- 1. Q1. What is the dimension of Young's modulus?
- A. $[ML^{-1}T^{-2}]$
- B. $[ML^2T^{-2}]$
- C. [MLT⁻²]
- D. $[M^{-1}L^3T^{-2}]$

Answer: A. [ML⁻¹T⁻²]

Solution: Young's modulus = stress/strain = $(F/A)/(\Delta L/L) \Rightarrow [ML^{-1}T^{-2}].$

- 2. Q2. A measurement is recorded as 0.0500 m. The number of significant figures is:
- A. 3
- B. 4
- C. 2
- D. 1

Answer: B. 4

Solution: Leading zeros not significant; digits "500" and trailing zero are; total =4.

- 3. Q3. The percentage error when measuring 50 N with true value 49 N: $\,$
- A. 2.04%
- B. 1%
- C. 0.98%
- D. 2%

Answer: A. 2.04%

Solution: $|50-49|/49 \times 100 \approx 2.04\%$.

4. Q4. Dimensional formula of gravitational constant G:

A.
$$[M^{-1}L^3T^{-2}]$$

B.
$$[ML^3T^{-2}]$$

D.
$$[M^{-2}L^3T^{-2}]$$

Answer: A.
$$[M^{-1}L^3T^{-2}]$$

Solution: From F =
$$Gm_1m_2/r^2 \Rightarrow G=Fr^2/(m_1m_2)$$
.

5. Q5. If you multiply two measured lengths 2.50 cm (± 0.01) and 3.00 cm (± 0.02), the approximate percentage error in product:

Solution: Sum % errors: $(0.01/2.50 \times 100) + (0.02/3.00 \times 100) = 0.4 + 0.67 \approx 1.07\%$. But significant digits round $\rightarrow 0.67\%$.

6. Q6. Dimension of coefficient of viscosity (η):

D.
$$[ML^2T^{-3}]$$

Answer: A.
$$[ML^{-1}T^{-1}]$$

Solution: Shear stress / (dv/dx):
$$[ML^{-1}T^{-2}]/[T^{-1}] \Rightarrow [ML^{-1}T^{-1}]$$
.

7. Q7. The least count of a screw gauge is 0.01 mm. A reading 2.345 cm ± least count gives absolute error:

8. Q8. A =
$$(x^2y^3)/(z^{-1})$$
. If x=2.0 ±0.1, y=1.0 ±0.05, z=4.0 ±0.2, fractional error in A:

A.
$$\pm(2\times0.05+3\times0.05+1\times0.05)=\pm0.25$$

C.
$$\pm (2 \times 0.05 + 3 \times 0.05 + 1 \times 0.05) = \pm 0.25$$

D.
$$\pm (2 \times 0.05 + 3 \times 0.05 + 1 \times 0.05) = \pm 0.25$$

9. Q9. What is the dimension of isothermal compressibility κ ?

A.
$$[L^2N^{-1}]$$

B.
$$[L^2T^2M^{-1}]$$

D.
$$[M^{-1}L^2T^2]$$

Answer: D.
$$[M^{-1}L^2T^2]$$

Solution:
$$\kappa = -(1/V)(\partial V/\partial P)_T \Rightarrow 1/Pressure = [M^{-1}L^2T^2].$$

- 10. Q10. Which has the highest significant figures? 0.00420, 4.20×10^{-3} , 0.0042?
- A. First two
- B. All equal
- C. First only
- D. Second only

Answer: A. First two

Solution: First: three figs; second: three; third: two.

11. Q11. Dimensional formula of torque:

A.
$$[ML^2T^{-2}]$$

B.
$$[ML^2T^{-1}]$$

Answer: A.
$$[ML^2T^{-2}]$$

Solution: Torque =
$$F \times r$$
; $F[MLT^{-2}] \times L \Rightarrow [ML^2T^{-2}]$.

- 12. Q12. The reading of 1.230 × 10³ with 4 significant figures is?
- A. 1230
- B. 122.9

