

13.43 571.6g H₂SO₄ 1329g
 ML (Soln)

Ⓐ Mass %
 Ⓑ X
 Ⓒ M
 Ⓓ M

$ml = cm^3$ solute + solvent

$$\frac{\text{Mass H}_2\text{SO}_4}{\text{Total Mass (solution)}} = \frac{571.6g}{1329g} \times 100 = 43\%$$

$$\frac{1.329g}{ml} \times \frac{1000ml}{1l} = 1329g \text{ soln}$$

← Total Mass Soln

Jan 3-7:22 AM

Ⓑ Mole fraction

5.83

$$\frac{\text{Moles H}_2\text{SO}_4}{\text{Total moles}} = 0.122$$

← Mole H₂SO₄ 5.83
 → Mole H₂O 42.08

571.6g H ₂ SO ₄	Mole H ₂ O
78g H ₂ SO ₄	Mole H ₂ SO ₄
5.83 mole H ₂ SO ₄	

In 1 liter

1329g - 571.6g = 757.4g H₂O

757.4g	Mole H ₂ O
18g	42.08 mole H ₂ O

(57.4g) water

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$$\textcircled{1} m = \frac{\text{moles } H_2SO_4}{\text{kg water}} = \frac{5.83}{0.7574 \text{ kg}} = 7.7 \text{ m}$$

$$\textcircled{2} M = \frac{\text{moles } H_2SO_4}{\text{L soln}} = \frac{5.83}{1} = 5.83 \text{ M}$$

Jan 3-7:49 AM

$\textcircled{50b}$ 120g soln, 0.65m Na_2CO_3

68.9g
 Na_2CO_3

0.65 mole Na_2CO_3
kg water

$\frac{68.9 \text{ g } Na_2CO_3}{1000 \text{ g } H_2O}$

1068.9g soln

Solute
+
Solvent

$\frac{68.9 \text{ g}}{1068.9 \text{ g soln}} =$

6.47

$\frac{120 \text{ g soln}}{120 \text{ g soln}}$

Jan 3-7:52 AM

SDC 1.20 l soln, 15% $Pb(NO_3)_2$ 1.165
by mass ml
soln

$$\frac{\text{soln } 1.165}{\text{ml}} \times \frac{1200 \text{ ml}}{1} = \boxed{1392 \text{ g soln}}$$
→ Solute + Solvent.

15% of Total
 $0.15 (1392) = \boxed{208.8 \text{ g } Pb(NO_3)_2}$

Jan 3-8:00 AM

Colligative Properties

What happens when you add a solute to a pure solvent

(Ex) Add salt to water

① Boiling Point. (STP)

Pure water: BP = $100^\circ C$ } BP salt water solution $> 100^\circ C$
HOT GETS HOTTER NaCl (aq)

② Freezing Point

Normal FP $H_2O = 0^\circ C$ } FP salt water soln $< 0^\circ C$
COLD gets COLDER

Jan 3-8:12 AM

③ Vapor Pressure - Raoult's Law

VP ↓

$$VP_{\text{soln}} = \chi_{\text{SOLVENT}} P^{\circ}$$

$\chi_{\text{SOLVENT}} = \frac{\text{mole solvent}}{\text{mole solvent} + \text{mole solute}}$

$P^{\circ} \rightarrow$ PRESSURE OF PURE SOLVENT water

0 = Salt NaCl

100°C

gas

releasing heat x warming next-layer

~~Fire~~

H₂O(l) stay in soln longer → releasing more heat energy / solution is HOTTER!

Jan 3-8:20 AM

④ osmotic Pressure (P) (π)

Colligative properties
add solute to a solvent

Solution M

Mole/l

$$PV = nRT$$

$$\frac{P}{V} = \frac{n}{V} RT$$

$$P = \frac{n}{V} RT$$

$$P = M RT$$

$$\pi = M RT$$

Jan 3-8:29 AM

Glycerin $C_3H_8O_3$ density $\frac{1.26g}{ml}$. VP pure H_2O = 23.8 torr at 25°C

Calc. VP at 25°C of a solution of
 50ml glycerine + 500ml H_2O

① H_2O $d = 1g/ml \Rightarrow 500g H_2O$

500g H_2O	mole H_2O	27.8 mole H_2O
18g H_2O		

② mole glycerine.

1.26g glycerine	50ml	mole glycerine
ml		92g glycerine

0.684 mole glycerine

$$VP_{soln} = X_{Solvent} P^{\circ}$$

$$= \frac{27.8}{27.8 + 0.684} (23.8)$$
pure solvent

$$VP_{soln} = \boxed{23.2 \text{ torr}}$$

Jan 3-8:37 AM

13 / 62a, 73

Jan 3-8:46 AM