Past Paper Questions with Model Answers

Unit 1 — Physical Quantities and Measurement

Paper	Source
2025 (B)	Footer code 1SA-I 25004 (B) · Standard
2025 (D)	Footer code 1SA-I 25004 (D) · Standard
2025 (Old Curriculum)	Footer code 1SA-I 25004 (OLD) · Curriculum 2006
2025 (II)	Footer code 1SA-II 25004 · Standard · stamped 10/02/2026
2026 (B)	Footer code 1SA-I 26004 (B) · Inclusive 2024
2026 (D)	Footer code 1SA-I 26004 (D) · Inclusive 2024
2026 (M)	Footer code 1SA-I 26004 (M) · Inclusive 2024
Model Paper 2026 (48 marks)	FBISE Model Paper · Inclusive Scheme of Studies
Model Paper 2026 (50% MCQs)	FBISE Model Paper · 60 MCQs + 30 marks

Answers follow the Unit 1 textbook and are written to earn full marks: the marks in teal brackets show how many points to write, and green brackets inside an answer show where each mark is earned. “(OR)” marks the alternative question in a choice pair.

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2025 (B)

Footer code 1SA-I 25004 (B) · Standard

Section A — MCQ

Q1. 1 picogram =

A) 10^{-3} g B) 10^{-6} g C) 10^{-12} g D) 10^{-15} g

Answer: C) 10^{-12} g (pico = 10^{-12})

Section B — Short Questions (Q2)

(i) Differentiate between scalar and vector quantities. Give two examples of each. **[3]**

Answer: Scalar: A physical quantity described completely by its magnitude (number + unit) only, e.g. *mass* (5 kg), time (30 s).

Vector: A physical quantity that needs magnitude (number + unit) and direction for its complete description, e.g. *force* (10 N towards east), displacement.

Difference: a scalar has magnitude only; a vector has magnitude and direction. **Second examples:** scalar – distance, energy; vector – displacement, velocity.

(vi) Show 2000 nano-grams in micro grams. **[3]**

Answer: nano (n) = 10^{-9} and micro (μ) = 10^{-6}

2000 ng = 2000×10^{-9} g = $2 \times 10^{3} \times 10^{-9}$ g = 2×10^{-6} g

Since 10^{-6} g = 1 μg, **2000 ng = 2 μg**

Section C — Long Questions

Q3 (OR) What is meant by Base Physical Quantities and Derived Physical Quantities? Give three examples of each with symbol and their SI units. **[2+3]**

Answer: Base (fundamental) physical quantities are the simplest form of physical quantities, chosen so that all other physical quantities can be derived from them. **Derived physical quantities** are those obtained by multiplying or dividing base quantities. **(2 marks)**

Base quantity	Symbol	SI unit (symbol)
Length	l	metre (m)
Mass	m	kilogram (kg)
Time	t	second (s)

Derived quantity	Symbol	SI unit (symbol)
Area	A	square metre (m^2)
Velocity	v	metre per second ($m\ s^{-1}$)
Force	F	newton (N) = $kg\ m\ s^{-2}$

(3 marks: any three examples of each with symbol and SI unit)

2025 (D)

Footer code 1SA-I 25004 (D) · Standard

Section A — MCQ

Q1. 1 milligram =

A) 10^{-3} g B) 10^{-6} g C) 10^{-12} g D) 10^{-15} g

Answer: A) 10^{-3} g (milli = 10^{-3})

Section B — Short Questions (Q2)

(i) Enlist the steps to represent a vector in a coordinate system. **[1×3]**

Answer: 1. Choose and draw a coordinate system.

2. Select a suitable scale (e.g. 5 km = 1 cm).

3. Draw a line in the fixed direction and cut it equal to the magnitude of the vector according to the chosen scale.

4. Put an arrow-head along the direction of the vector.

Example: a helicopter moving 20 km from the origin at 60° south of west is drawn as a 4 cm line (scale 5 km = 1 cm) with an arrow-head at its end.

