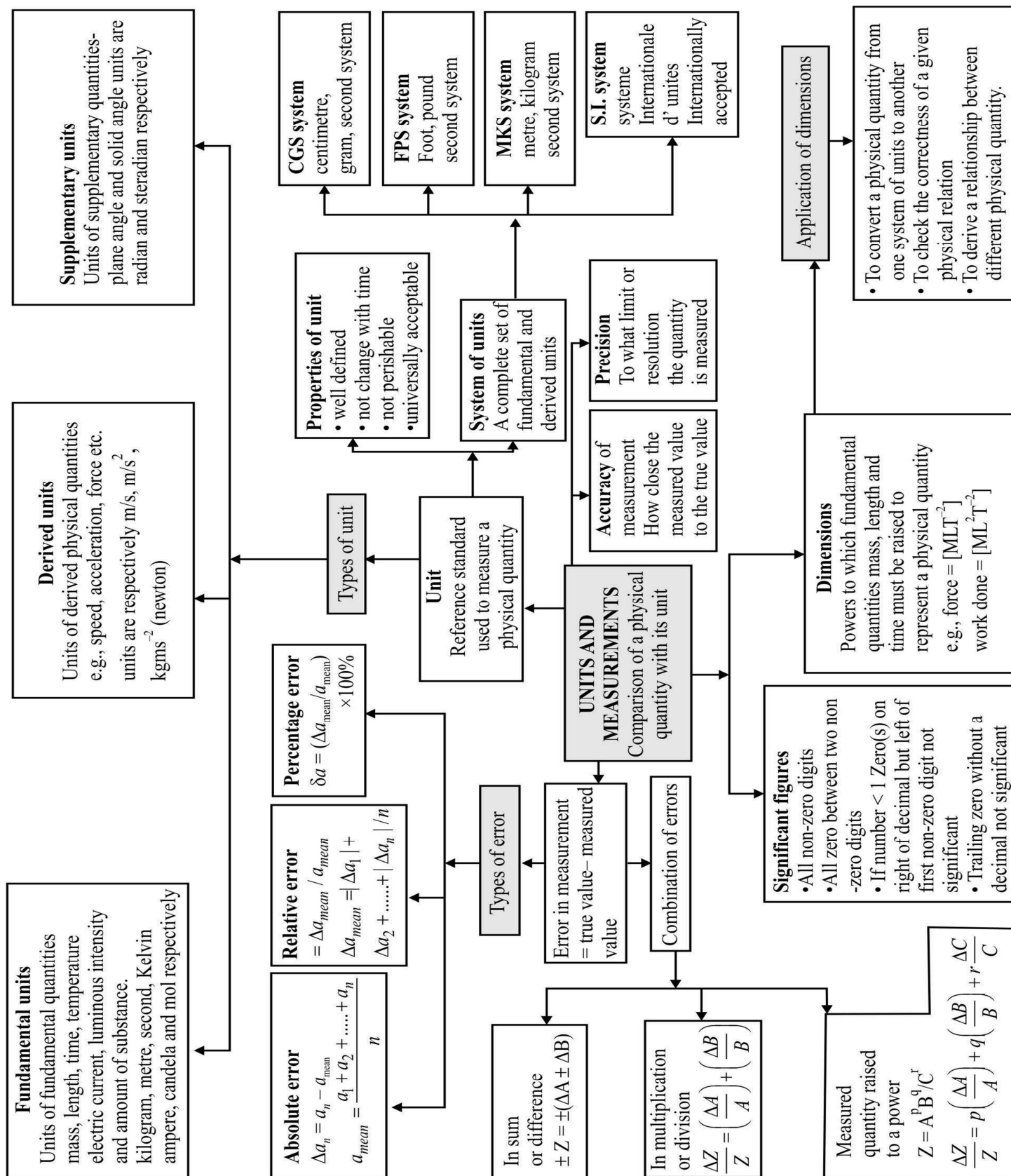


CONCEPT MAP



1. Which of these is largest: astronomical unit, light year and par sec?
2. What is the difference between **nm** , **mN** , **Nm** ?
3. Derive the SI unit of joule (**J**) in terms of fundamental units. (KV-2024)
4. Calculate the number of astronomical units in one meter.
5. How many a.m.u would make up 1 kg?
6. What is common between bar and torr?
7. Can a body have zero mass and zero weight?
8. Is light year a unit of time?
9. Name two physical quantities having the dimensions [ML^2T^{-2}]
10. Deduce the dimensional formulae of the following physical quantities:
a) Heat b) Specific heat c) Latent heat d) Gas constant e) Boltzmann's constant
f) Coefficient of thermal conductivity g) Mechanical equivalent of heat. (CBSE-2014,16,20)
11. The average wavelength of light from a sodium lamp is **5893** angstroms. Express it in metre and in **nm**.
12. Express an acceleration of 10 ms^{-2} in km h^{-2} .
13. The density of air is 1.293 kg m^{-3} Express it in cgs units.
14. Why parallax method cannot be used for measuring distances of stars more than 100 light years away?
15. Find the number of significant figures in 0.005.
16. What are the limitations of dimensional analysis?
17. Which of the following length measurement is most accurate and why?
a) 4.00 cm b) 0.004 mm c) 40.00 cm.
18. The wavelength of matter waves may depend upon Planck's constant, mass and velocity of the particle. Use the method of dimensions to derive the formula.
19. The velocity of transverse waves on a string may depend upon length of string, tension in the string and mass per unit length of the string. Derive the formula dimensionally.
20. Write the dimensional for the Gravitational Constant, Pressure & Power. (CBSE-2018)
21. What are the dimensions of 'a' and 'b' in the relation $F = at + bx$ Where F is force and x is distance?

22. In Vander Wall's equation $(P + a/V^2)(V - b) = RT$, what are the dimensions of **a** and **b**? Here, **P** is pressure, **V** is volume, **T** is temperature and **R** is gas constant. (CBSE-2015, 2018, 2023, KV-2024)
23. Derive by the method of dimensions, an expression for the volume of a liquid flowing out per second through a narrow pipe. Assume that the rate of flow of liquid depends on
- 1) The coefficient of viscosity ' η ' of the liquid
 - 2) The radius ' r ' of the pipe
