Units and Measurement: Chapter Introduction

A number alone means nothing: every measurement is a number and a unit. The chapter builds the SI system, significant figures and dimensions, the base of all physics.

Name: Date: Score: ____ / 23

A. Fill in the blanks

1. Every measurement is written as a number and a ____.

2. There are ____ SI base units.

3. The SI base unit of mass is the ____.

4. The SI base unit of electric current is the ____.

5. Checking a formula by comparing the dimensions of its two sides uses the principle of ____ of dimensions.

B. True or False

6. The newton is an SI base unit. True / False

7. The kelvin is the SI base unit of temperature. True / False

8. 2.54 cm has 3 significant figures. True / False

9. A dimensionally correct formula is always physically correct. True / False

10. The Mars Climate Orbiter was lost because of a unit mix-up. True / False

C. Assertion and reason

11. Assertion (A): $v = u + at^2$ is dimensionally wrong.
Reason (R): The term at^2 has dimensions [L], not $[LT^{-1}]$.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

12. Assertion (A): The newton is a derived unit.
Reason (R): Every SI unit other than the 7 base units is built from the base units.

(a) Both A and R are true, and R explains A
(b) Both A and R are true, but R does not explain A
(c) A is true, R is false
(d) A is false, R is true

Answer: _____

D. Choose the correct option

13. Which is NOT an SI base unit?

(a) metre
(b) newton
(c) mole
(d) candela

Answer: _____

14. The SI base unit of luminous intensity is the:

(a) lux
(b) candela
(c) lumen
(d) watt

Answer: _____

15. The dimensions of velocity are:

(a) $[LT^{-2}]$
(b) $[LT^{-1}]$
(c) $[L^2T^{-1}]$
(d) $[MLT^{-1}]$

Answer: _____

16. The number of significant figures in 0.0250 is:

(a) 2
(b) 3
(c) 4
(d) 5

Answer: _____

17. The Mars Climate Orbiter mix-up was between:

(a) metre and foot
(b) pound-force and newton
(c) kilogram and pound
(d) second and hour

Answer: _____

E. Numerical problems

18. Write 1 newton in SI base units and give its dimensions.

19. Check $s = ut + \frac{1}{2}at^2$ dimensionally.

20. 1 pound-force = 4.45 N. Convert a thrust of 10 pound-force to newton.

F. Short answer questions

21. Why is a number alone not a measurement?

22. What does the number of significant figures in a reading tell us?

G. Match the columns

23. Match each item in Column A with the correct item in Column B.

Column A	Column B	Your answer
1. metre	(a) length	1 → ____
2. kilogram	(b) electric current	2 → ____
3. second	(c) mass	3 → ____
4. ampere	(d) luminous intensity	4 → ____
5. candela	(e) time	5 → ____

Detailed solutions

1. unit

2. 7

3. kilogram

4. ampere

5. homogeneity

6. False. It is a derived unit: 1 N = 1 kg m s^{-2}.

7. True. It is one of the 7 base units.

8. True. All non-zero digits are significant.

9. False. Dimensions cannot check pure-number constants such as ½.

10. True. Thrust data in pound-force seconds was read as newton-seconds.

11. (a) R is exactly why the two sides disagree.

12. (a) 1 N = 1 kg m s^{-2}.

13. (b) newton. The newton is derived from kg, m and s.

14. (b) candela. Candela is one of the 7 base units.

15. (b) $[LT^{-1}]$. Velocity = displacement ÷ time.

16. (b) 3. Leading zeros do not count; the final zero after the decimal point does: 2, 5, 0.

17. (b) pound-force and newton. One team used pound-force, the other expected newton.

18. F = ma; unit = kg × m s^{-2}. **Answer: 1 N = 1 kg m s^{-2}; dimensions $[MLT^{-2}]$**

19. [s] = [L]; $[ut] = [LT^{-1}][T] = [L]$; $[at^2] = [LT^{-2}][T^2] = [L]$. **Answer: Every term is [L], so the formula is dimensionally correct.**

20. 10 × 4.45 N. **Answer: 44.5 N**

21. A number says how many, the unit says of what. 5 m, 5 s and 5 kg are completely different quantities; without the unit the number has no meaning, as the Mars Climate Orbiter loss showed.

22. It shows how precise and reliable the reading is: 2.54 cm (3 significant figures) is more precise than 2.5 cm (2 significant figures).

23. 1 → (a), 2 → (c), 3 → (e), 4 → (b), 5 → (d). These are 5 of the 7 SI base units; the other 2 are kelvin (temperature) and mole (amount of substance).