(x) Show 4000 nano grams in milli grams. **[1+2]**

Answer: nano = 10^{-9}, milli = 10^{-3} **(1)**

4000 ng = $4 \times 10^{3} \times 10^{-9}$ g = 4×10^{-6} g

1 mg = 10^{-3} g, so 4×10^{-6} g = $4 \times 10^{-6} \div 10^{-3}$ mg = 4×10^{-3} mg

4000 ng = 0.004 mg (2)

Section C — Long Questions

Q5 What is meant by Base Physical Quantities and Derived Physical Quantities? Give three examples of each with their symbol and SI units. **[2+3]**

Answer: Base (fundamental) physical quantities are the simplest form of physical quantities, chosen so that all other physical quantities can be derived from them. **Derived physical quantities** are those obtained by multiplying or dividing base quantities. **(2 marks)**

Base quantity	Symbol	SI unit (symbol)
Length	l	metre (m)
Mass	m	kilogram (kg)
Time	t	second (s)

Derived quantity	Symbol	SI unit (symbol)
Area	A	square metre (m^2)
Velocity	v	metre per second (m s^{-1})
Force	F	newton (N) = kg m s^{-2}

(3 marks: any three examples of each with symbol and SI unit)

2025 (Old Curriculum)

Footer code 1SA-I 25004 (OLD) · Curriculum 2006

Section A — MCQ

Q1. Least count of a Screw gauge is:

A) 1 mm B) 0.1 mm C) 0.01 mm D) 0.001 mm

Answer: C) 0.01 mm (pitch 0.5 mm ÷ 50 divisions)

Q2. The prefix giga is equal to:

A) 10^{12} B) 10^{9} C) 10^{6} D) 10^{3}

Answer: B) 10^{9}

Q6. Magnitude of resultant vector F is:

A) $F = F_x + F_Y$ B) $F = \sqrt{(F_x^2 + F_Y^2)}$ C) $F = F_x - F_Y$ D) $F = \sqrt{(F_x - F_Y)}$

Answer: B) $F = \sqrt{(F_x^2 + F_Y^2)}$ (Pythagoras theorem)

Section B — Short Questions (Q2)

(i) Express the following quantities in prefix micro: (a) 0.00002 g (b) 0.0000000081 m (c) 0.000004 s **[3]**

Answer: micro (μ) = 10^{-6}

(a) 0.00002 g = 2×10^{-5} g = 20×10^{-6} g = **20 μg**

(b) 0.0000000081 m = 8.1×10^{-9} m = 0.0081×10^{-6} m = **0.0081 μm**

(c) 0.000004 s = 4×10^{-6} s = **4 μs**

(ii) What are base quantities? Enlist any two base quantities with SI units along with their symbols. **[3]**

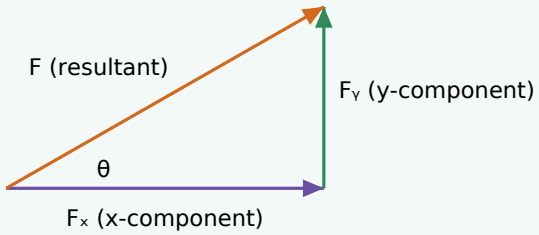
Answer: Base quantities: The simplest form of physical quantities, chosen so that all other physical quantities can be derived from them. **(1)**

Base quantity	Symbol	SI unit (symbol)
Length	l	metre (m)
Mass	m	kilogram (kg)

(2: two quantities with symbols and units)

(vi) Determine the magnitude and direction of a force F from its perpendicular components. Draw diagram. **[3]**

Answer: Let F_x (along x-axis) and F_Y (along y-axis) be the perpendicular components. Placing F_Y on the head of F_x, the resultant F joins the tail of F_x with the head of F_Y, forming a right-angled triangle. **(1: diagram)**



Magnitude: $F^2 = F_x^2 + F_Y^2 \Rightarrow$ **$F = \sqrt{(F_x^2 + F_Y^2)}$ (1)**

Direction: angle θ with the x-axis, $\tan\theta = F_Y/F_x \Rightarrow$ **$\theta = \tan^{-1}(F_Y/F_x)$ (1)**

(x) (OR) Your hair grow at the rate of 1 mm per day. Find their growth rate in nms^{-1} and μms^{-1}. **[3]**

> **Answer:** 1 mm = 10^{-3} m; 1 day = 24 × 60 × 60 = 86400 s
> Rate = 10^{-3} m ÷ 86400 s = 1.157×10^{-8} m s^{-1} **(1)**
> In nm s^{-1}: 1.157×10^{-8} m $s^{-1} \div 10^{-9}$ = **11.57 nm s^{-1}** **(1)**
> In µm s^{-1}: 1.157×10^{-8} m $s^{-1} \div 10^{-6}$ = **0.01157 µm s^{-1}** (1.157×10^{-2} µm s^{-1}) **(1)**

(xi) (OR) A chocolate wrapper is 7.6 cm long and 4.5 cm wide. Calculate its area up to reasonable number of significant figures. **[3]**

> **Answer:** Length = 7.6 cm (2 s.f.), width = 4.5 cm (2 s.f.)
> Area = l × w = 7.6 × 4.5 = 34.2 cm^2 **(2)**
> The result cannot have more significant figures than the data (2), so rounding off (digit 2 < 5 is dropped):
> **Area ≈ 34 cm^2** **(1)**

2025 (II)

Footer code 1SA-II 25004 · Standard · stamped 10/02/2026

Section A — MCQ

Q2. Which one is a scalar quantity?

