Solutions Review

(1) A homogenous mixture of two or more substances.

(2) Boil off the solvent. The solute will remain.

(3)
- water molecules collide with Na_2SO_4
- Na^+ is attracted to negative side of water molecules
- SO_4^{2-} is attracted to positive side of water molecules
- the attraction between ions and water is greater than between the attraction between the ions in the crystal
- the ions break away from the surface of the crystal
- the ions are surrounded by the water molecules and carried off into the solution.

(4) (C)

(5) exothermic; the beaker will heat up

(6) the maximum amount of solute has been dissolved at a given temperature

(7)
- dissolve enough solute to make a saturated solution at a given temperature (hot)
- cool the solution (without disturbing it)

(8) $\frac{45\text{g } KNO_3}{x} = \frac{50\text{g } H_2O}{100\text{g } H_2O}$ $x = 90\text{g}$

- super saturated (just barely)

(9) (a) KCl, potassium chloride

(b) solubility chart: 43g KCl / 100g H_2O at 60°C

43g KCl = 100g H_2O

x = 200g

x = <u>86g</u>

(c) solubility chart: 30g KCl / 100g H_2O at 10°C

30g KCl = 100g H_2O

x = 200g

x = 60g

So, 86 − 60g = <u>26g</u> precipitates out

(10) at 10°C: ~80g $NaNO_3$ / 100g H_2O

at 60°C: ~123g $NaNO_3$ / 100g H_2O

Therefore: 123 − 80g = 43g $NaNO_3$ / 100g H_2O could be added

(11)
- at the surface, there are fewer water molecules because of the salt ions
- the salt ions absorb some of the energy leaving less for the water molecules.
- energy is required to overcome the intermolecular forces between the salt ions and the water molecules.
- all of these things cause the vapor pressure of the water to be lowered, thus raising the boiling point.

(12) - as temperature increases the solubility of CO_2 in pure water decreases

(13) (a) mass/mass (ex) 1g of pramoxine / 100g of Calomine Lotion

(b) mass/volume (ex) 0.9g of sodium chloride / 100mL of Otrivin

(c) parts per billion (ex) 2 molecules of fluoride ions for every billion water molecules.

(14) $.04(200g) = \underline{8g}$

(15) $\text{conc.} = \frac{\text{mol}}{L}$

$= \frac{0.1}{1}$

$= \underline{0.1 \text{ mol/L}}$

$H_3PO_4 = 98.03g$

$1 \text{ mol} = 98.03g$

$x \quad 9.8g \quad x = 0.1 \text{ mol}$

(16) $\text{conc.} = \frac{\text{mol}}{L}$

$.2 = \frac{x}{.250}$

$x = 0.05 \text{ mol}$

$NaOH = 40.01g$

$1 \text{ mol} = 40.01g$

$.05 = x$

$x = \underline{2g}$

(17) original

$\text{conc} = \frac{\text{mol}}{L}$

$6 = \frac{x}{.010}$

$x = 0.06 \text{ mol}$

new

$\text{conc} = \frac{\text{mol}}{L}$

$x = \frac{0.06}{.250}$

$x = \underline{0.24 \text{ mol/L}}$

(18) $1 \text{ mol} = 6.02 \times 10^{23}$ molecules

$x \qquad 8.5 \times 10^{18}$ molecules

$x = 1.412 \times 10^{-5}$ mol

$$\text{conc.} = \frac{\text{mol}}{L}$$

$$= \frac{1.412 \times 10^{-5}}{0.005} = \underline{0.0028 \text{ mol/L}}$$

(19) - Determine number of moles needed

$$\text{conc.} = \frac{\text{mol}}{L}$$

$$2.75 = \frac{x}{.5}$$

$x = 1.375$ mol

- Determine mass needed

$1 \text{ mol } NH_3Cl = 52.53 g$

$1.375 \text{ mol} = x$

$x = 72.23 g$

- using a balance, mass out 72.23 g of NH_3Cl
- place in a 500 mL volumetric flask
- carefully fill the flask, while gently agitating it, until the solution level is at the mark.

(20) new

$$\text{conc} = \frac{\text{mol}}{L}$$

$$0.125 = \frac{x}{2.5}$$

$x = 0.3125$ mol needed.

original (stock)

$$\text{conc} = \frac{\text{mol}}{L}$$

$$12 = \frac{0.3125}{x}$$

$x = \underline{0.026 \text{ L}}$ or $\underline{26 \text{ mL}}$