Volume strength of H_2O_2

20V

1 volume of sol^n will give 20 volume $O_{2(g)}$ at STP

$H_2O_{2(aq)} \longrightarrow H_2O_{(l)} + \frac{1}{2}O_{2(g)}$

M

$\frac{M}{2}$ mole

Sol^n = 1000 ml ≡ 1 lit

H_2O_2 = M mole

$V = \frac{M}{2} \times 22.7$

$= M \times 11.35$ lit

V.S

M moles

V.S. of H_2O_2 = M × 11.35

STP ⇒ P = 1 bar, T = 273 K ⇒ V = 22.7 lit

NTP ⇒ P = 1 atm, T = 273 K ⇒ V = 22.4 lit

Oleum : fuming H_2SO_4 (or $H_2SO_4 + SO_3$)

109% oleum ⇒ 100 gm oleum will give max^m 109 gm H_2SO_4

100 gm oleum require 9 gm of water.

$SO_3 + H_2O \longrightarrow H_2SO_4$

9 gm

0.5 mol 0.5 mole

SO_3 = 0.5 mol = 40 gm

$\% SO_3 = \frac{40}{100} \times 100 = 40\%$

eg: 114% oleum ⇒ 100 gm oleum req 14 gm H_2O req

$SO_3 + H_2O \longrightarrow H_2SO_4$

$\frac{14}{18}$ mol $\left(\frac{14}{18}\right)$ mol

$\% SO_3 = \frac{\frac{14}{18} \times 80}{100} \times 100 = 62.22$

35 mL sample of hydrogen peroxide gives off 494 mL of O_2 at 27° C and 1 atm pressure. Volume strength of H_2O_2 sample will be:

(a) 10 V ✓(b) 13 V (c) 11 V (d) 12 V

b

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Rightarrow \frac{1 \times 494}{300} = \frac{1 \times V_2}{273} \Rightarrow V_2 = 449.54 \text{ ml}$$

$$1 \text{ ml } H_2O_2 \text{ Soln} \equiv \frac{449.54}{35} \simeq 12.844 \text{ ml} \simeq 13 \text{ ml}$$

A fresh H_2O_2 solution is labelled 11.2 V. This solution has the same concentration as a solution which is: (Assume 1 mole of an ideal gas occupies 22.4 L at STP)

(a) 3.4% (w/w) (b) 3.4% (v/v) ✓(c) 3.4% (w/v) (d) none of these

c

$$11.2 = M \times 11.2 \Rightarrow \text{Molarity} = 1M$$

$$\% \text{ wt/v} = \frac{34}{1000} \times 100 = 3.4$$

Soln = 1000 ml

H_2O_2 = 1 mole = 34 gm

The molality of a H_2O_2 solution of density 1.068 gm/ml is 2 m. The only incorrect concentration of the same solution is:

(a) molarity = 2 M (b) volume strength = 22.7 vol at STP

(c) 6.8 % (w/v) (d) 6.8 % (w/w)

An oleum sample is labelled as 113.5%. Identify the incorrect statement.

(a) The amount of free SO_3 in 50 g oleum sample is 30 g.

(b) The amount of H_2SO_4 in 50 g oleum sample is 30 g.

(c) The new labelling of oleum sample when 8 g water is added in 100 g original oleum sample is $\left(100+\frac{137.5}{27}\right)\%$

(d) In the original 50g oleum sample when 6.75 g water is added then 56.75 g H_2SO_4 is produced.

b

200 gm of an oleum sample (labelled as 109%) is mixed with 400 gm of another oleum sample (labelled as 118%). The labelling of the new sample formed will be:

(a) 115 % (b) 112 % (c) 122 % (d) 116 %

a

200 gm oleum ≡ 18 gm H_2O
= 1 mole H_2O
= 1 mole SO_3 = 80 gm

SO_3 = 80 gm

400 gm oleum ≡ 18 × 4 gm H_2O
= 4 mole H_2O
≡ 4 mole SO_3
≡ 320 gm SO_3

Total oleum = 600 gm

SO_3 = 400 gm ≡ 5 mole SO_3 = 5 mole H_2O
= 90 gm

100 gm oleum = $\frac{90}{600}\times 100 = 15$

⇒ (100 + 15) %

Label an oleum sample which has mass fraction of SO_3 equal to 0.6:

(a) 115% (b) 109% (c) 104.5% (d) 113.5%

d

Oleum ≡ 100 gm
- SO_3 = 60 gm ≡ $\frac{60}{80}$ mole = $\frac{3}{4}$ mole
- H_2SO_4 = 40 gm

$SO_3 + H_2O \longrightarrow H_2SO_4$

$\frac{3}{4}$ mole $\frac{3}{4}$ mole

$\left(100+\frac{3}{4}\times 18\right) = 113.5\%$