . [3]

- C3** Explain why a heavier skydiver of the same shape and size reaches a higher terminal speed than a lighter one. [3]