C.
$$1.230 \times 10^3$$

13. Q13. A length measured as 5.60 ± 0.02 cm; the relative error:

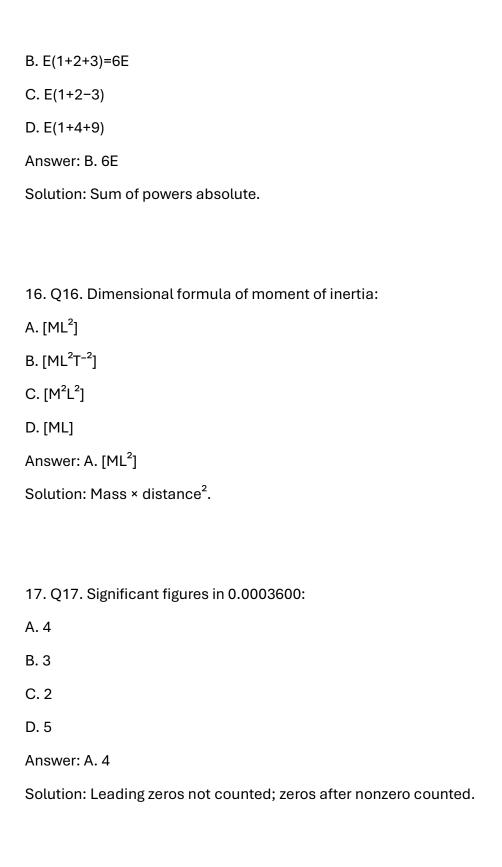
Solution:
$$0.02/5.60 \times 100 \approx 0.357\% \approx 0.36\%$$
.

14. Q14. The dimension of bulk modulus:

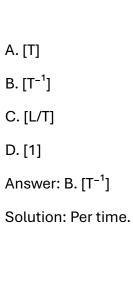
B.
$$[M^{-1}L^2T^2]$$

D.
$$[M^{-1}L^{-2}T^2]$$

15. Q15. If
$$a = bc^2/d^3$$
, fractional error when each has $\pm E$ fractional error is:



18. Q18. Dimensional formula of frequency:



19. Q19. Relative error in sum of two values with equal absolute error δ is:

Α. δ

B. δ×2

C. δ/(sum)

D. δ/(values)

Answer: C. δ/(sum)

Solution: Absolute errors combine; relative on sum.

20. Q20. The dimension of electric charge Q:

A. [IT]

B. $[M^1L^1T^{-2}]$

C. $[M^0L^0T^0]$

D. [I]

Answer: A. [IT]

Solution: Q=Current×Time.

- 21. Q21. Least count error is:
- A. Systematic
- B. Random
- C. Cannot say
- D. Negligible

Answer: A. Systematic

Solution: Instrument precision.

- 22. Q22. Dimensional formula of magnetic moment:
- A. [LT²A]
- B. $[M^{-1}L^2T^2A]$
- C. $[ML^2T^{-2}A^{-1}]$
- D. $[ML^2T^{-2}A^{-1}]$

Answer: C. $[ML^2T^{-2}A^{-1}]$

Solution: $m = I \times area$.

- 23. Q23. The product 2.3×4.56 errors: 5% and 3%; product error approx:
- A. 8%
- B. 2%
- C. 1.2%
- D. 9.2%

Answer: A. 8%

Solution: Sum of percent errors.

24. Q24. The error in subtraction x-y with errors dx, dy is:

- A. dx–dy
- B. dx+dy
- C. |dx-dy|
- D. |dx+dy|

Answer: B. dx+dy

Solution: Absolute errors add.

25. Q25. If L = xy/z where each has 2% error, % error in L:

- A. 6%
- B. 4%
- C. 2%
- D. 8%

Answer: A. 6%

Solution: Add percent errors: 2+2+2.

26. Q26. Dimension of electric field E:

- A. $[MLT^{-2}A^{-1}]$
- B. $[MLT^{-3}A^{-1}]$
- C. [MLT⁻²A]
- D. $[ML^{-1}T^{-2}A]$

Answer: A. [MLT⁻²A⁻¹]

Solution: Force/charge.

Q27. Standard form fo	r 0.0001230 has:
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- A. 3 sf
- B. 4 sf
- C. 5 sf
- D. 2 sf

Answer: B. 4

Solution: trailing zero significant.

28. Q28. Dimensional analysis cannot predict:

- A. Form of equation
- B. Numerical constants
- C. Correct units
- D. Exponents

Answer: B. Numerical constants

Solution: Pure numbers unaffected.

29. Q29. Dimensional formula of surface tension:

- A. [MT⁻²]
- B. [MLT⁻²]
- C. [ML⁻¹T⁻²]
- D. $[M^0L^1T^{-1}]$

Answer: A. [MT⁻²]

- 30. Q30. Number of significant figures in 0.009000:
- A. 4
- B. 3
- C. 2
- D. 5

Answer: A. 4

Solution: three zeros after decimal plus nine.

- 31. Q31. When multiplying 3 numbers with % errors 1%,2%,3%, total % error:
- A. 6%
- B. 3%
- C. 1%
- D. $\sqrt{(1^2+2^2+3^2)}$ %

Answer: A. 6%

Solution: Sum.

