Interconversion of Concentration Terms

Course on Mole Concept for Class XI

akhilesh • Lesson 10 • June 24, 2021

① % w/w (% by mass)

20 % w/w NaOH (aq)

100 gm solution contains 20 gm NaOH

$W_{solvent} = 80$ gm

(2) % W/V

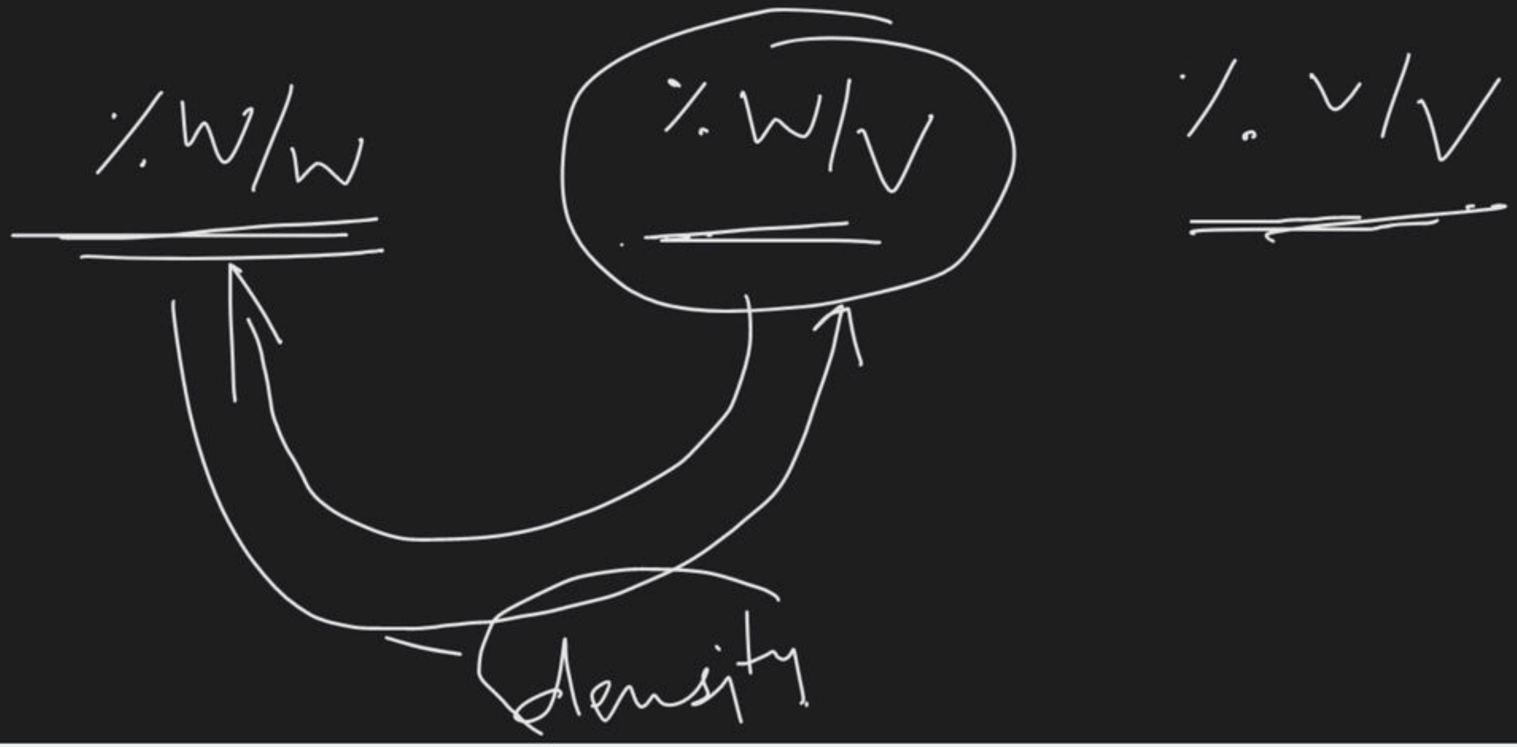
20 % W/V NaOH (aq)

