MARKING GUIDELINE

MARKS	DURATION	QUESTIONS
31	50 minutes	3

Name: _____ Class: _____

Date: _____

MARK ____ / 31

INSTRUCTIONS AND INFORMATION

1. Answer **ALL** the questions in this question paper.
2. Answer QUESTION 1 by **circling** the letter (A–D) in the answer grid at the end of that section.
3. Show **ALL** calculations clearly.
4. Show all units where applicable.
5. Number the answers correctly according to the numbering system used in this question paper.
6. A non-programmable calculator may be used, unless stated otherwise.
7. Write neatly and legibly.

QUESTION 1 [10 MARKS]

Four options are given as possible answers to the following questions. Choose the correct answer and circle the letter (A–D) in the grid at the end of this section. If you want to change your choice, put a cross through the wrong letter and circle your new choice.

1.1 $2^{-3} = \ldots$ (1)

A) -8 **B)** 8

C) $\frac{1}{8}$ ✓ **D)** -6

Answer: C — A negative exponent means the RECIPROCAL: $\frac{1}{2^3} = \frac{1}{8}$.

- **A** — a negative exponent does not make the answer negative
- **B** — ignored the minus sign in the exponent — that is 2^3
- **D** — multiplied 2 by -3

1.2 x^{-2} written with a positive exponent is ... (1)

A) $-2x$ **B)** $\frac{x^2}{1}$

C) $-x^2$ **D)** $\frac{1}{x^2}$ ✓

Answer: D — Move the power to the denominator and the sign of the exponent changes.

- **A** — multiplied instead of taking a reciprocal
- **B** — that is just x^2
- **C** — a negative exponent is not a negative number

1.3 $0{,}000\ 045$ written in scientific notation is ... (1)

A) $\mathbf{4{,}5 \times 10^{-5}}$ ✓ **B)** $4{,}5 \times 10^{5}$

C) 45×10^{-6} **D)** $4{,}5 \times 10^{-4}$

> **Answer: A** — The comma moves 5 places to the RIGHT, so the exponent is -5.
>
> - **B** — a number smaller than 1 needs a NEGATIVE exponent
> - **C** — 45 is not less than 10
> - **D** — the comma moves 5 places, not 4

1.4 $3{,}2 \times 10^{-3}$ written in full is ... (1)

A) $-3\ 200$ **B)** $\mathbf{0{,}0032}$ ✓

C) $0{,}32$ **D)** $3\ 200$

> **Answer: B** — A negative exponent moves the comma LEFT.
>
> - **A** — the sign of the number does not change
> - **C** — moved the comma only one place
> - **D** — that is $3{,}2 \times 10^{3}$

1.5 $(2 \times 10^{3}) \times (4 \times 10^{2}) = \ldots$ (1)

A) $8 \times 10^{2{,}5}$ **B)** 8×10^{6}

C) $\mathbf{8 \times 10^{5}}$ ✓ **D)** 6×10^{5}

> **Answer: C** — Multiply the numbers and ADD the exponents.
>
> - **A** — averaged the exponents: $(3 + 2) \div 2 = 2{,}5$
> - **B** — multiplied the exponents
> - **D** — ADDED 2 and 4 instead of multiplying

1.6 $\dfrac{6 \times 10^{8}}{3 \times 10^{5}} = \ldots$ (1)

A) $2 \times 10^{1{,}6}$ **B)** 3×10^{3}

C) $\mathbf{2 \times 10^{3}}$ ✓ **D)** 2×10^{13}

> **Answer: C** — Divide the numbers and SUBTRACT the exponents.
>
> - **A** — divided the exponents
> - **B** — subtracted the numbers instead of dividing
> - **D** — added the exponents

1.7 Which one of the following is the SMALLEST? (1)

A) 3×10^{-2} **B)** $\mathbf{3 \times 10^{-4}}$ ✓

C) 3×10^{2} **D)** 3×10^{0}

> **Answer: B** — The more negative the exponent, the smaller the number: $0{,}0003$.
>
> - **A** — $0{,}03$
> - **C** — 300
> - **D** — 3

