

FREE SAMPLE: THE FIRST 3 QUESTIONS

PAPER 1

40 marks · Questions 1 – 40 · multiple choice (A – D) · 1 h

Answer ALL questions. For each question from 1 to 40, four options are given. One of them is the correct answer. Make your choice (A, B, C or D). Each question carries 1 mark. Take the acceleration of free fall, and the gravitational field strength, to be 10 m/s^2 (10 N/kg).

1. Convert $7.5 \mu\text{s}$ to s. [1 mark]

- A $7.5 \times 10^6 \text{ s}$
- B $7.5 \times 10^{-3} \text{ s}$
- C $7.5 \times 10^{-6} \text{ s}$
- D $7.5 \times 10^{-9} \text{ s}$

2. A displacement of 30 m east is added to a displacement of 40 m south. What is the magnitude of the resultant displacement? [1 mark]

- A 50 m
- B 70 m
- C 100 m
- D 600 m

3. A train moving at 4 m/s increases its speed uniformly to 14 m/s in 5 s. What is the acceleration? [1 mark]

- A 0.5 m/s^2
- B 2 m/s^2
- C 2.8 m/s^2
- D 10 m/s^2

THE WORKED ANSWERS TO THOSE 3 QUESTIONS

1. Convert $7.5 \mu\text{s}$ to s. [1 mark] [Physical quantities, units and measurement]

Correct answer: C — $7.5 \times 10^{-6} \text{ s}$

- $1 \mu\text{s} = 10^{-6} \text{ s}$.
- $7.5 \mu\text{s} = 7.5 \times 10^{-6} \text{ s}$.
- Why the other options are wrong:
 - A ($7.5 \times 10^6 \text{ s}$): the power of ten has the wrong sign
 - B ($7.5 \times 10^{-3} \text{ s}$): the wrong prefix size was used
 - D ($7.5 \times 10^{-9} \text{ s}$): the wrong prefix size was used

LOS: Measurement · Physical quantities, units and measurement

KEY TAKEAWAY

Prefixes: n 10^{-9} , μ 10^{-6} , m 10^{-3} , c 10^{-2} , k 10^3 , M 10^6 , G 10^9 : replace the prefix by its power of ten.

2. A displacement of 30 m east is added to a displacement of 40 m south. What is the magnitude of the resultant displacement? [1 mark] [Scalars and vectors]

Correct answer: A — 50 m

- The vectors are at right angles, so use Pythagoras' theorem (or a scale drawing).
- Resultant = $\sqrt{(30^2 + 40^2)} = \sqrt{2500} = 50 \text{ m}$.
- Why the other options are wrong:
 - B (70 m): the magnitudes were added, but the vectors are at right angles
 - C (100 m): a wrong calculation
 - D (600 m): the magnitudes were multiplied

LOS: Measurement · Scalars and vectors

KEY TAKEAWAY

Vectors at right angles combine with Pythagoras; the same line, add or subtract.

3. A train moving at 4 m/s increases its speed uniformly to 14 m/s in 5 s. What is the acceleration? [1 mark] [Kinematics]

Correct answer: B — 2 m/s²

- Acceleration = change in velocity $\div$ time taken.
- $a = (14 - 4) \div 5 = 2 \text{ m/s}^2$.
- Why the other options are wrong:
- A (0.5 m/s²): time $\div$ change in speed is upside down
- C (2.8 m/s²): the final speed was divided by the time but the starting speed was not subtracted
- D (10 m/s²): the time was ignored

LOS: Newtonian Mechanics · Kinematics

KEY TAKEAWAY

Acceleration is the change in velocity per second: $(v - u) \div t$.

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