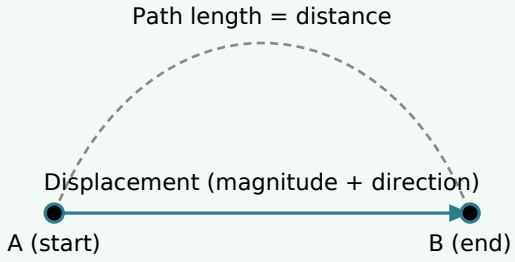
A) velocity B) force C) energy D) weight

> **Answer: C) energy** (velocity, force and weight are vectors)

Section B — Short Questions (Q2)

(i) (OR) Justify that displacement is a vector quantity. Also draw diagram. **[2+1]**

> **Answer:** Displacement is the straight-line distance from the initial position to the final position *in a particular direction*. To tell where a body finally is, its magnitude **and** direction must both be stated; e.g. “5 m” alone does not fix the final position, but “5 m towards east” does. **(1)**
> Two displacements of the same magnitude but different directions give different final positions, and displacements add by vector (head-to-tail) rules, not ordinary algebra. Hence displacement is a vector. **(1)**



(1: diagram)

(ii) (OR) Compare scalar and vector quantities. (Any three points) **[1.5+1.5]**

Answer:

Scalar quantities	Vector quantities
Described completely by magnitude (number + unit) only	Need magnitude (number + unit) and direction
Added, subtracted, multiplied by ordinary algebra	Follow vector algebra (head-to-tail rule)
Examples: distance, speed, time, mass, energy, temperature	Examples: displacement, force, weight, velocity, acceleration, momentum

(iii) (OR) How many kilometers are there in 25 micrometers? **[3]**

Answer: micro = 10^{-6}; 25 μm = 25 × 10^{-6} m **(1)**
1 km = 10^{3} m, so 1 m = 10^{-3} km
25 × 10^{-6} m = 25 × 10^{-6} × 10^{-3} km **(1)**
= 2.5 × 10^{-8} km (1)

(vii) Show that prefix micro is thousand times smaller than prefix milli. **[3]**

Answer: milli (m) = 10^{-3} and micro (μ) = 10^{-6} **(1)**
milli ÷ micro = 10^{-3} ÷ 10^{-6} = 10^{6} ÷ 10^{3} = 10^{3} = 1000 **(1)**
Hence 1 milli = 1000 micro, i.e. **micro is 1000 times smaller than milli**. (e.g. 1 mm = 1000 μm) **(1)**

(xi) (OR) Express the following using prefixes: a. 29.3×10^{-10} m b. 0.00034×10^{-7} s **[3]**

Answer: a. 29.3 × 10^{-10} m = 2.93 × 10^{-9} m = **2.93 nm** (nano = 10^{-9}) **(1.5)**
b. 0.00034 × 10^{-7} s = 3.4 × 10^{-4} × 10^{-7} s = 3.4 × 10^{-11} s = 34 × 10^{-12} s = **34 ps** (pico = 10^{-12}) **(1.5)**

2026 (B)

Footer code 1SA-I 26004 (B) · Inclusive 2024

Section A — MCQ

Q1. A device measures a charge of 3000 nC. Convert it into microcoulombs (μC).

A) 0.03 μC B) 3 μC C) 30 μC D) 300 μC

Answer: B) 3 μC (3000 × 10^{-9} C = 3 × 10^{-6} C = 3 μC)

Q4. What is a reasonable estimate for the mass of a physics textbook?

A) 2 mg B) 1 kg C) 10 kg D) 1 g

Answer: B) 1 kg

Q5. Which unit belongs to a derived quantity?