100ml solution contains 20gm NaOH

(3) % V/V (% by volume) 20% V/V O_2 in air

100 ml air contains 20 ml O_2

V_{N_2} = 80 ml



(4) gm/lit

40 gm/lit NaOH (aq)

1000 ml solution contains 40 gm NaOH

$$\% W/V = \frac{1}{10} \times (\text{gm/lit})$$

(5) ppm (Parts per million)

Case-I for solid/liq solution

200 ppm $CaCO_3$ in H_2O

10^6 gm solution contains 200 gm $CaCO_3$

$$\%\ w/w = \frac{200}{10^6} \times 100 = \frac{2}{100} = 0.02$$

Case - II

200 ppm $SO_{2(g)}$ in air

10^6 ml air contains 200 ml $SO_{2(g)}$

100 air $\longrightarrow \frac{200}{10^6} \times 100 = 0.02$

$\therefore V/V = 0.02$

⑥ Molarity (M) :—

$M = mol/lit$

2M NaOH (aq)

1000 ml solution contains 2 mol NaOH

80 gm NaOH

↳ # gm/lit = 80

↳ # %W/V = 8

$$\text{Molarity } (M) = \frac{\text{no. of moles}}{V(\text{lit})}$$

$$= \frac{\text{no. of moles}}{V(ml)} \times 1000$$

$$\text{no. of moles} = M \times V(\text{lit})$$

$$\text{no. of millimoles} = M \times V(ml)$$

Molality (m)

2m NaOH (aq)