 - 3) The pressure gradient (p/l) along the pipe. (Take $k = \pi/8$) (CBSE-2023)
24. By the method of dimensions, obtain an expression for the surface tension '**S**' of a liquid rising in a capillary tube. Assume that the surface tension depends upon mass '**m**' of the liquid, pressure '**p**' of the liquid and radius '**r**' of the capillary tube. (Take $k = 1/2$)
25. The period of vibration of a tuning fork depends on the length '**l**' of its prong, density '**d**' and Young's modulus '**Y**' of its material. Deduce an expression for the period of vibration on the basis dimensions.
26. If area **A**, velocity **v** and density **p** are the fundamental quantity then using them find dimension of force.
27. Write the dimensions of **a/b** in the relation $P = \frac{a-t^2}{bx}$; where **P** is the pressure, **x** is the distance, and **t** is the time. (CBSE)
28. Write the dimensions of **a** and **b** in the relation, $P = \frac{b-x^2}{at}$; where **P** is Power, **x** is distance and **t** is time.
29. Suppose the kinetic energy of a body oscillating with amplitude **A** and at a distance **x** is given by $K = \frac{Bx}{x^2 + A^2}$ What is Dimensions of **B**.
30. If force [**F**], acceleration [**A**] and time [**T**] are chosen as the fundamental physical quantities, Find the dimensions of energy. (CBSE-2016, 2020, KV-2023)
31. Planck's constant (**h**), speed of light in vacuum (**c**) and Newton's gravitational constant (**G**) are three fundamental constants. What is the dimension of length?
32. If energy (**E**), velocity (**V**) and time (**T**) are chosen as the fundamental quantities, What is the dimensional formula of surface tension?
33. The velocity **v** of a particle at time **t** is given by $v = at + \frac{b}{t+c}$ where **a**, **b** and **c** are constant, what are dimension of **a**, **b** and **c**.
34. If the units of length, mass and force are chosen as fundamental units, what is the dimensions of Time?

35. A gas bubble forms and explosion under water which oscillate with a period $T \propto P^a \rho^b E^c$, where P is the static pressure, ρ is the density of water and E is the total energy of explosion. Then, what are the values of a, b and c. (CBSE-2022)
36. Force F is given in terms of time t and distance x by the formula $F = A \sin Ct + B \cos Dx$. Dimensions of A/B and C/D are? (CBSE-2024)

MCQ (Multiple Choice Questions)

