- KILOGRAM = $5,01 \times 10^{25}$ ATOMS OF CARBON 12
  - UNCERTAINTY = 1 PART IN 20 000
2. THE CENTIMETER-GRAM-SECOND DIFFERS FROM MKS only IN USING centimeter AND gram.
3. THE FOOT-POUND-SECOND (FPS) SYSTEM:
   POUND = 1/2.2046 OF A kilogram. (SINCE 1893)
   FOOT = 1200/3937 m = 2.54000508... cm
   1 INCH = 2,54 cm

→ Pg 9 (1-5)
21/08/2018
Pg 10

1-5 THE EQUATIONS AND FORMULAS OF PHYSICS

- EXAMPLE 1.1 : DISTANCE TRAVELED BY A FALLING BODY

$S = \frac{1}{2} v_0 t^2 + vt$

S = DISTANCE FALLEN
t = ELAPSED TIME
V = FINAL VELOCITY

MAKING a DIMENSIONAL CHECK AND IGNORING THE $\frac{1}{2}$ FACTOR (HAS NO DIMENSIONS)

USING FRACTIONS: $[L] \stackrel{?}{=} \frac{[L]}{[t]}[t]^2 + \frac{[L]}{[t]}[t]$

$[L] \stackrel{?}{=} [LT] + [L]$

USING NEGATIVE EXPONENTS: $[L] \stackrel{?}{=} [LT^{-1}][T^2] + [LT^{-1}][T]$

$[L] \stackrel{?}{=} [LT + L]$

THE DIMENSIONS ARE INCORRECT, so THE EQUATION IS WRONG.

→ FIXED WITH calculus.

- EXAMPLE 1.2: A FALLING RAINDROP REACHES A STEADY SPEED WHICH DEPENDS ON ITS SIZE AND THE COEFFICIENT OF THE VISCOSITY OF AIR. CHECK THE FOLLOWING EQUATION FOR POSSIBLE CORRECTNESS:

$V_t = \frac{2}{9\pi} \frac{r^2 g d}{\eta}$

V_t = STEADY SPEED (cm/s)
r = RADIUS OF THE DROP (cm)
g = GRAVITY ACCELERATION (cm/s²)
d = DENSITY (g/cm³)
η = COEF. VISC. OF AIR (g/cm s)

USING FRACTIONS:

$\frac{[L]}{[t]} \stackrel{?}{=} \frac{[L^2]\left[\frac{L}{T^2}\right]\left[\frac{M}{L^3}\right]}{\left[\frac{M}{LT}\right]}$

$\frac{[L]}{[T]} \stackrel{?}{=} \frac{[L]}{[T]}$

USING NEGATIVE EXPONENTS:

$[LT^{-1}] = [L^2][LT^{-2}][ML^{-3}][LTM^{-1}]$

$[LT^{-1}] = [LT^{-1}]$

THE EQUATION IS NOT WRONG FROM A DIMENSIONAL POINT OF VIEW. AS A MATTER OF FACT, IT IS NOT RIGHT, EITHER, SINCE THE NUMERICAL FACTOR 2/9π IS INCORRECT. DIMENSIONAL ANALYSIS DON'T GIVE INFO ABOUT NUMERICAL CONSTANTS.

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