1.8 $5^{-1} + 5^{0} = \ldots$ (1)

A) 5 **B)** $\frac{1}{5}$

C) 0 **D)** $1\frac{1}{5}$ ✓

> **Answer: D** — $\frac{1}{5} + 1 = 1\frac{1}{5}$.
>
> - **A** — added the bases instead of the values
> - **B** — forgot that $5^{0} = 1$
> - **C** — neither term is 0

1.9 The mass of a dust particle is $7{,}5 \times 10^{-7}$ g. In grams that is ... (1)

A) 0,000 075 **B)** **0,000 000 75** ✓

C) 75 000 000 **D)** 0,000 007 5

> **Answer: B** — The comma moves 7 places to the left.
>
> - **A** — moved it 5 places
> - **C** — moved it to the RIGHT
> - **D** — moved the comma 6 places

1.10 $\frac{1}{x^{-3}} = \ldots$ (1)

A) x^{3} ✓ **B)** $-3x$

C) $-x^{3}$ **D)** $\frac{1}{x^{3}}$

> **Answer: A** — A negative exponent in the DENOMINATOR moves up to the numerator as a positive one.
>
> - **B** — multiplied instead
> - **C** — a negative exponent is not a negative number
> - **D** — that is x^{-3} itself

ANSWER GRID — MARKING GUIDELINE

1.1	A	B	**C**	D
1.2	A	B	C	**D**
1.3	**A**	B	C	D
1.4	A	**B**	C	D
1.5	A	B	**C**	D
1.6	A	B	**C**	D
1.7	A	**B**	C	D
1.8	A	B	C	**D**
1.9	A	**B**	C	D
1.10	**A**	B	C	D

QUESTION 2 [9 MARKS]

Write the following in scientific notation.

2.1 Light travels about $9\ 460\ 000\ 000\ 000$ km in one year. Write this distance in scientific notation. **(3)**

> Move the comma 12 places to the left *(1)*
> $= \mathbf{9{,}46 \times 10^{12}\ km}$ *(2)*

2.2 Write $0{,}0000125$ in scientific notation. **(3)**

> Move the comma 5 places to the right, so the exponent is negative *(1)*
> $= \mathbf{1{,}25 \times 10^{-5}}$ *(2)*

2.3 Write $3{,}04 \times 10^{-3}$ as an ordinary decimal number, and state which is larger: $3{,}04 \times 10^{-3}$ or $3{,}4 \times 10^{-4}$. **(3)**

> $= \mathbf{0{,}00304}$ *(1)*
> $3{,}4 \times 10^{-4} = 0{,}00034$ *(1)*
> $\mathbf{3{,}04 \times 10^{-3}}$ is larger — compare the EXPONENTS first, not the leading digits *(1)*

QUESTION 3 [12 MARKS]

Calculate the following, leaving your answers in scientific notation.

3.1 $(2{,}4 \times 10^5) \times (3 \times 10^3)$ **(4)**

> $2{,}4 \times 3 = 7{,}2$ *(1)*
> $10^5 \times 10^3 = 10^8$ *(1)*
> $= \mathbf{7{,}2 \times 10^8}$ *(2)*

3.2 $\dfrac{6 \times 10^7}{1{,}5 \times 10^3}$ **(4)**

> $6 \div 1{,}5 = 4$ *(1)*
> $10^{7-3} = 10^4$ *(1)*
> $= \mathbf{4 \times 10^4}$ *(2)*

3.3 The mass of a dust particle is $7{,}5 \times 10^{-7}$ g. Determine the total mass of $2\ 000$ identical dust particles. Give your answer in scientific notation. **(4)**

> $2\ 000 = 2 \times 10^3$ *(1)*
> $(7{,}5 \times 10^{-7}) \times (2 \times 10^3) = 15 \times 10^{-4}$ *(2)*
> $= \mathbf{1{,}5 \times 10^{-3}\ g}$ *(1)*

TOTAL: 31 marks

This question paper consists of 3 questions.

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