1. Electron volt is a unit of
(a) charge (b) potential difference
(c) energy (d) magnetic force
2. Which of the following pairs has the same dimensions?
(a) specific heat and latent heat (b) Impulse and momentum
(c) surface tension and force (d) moment of Inertia and torque
3. Which of the following sets of quantities has the same dimensional formula?
(a) Frequency, angular frequency and angular momentum
(b) Surface tension, stress and spring constant
(c) Acceleration, momentum and retardation
(d) Work, energy and torque
4. Fundamental or base quantities are arbitrary. In SI system these are
(a) length, force, time, electric current, thermodynamic temperature, amount of substance, and luminous intensity
(b) length, mass, time, electric current, thermodynamic temperature, amount of substance, and luminous intensity
(c) as length, mass, time, electric charge, thermodynamic temperature, amount of substance, and luminous intensity
(d) length, mass, force, electric current, thermodynamic temperature, amount of substance, and luminous intensity
5. If energy (E), velocity (v) and force (F) are taken as fundamental quantities, what are the dimensions of mass?
(a) Ev^2 (b) Ev^{-2}
(c) Fv^{-1} (d) Fv^{-2}
6. Which of the following sets of quantities has the same dimensional formula?
(a) Frequency, angular frequency and angular momentum
(b) Surface tension, stress and spring constant
(c) Acceleration, momentum and retardation
(d) Work, energy and torque

7. Which two of the following five physical parameters have the same dimensions?
- I. Energy density
 - II. Refractive index
 - III. Dielectric constant
 - IV. Young's modulus
 - V. Magnetic field
- (a) I and IV (b) III and V
(c) I and II (d) I and V
8. If dimensions of critical velocity V_c of a liquid flowing through a tube are expressed as $[\eta^x \rho^y r^z]$ where η , ρ and r are the coefficient of viscosity of liquid, density of liquid and radius of the tube respectively, then the values of x , y , z , and are given by
- (a) -1, -1, 1 (b) 1, -1, -1
(c) -1, -1, -1 (d) 1, 1, 1
9. The density of a material in CGS system is 10gcm^{-3} . If unit of length becomes 10 cm and unit of mass becomes 100g, the new value of density will be
- (a) 10units (b) 100units
(c) 1000units (d) 1unit
10. Photon is quantum of radiation with energy $E=h\nu$, where ν is frequency and h is Planck's constant. The dimensions of h are the same as that of.....
- (a) linear impulse (b) angular impulse
(c) linear momentum (d) energy
11. Given that T stands for time period and l stands for the length of simple pendulum. If g is the acceleration due to gravity, then which of the following statements about the relation $T^2 = l/g$ is correct?
- (a) It is correct both dimensionally as well as numerically.
(b) It is neither dimensionally correct nor numerically.
(c) It is dimensionally correct but not numerically.
(d) It is numerically correct but not dimensionally
12. The SI unit of the universal gas constant R is
- a) $\text{erg K}^{-1} \text{mol}^{-1}$ b) $\text{watt K}^{-1} \text{mol}^{-1}$
c) $\text{Newton K}^{-1} \text{mol}^{-1}$ d) $\text{joule K}^{-1} \text{mol}^{-1}$
13. The speed (v) of ripples depends upon their wavelength (λ), density (ρ) and surface tension (σ) of water. Then v is proportional to
- a) $\lambda^{1/2}$ b) λ
c) $1/\lambda$ d) $1/\lambda^{1/2}$

- 

BHAUTIK STUDY
(8860409373, 7678250287)

Assertions and Reasons

Assertion- Reasoning MCQs For question two statements are given-one labelled Assertion(A) and the other labelled Reason(R).Select the correct answer to these questions from the codes (a), (b), (c) and (d) are as given below

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true but R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false and R is also false.

1. **Assertion (A):** Special functions such as trigonometric, logarithmic and exponential functions are not dimensionless.
Reason (R): A pure number, ratio of similar physical quantities, such as angle and refractive index, has some dimensions.
2. **Assertion (A):** Specific gravity of a fluid is a dimensionless quantity.
Reason (R): It is the ratio of density of fluid to the density of water.
3. **Assertion (A):** The method of dimensions analysis cannot validate the exact relationship between physical quantities in any equation.
Reason (R): It does not distinguish between the physical quantities having same dimensions.
4. **Assertion (A):** Force and pressure cannot be added.
Reason (R): The dimensions of force and pressure are different.
5. **Assertion (A):** Dimensional constants are the quantities whose values are constant.
Reason (R): Dimensional constants are dimensionless.
6. **Assertion (A):** Surface energy of a liquid is numerically equal to its surface tension.
Reason (R): The dimensional formula of surface energy and surface tension is $[ML^0T^{-2}]$.
7. **Assertion (A):** When we change the unit of measurement of a quantity, its numerical value changes.
Reason (R): Smaller the unit of measurement smaller is its numerical value.
8. **Assertion (A):** Impulse has the dimensions of momentum.
Reason (R): Impulse is directly proportional to force and time.
9. **Assertion :** Energy cannot be divided by volume.
Reason : Dimensions for energy and volume are different.
10. **Assertion:** 'Light year' and 'Wavelength' both measure distance.
Reason : Both have dimension of time.