A) Second (s) B) Kelvin (K) C) Meter (m) D) Newton (N)

Answer: D) Newton (N) (kg m s^{-2}, unit of force; the others are base units)

Section B — Short Questions (Q2)

(i) (OR) Briefly describe scalar and vector quantities with one example each. **[1.5+1.5]**

Answer: **Scalar:** A physical quantity described completely by its magnitude (number + unit) only, e.g. *mass* (5 kg), time (30 s).

Vector: A physical quantity that needs magnitude (number + unit) and direction for its complete description, e.g. *force* (10 N towards east), displacement.

(ix) A digital balance gives slightly different readings each time a stone is placed on it: a. Identify the error. b. How can this error be fixed? **[1+2]**

Answer: **a. Error: Random error** – unpredictable, uncontrollable variation caused by fluctuations in experimental conditions or imperfection of the instrument. **(1)**

b. Fix: Random errors cannot be removed completely, but are minimized by taking repeated measurements of the same quantity and finding their **mean (average)**, and by using statistical analysis of the variation. **(2)**

(x) (OR) Compare precision and accuracy in measurements. **[3]**

Answer:

Point	Precision	Accuracy
Meaning	Closeness (agreement) of repeated measurements of the same quantity with each other	Closeness of a measured value to the true or accepted value
Concerned with	Consistency and reproducibility of results	Absence of systematic errors or bias
Depends on	Random errors / scatter in readings	Systematic errors (e.g. zero error, wrong calibration)
Example	A scale that always gives the same weight within 0.1 kg but overestimates by 0.5 kg is precise, not accurate	A thermometer reading the actual temperature is accurate; one always 2 °C higher is not

2026 (D)

Footer code 1SA-I 26004 (D) · Inclusive 2024

Section A — MCQ

Q1. Which of the following is a derived quantity?

A) Mass B) Speed C) Length D) Temperature

Answer: **B) Speed** (length ÷ time; the rest are base quantities)

Section B — Short Questions (Q2)

(iii) A digital balance gives slightly different readings each time same stone is placed on it: a. Identify the error. b. How can this error be fixed? **[1+2]**

Answer: **a. Error: Random error** – irregular and unpredictable variation in readings. **(1)**

b. Fix: Take multiple readings of the same measurement and calculate their mean; this reduces the effect of random error. **(2)**

(v) (OR) Differentiate between precision and accuracy. **[3]**

Answer:

Point	Precision	Accuracy
Meaning	Closeness (agreement) of repeated measurements of the same quantity with each other	Closeness of a measured value to the true or accepted value
Concerned with	Consistency and reproducibility of results	Absence of systematic errors or bias
Depends on	Random errors / scatter in readings	Systematic errors (e.g. zero error, wrong calibration)
Example	A scale that always gives the same weight within 0.1 kg but overestimates by 0.5 kg is precise, not accurate	A thermometer reading the actual temperature is accurate; one always 2 °C higher is not

(viii) (OR) What is meant by base and derived quantities? Give one example for each. **[1.5+1.5]**

Answer: **Base quantities:** The simplest physical quantities from which all others can be derived. *Example:* length (SI unit: metre, m). **(1.5)**

Derived quantities: Quantities obtained by multiplying or dividing base quantities. *Example:* velocity = length ÷ time (SI unit: m s^{-1}). **(1.5)**

2026 (M)

Footer code 1SA-I 26004 (M) · Inclusive 2024

Section A — MCQ

Q1. Which pair correctly shows base quantity and its unit?

A) Temperature – kg B) Time – m C) Mass – kg D) Speed – s

Answer: C) Mass – kg

Q6. Which statement best explains why displacement is a vector quantity?

A) It has only magnitude B) It depends on path length C) It has magnitude and direction D) It is measured in meters

Answer: C) It has magnitude and direction

Section B — Short Questions (Q2)

(i) Convert the following using appropriate prefixes: a. 0.002 m into mm b. 5×10^{-6} s into ns c. 3000 g into kg **[1+1+1]**

Answer: **a.** 1 m = 10^3 mm, so 0.002 m = 0.002 × 10^3 mm = **2 mm**

b. 1 s = 10^9 ns, so 5 × 10^{-6} s = 5 × 10^{-6} × 10^9 ns = 5 × 10^3 ns = **5000 ns**

c. 1 kg = 10^3 g, so 3000 g = 3000 ÷ 10^3 kg = **3 kg**

(ii) What is meant by precision? How a measurement can be precise but not accurate? (Explain with one example.) **[1+2]**

Answer: **Precision:** The degree of agreement between repeated measurements of the same quantity; precise readings show little scatter and are consistent and reproducible. **(1)**

Precise but not accurate: Accuracy depends on how close the readings are to the true value. If a systematic error (e.g. zero error or wrong calibration) shifts every reading by the same amount, the readings stay close to each other (precise) but far from the true value (not accurate). **(1)**

Example: A thermometer that always reads 2 °C higher than the actual temperature gives very consistent readings (precise) but never the true value (not accurate). Similarly, darts tightly grouped but away from the bullseye. **(1)**

Model Paper 2026 (48 marks)

FBISE Model Paper · Inclusive Scheme of Studies

Section A — MCQ

Q7. Which of the followings is a greatest prefix?