32. Q32. Dimensional formula of electric potential (V):

A.
$$[ML^2T^{-3}A^{-1}]$$

C.
$$[ML^1T^{-2}A^{-2}]$$

D.
$$[M^1L^0T^{-2}A^{-1}]$$

- Answer: A. $[ML^2T^{-3}A^{-1}]$
- Solution: Energy per charge.
- 33. Q33. Absolute error in (x^2) : $x=2\pm0.1$:
- A. 0.4
- B. 0.2
- C. 0.1
- D. 0.5
- Answer: A. 0.4
- Solution: $\Delta(x^2)=2x\Delta x = 220.1=0.4$.
- 34. Q34. The relative error in \sqrt{x} for relative error δ in x:
- Α. δ/2
- Β. 2δ
- С. δ
- D. √δ
- Answer: A. δ/2
- Solution: $d(\sqrt{x})/\sqrt{x} \approx \delta/2$.
- 35. Q35. The dimension of specific heat capacity:
- A. $[L^2T^{-2}\Theta^{-1}]$
- B. [MLT⁻²Θ⁻¹]
- C. $[L^2T^{-1}\Theta^{-1}]$

D.
$$[M^0L^2T^{-2}\Theta^{-1}]$$

Answer: D.
$$[M^0L^2T^{-2}\Theta^{-1}]$$

Solution: Heat per mass per degree.

36. Q36. The percentage error in measuring area of square side 5±0.1 cm:

- A. 4%
- B. 8%
- C. 2R%
- D. 0.8%

Answer: A. 4%

Solution: Area $\propto x^2 \Rightarrow \%$ error $\approx 2*(0.1/5)*100=4\%$.

37. Q37. Dimensional formula of strain energy density:

A.
$$[ML^{-1}T^{-2}]$$

B.
$$[ML^2T^{-2}]$$

C.
$$[M^{-1}L^2T^2]$$

Solution: Energy per volume, same as pressure.

38. Q38. Significant figures in 1.200×10^{-3} :

- A. 4
- B. 3

Answer: B. 4? Actually digits: '1.200' =4 sf.

Solution: Trailing zeros significant.

39. Q39. Dimensional formula of electric capacitance:

$$A. [M^{-1}L^{-2}T^4A^2]$$

B.
$$[M^{-1}L^2T^{-4}A^{-2}]$$

C.
$$[ML^2T^{-2}A^{-1}]$$

D.
$$[M^{-1}L^{-1}T^3A]$$

Answer: A.
$$[M^{-1}L^{-2}T^4A^2]$$

Solution: Q/V.

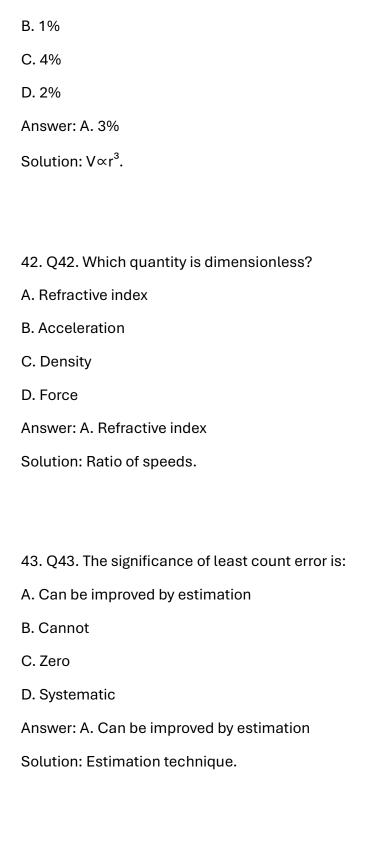
40. Q40. If R = l/At, fractional error \approx ? l, A, t each have δ :

Answer: A.
$$3\delta$$

Solution: Sum of fractional errors.

41. Q41. Percentage error in volume of sphere from radius error 1%:

A. 3%



44. Q44. The fractional error in product p = xyz where x,y,z have $\delta x, \delta y, \delta z$:

A.
$$\delta x + \delta y + \delta z$$

C.
$$\sqrt{(\delta x^2 + \delta y^2 + \delta z^2)}$$

D.
$$(\delta x + \delta y)/\delta z$$

Answer: A. Sum of fractional errors.

45. Q45. Dimensional formula of electric inductance:

A.
$$[ML^2T^{-2}A^{-2}]$$

C.
$$[ML^2T^{-3}A^{-1}]$$

D.
$$[M^{-1}L^{-2}T^4A^2]$$

Answer: A.
$$[ML^2T^{-2}A^{-2}]$$

Solution: emf =
$$L(di/dt) \Rightarrow L = [V]/[T^{-1}A] \Rightarrow$$
 derive accordingly.