1000 gm solvent contains 2 mol NaOH

$W_{solution} = 1080$ gm → 80 gm NaOH

$$\% w/w = \frac{80}{1080} \times 100 = \frac{800}{108}$$

$$ppm = \frac{80}{1080} \times 10^6$$

$$m = \frac{\text{no. of moles}}{\text{mass of solvent (kg)}}$$

$$= \frac{\text{no. of moles}}{\text{mass of solvent (gm)}} \times 1000$$

(8) mole fraction

50.4 gm

0.2 × 180 = 36 gm

0.2 mole fraction $C_6H_{12}O_6$ in H_2O

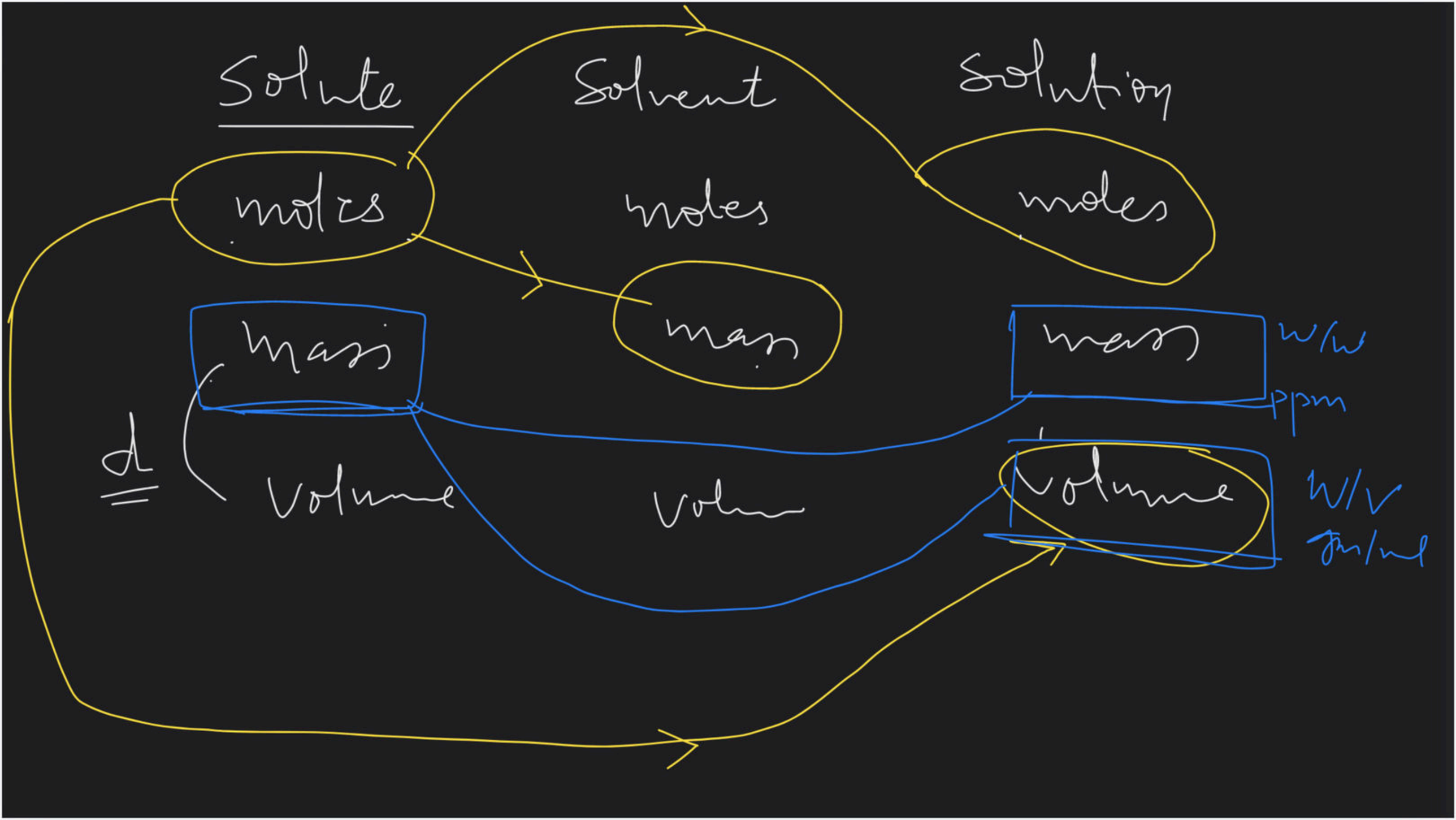
1 mol soln contains 0.2 mole $C_6H_{12}O_6$

moles of H_2O = 0.8 = 0.8 × 18 = 14.4 gm

$$m = \frac{0.2}{14.4} \times 1000$$

$$ppm = \frac{36}{50.4} \times 10^6$$

$$\%\ w/w = \frac{36}{50.4} \times 100$$


Solute
Solvent
Solution
moles
moles
moles
mass
mass
mass
w/w
ppm
d
volume
volume
volume
w/v
g/mL

40 gm MgO was dissolved in H_2O to form 200 ml solution. Given $d_{soln} = 1.25\ gm/ml$ find

200 ml soln contains 40 gm MgO

250 gm soln " 1 mol MgO

$W_{solvent} = 210\ gm$

$n_{solvent} = \frac{210}{18}$

$\frac{1}{210} \times 1000$

(1) % W/W (16) ⟹

(2) % W/V (20) ✓

(3) gm/lit (200)

(4) ppm = 16×10^4

(5) M

(6) m

(7) Mole fraction

A) 160

B) 200

C) 16

D) 20

250 ml ⟶ 40

100 gm ⟶ 40 × 100/250 = 16 gm

(A) 5

(B) 50

(C) $100/21$

(D) $1000/21$

(A) $9/114$

(B) $9/134$

(C) $9/105$

(D) None

Molarity

$M = ?$

$= \frac{1}{\frac{1}{1 + 210/18}}$

210gm 40gm

Q. Density of 5M urea (NH_2CONH_2) is 1.5 gm/ml.

(1) % W/W =

(2) % W/V

(3) gm/lit

(4) ppm

(5) — m

(6) — mole fraction.

S-1 1-7

0-2 1-14

Question

from Aaditya Agarwal

NUMBER	SHORT SCALE
10^6	*one million*
10^9	*one billion*
10^{12}	*one trillion*
10^{15}	*one quadrillion*
10^{18}	*one quintillion*
10^{21}	*one sextillion*
10^{24}	*one septillion*
10^{27}	*one octillion*
10^{30}	*one nonillion*