



QUESTION WORKBOOK

Kinematics with variable acceleration

Mechanics · Year 12–13

6 questions · 20 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

- A1** Explain why the suvat equations cannot be used when acceleration depends on time, and state the calculus links between x , v and a . [2]

- A2** A particle has $v = 4t^3 - 6t \text{ m s}^{-1}$. Find its acceleration at $t = 2$. [3]

SECTION B · Standard

- B1** A particle starts at the origin with $v = 8t - 2t^2 \text{ m s}^{-1}$. Find its maximum velocity, and its displacement at $t = 3$. [4]

- B2** A particle moves with $a = 6t - 12 \text{ m s}^{-2}$ and initial velocity 9 m s^{-1} . Find $v(t)$, and the times at which the particle is at rest. [4]

- B3** For the same particle, starting at the origin, find the displacement and the total distance travelled over $0 \leq t \leq 3$. [4]

SECTION C · Stretch

- C1** Show that this particle returns to the origin at $t = 3$, and describe its state at that instant. [3]