A) Deca B) Deci C) Milli D) Nano

Answer: **A) Deca** (10^{1}; deci = 10^{-1}, milli = 10^{-3}, nano = 10^{-9})

Section B — Short Questions (Q2)

(i) Differentiate between precision and accuracy. **[3]**

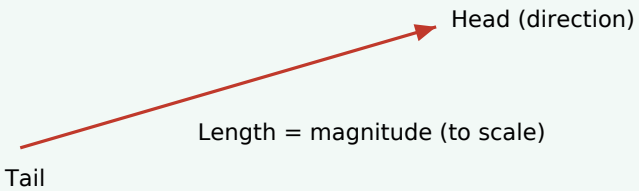
Answer:

Point	Precision	Accuracy
Meaning	Closeness (agreement) of repeated measurements of the same quantity with each other	Closeness of a measured value to the true or accepted value
Concerned with	Consistency and reproducibility of results	Absence of systematic errors or bias
Depends on	Random errors / scatter in readings	Systematic errors (e.g. zero error, wrong calibration)
Example	A scale that always gives the same weight within 0.1 kg but overestimates by 0.5 kg is precise, not accurate	A thermometer reading the actual temperature is accurate; one always 2 °C higher is not

(iv) (OR) How a vector is represented graphically and symbolically? **[3]**

Answer: **Symbolically:** A vector is represented by a letter, capital or small (e.g. F, A, f), with an arrow over it. **(1)**

Graphically: A vector is represented by an arrow. The **length** of the arrow (to a chosen scale, with proper unit) gives the magnitude and the **arrow-head** points in the direction of the vector. **(1)**



Example: the air route from Islamabad to Karachi is a vector, the tail at Islamabad and the head at Karachi. **(1)**

(x) What steps would you take to minimize random error from measurement? **[3]**

Answer: **1.** Take multiple (repeated) readings of the same measurement. **(1)**

2. Find the mean (average) of the readings – random errors in both directions cancel out. **(1)**

3. Use statistical analysis to account for the variability, and be careful in technique (e.g. reaction time). *Example:* in a simple pendulum, measure the time for ten oscillations and divide by 10 to get the period. **(1)**

Model Paper 2026 (50% MCQs)

FBISE Model Paper · 60 MCQs + 30 marks

MCQs (0.5 mark each)

Q1. Which of the following is a base quantity?

A) Velocity B) Mass C) Force D) Momentum

Answer: **B) Mass**

Q6. Which of the following is a scalar quantity?

A) Force B) Displacement C) Energy D) Velocity

Answer: **C) Energy**

Q16. A file size is 2 gigabytes (GB). If expressed in megabytes (MB), what is the correct value?

A) 2 MB B) 20 MB C) 200 MB D) 2000 MB

Answer: **D) 2000 MB** (1 GB = 10^9 B = 10^3 MB)

Q29. Vector X points towards east and vector Y points towards north. In which direction does the resultant vector lie?

A) North-East B) South-East C) North D) East

Answer: **A) North-East** (perpendicular vectors; resultant lies between them)

Q34. In scientific notation, 0.005 is written as:

A) 5×10^{-3} B) 5×10^{3} C) 5×10^{-2} D) 5×10^{-4}

Answer: **A) 5×10^{-3}** (decimal moved 3 places right)

Q37. What is a reasonable estimate for the mass of an apple?

A) 2 kg B) 200 g C) 2 mg D) 20 kg

Answer: **B) 200 g**

Section B — Short Questions

Q1 Differentiate between base quantities and derived quantities with one example of each. **[3]**

Answer:

Base quantities	Derived quantities
Simplest form of physical quantities; all other quantities can be derived from them	Obtained by multiplying or dividing base quantities
Independent of other quantities; only seven in SI	Depend on base quantities; many in number
Example: length (unit: metre, m)	Example: speed = length ÷ time (unit: m s^{-1})

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