Unit 9 – Solutions & Equilibrium Twitter Review Questions

U9-1: Identify THREE ways in which a solute is able to dissolve FASTER in water:
A)
B)
C)

- Answer: A) Increase temp of reaction C) Increase surface area of solute
  B) Agitate/stir solution

U9-2: What is the max amount (grams) of NaNO3 that can dissolve in 350. g of H2O at 30°C if its solubility is 20.0 g/100 g H2O at this temp?

- Answer: 70.0 g $NaNO_3$

U9-3: On a solubility curve, solids have a _____ slope and gases have a _____ slope.

- Answer: positive ; negative

U9-4: Explain why most solid solutes increase solubility as temperature increases.

- Answer: Greater kinetic energy for greater solvation

U9-5: Which of the following would MOST likely dissolve in water? : AgBr, BF3, NaC2H3O2, or Cl2

- Answer: From solubility rules = $NaC_2H_3O_2$

U9-6: What is the concentration of a solution that contains 5.50 moles of KClO3 in 255 mL of solution?

- Answer: 21.6 M $KClO_3$

U9-7: When solvent is added to dilute a solution, the concentration of dilute solution changes (decreases). However, what will NOT change?

- Answer: moles of solute

U9-8: What type of compound dissociates when dissolved in water? (Think of the solvation process)

- Answer: Ionic Compound

U9-9: What is the definition of solubility? Be very specific.

- Answer: Ability of an amount of solute (grams) to dissolve in a given amount of solvent (grams) at a given temperature

U9-10: If solubility of LiBr is 90g/100g H2O at 40°C, give ANY soln conc. representing an unsaturated soln. (Express as g/100 g H2O at __°C)

- Answer: Any amount of LiBr LESS THAN 90g LiBr / 100g H_2O at 40°C

U9-11: How many grams of sodium chloride should be used to prepare 450. mL of a 3.50M solution of sodium chloride?

- Answer: mol = (M)(L_{soln}) ; mol → g → 92.0 g NaCl

U9-12: What volume of water (in overall solution) should be used to prepare a 0.250M solution of NaNO3 from 125 grams of NaNO3?

- Answer: 1) g → mol 2) L_{soln} = mol/M → 5.88 L H_2O

U9-13: When any amount of solute is added to an already saturated solution, what will happen? Be very specific.

- Answer: Solute will NOT dissolve and will SETTLE to the bottom

U9-14: A decrease in temperature increases the solubility of what types of solutes?

- Answer: Gas solutes

U9-15: When 85.0 mL of 2.50M H2SO4 is diluted to 275 mL, what is the resulting concentration?

- Answer: $M_1V_1=M_2V_2$ → M_2 = 0.773 M H_2SO_4

U9-16: Increasing the temperature of an exothermic reaction will favor the production of more _____.

- Answer: EQ shifts left → Reactants

U9-17: Calculate for EQ constant (K): __CO(g) + __H2(g) <-> __CH4(g) + __H2O(g) if [CO]=0.500M, [H2]=1.50M, [CH4]=0.150M, & [H2O]=0.250M.

- Answer: 1,3,1,1 → $K = [CH_4][H_2O]/[CO][H_2]^3$ → K = 0.0222

U9-18: At equilibrium, what is true about the concentration of reactants and concentration of products? Be very specific.

- Answer: Rate Forward Reaction = Rate Reverse Reaction → At EQ, concentration of reactants and products remain UNCHANGED

U9-19: Using a solubility curve, what is the solubility of KCl at 80°C ?

- Answer: At 80°C → 50 g KCl / 100 g H_2O

U9-20: Using a solubility curve, what is the CHANGE in solubility of KClO3 from 50°C to 80°C? (Express as grams KClO3 / 1°C)

- Answer: At 50°C = 20g $KClO_3$ / 100g H_2O ; At 80°C = 40g $KClO_3$ / 100g H_2O ; Δg = 20g $KClO_3$; ΔT = 30°C → 20g $KClO_3$ / 30°C = 0.67g $KClO_3$ / 1°C

U9-21: Using a solubility curve, 230g of NH4Cl is dissolved in 300g of water at 90°C. Is solution saturated, unsaturated, or supersaturated?

- Answer: At 90°C → 70g NH_4Cl / 100g H_2O = 210g NH_4Cl / 300g H_2O → 230g > 210g → SUPERSATURATED

U9-22: Using a solubility curve, if 55g KCl are stirred in 55g H2O at 80°C:
A) Should all solute dissolve?
B) How much will/will not?

- Answer: At 80°C → 50g KCl / 100g H_2O = 27.5g KCl / 55g H_2O → A) No – SUPERSATURATED B) 55g - 27.5g = 27.5g KCl will NOT dissolve

U9-23: If 15.0g of magnesium chloride is dissolved in 125mL of H2O, resulting mixture has a volume of 135mL. What is concentration of soln?

- Answer: 1) g → mol 2) $M=mol/L_{soln}$ → 1.17 M $MgCl_2$

U9-24: Write the equilibrium constant expression (K) for: __P4(s) + __NO(g) <-> __P4O6(s) + __N2(g)

- Answer: 1,6,1,3 → $K = [N2]^3 / [NO]^6$

U9-25: Write the equilibrium constant expression (K) for: __NH4Cl(s) <-> __NH3(g) + __HCl(g)

- Answer: 1,1,1 → $K = [NH_3][HCl]$

U9-26: Write the equilibrium constant expression (K) for: __CaO(s) + __CO2(g) <-> __CaCO3(s)

- Answer: 1,1,1 → $K = 1 / [CO_2]$

U9-27: 2 SO2(g) + O2(g) <-> 2 SO3(g) + Heat : Left/Right/No Effect?
A) O2 removed
B) SO3 added
C) Temp decreased
D) Volume increased

- Answer: A) Left B) Left C) Right D) Left

U9-28: CO(g) + H2O(g) <-> CO2(g) + H2(g) + Heat; Left/Right/No Effect?
A) H2O added
B) H2 removed
C) Temp increased
D) Pressure decreases

- Answer: A) Right B) Right C) Left D) No Effect

U9-29: How many moles of Ba(OH)2 are contained in a solution of 125 mL of 0.0500 M Ba(OH)2 ?

- Answer: $mol_{solute} = (M)(L_{soln})$ → 0.00625 mol $Ba(OH)_2$

U9-30: What volume of 2.55 M NaOH is needed to make 125 mL of 0.0750 M NaOH solution?

- Answer: $M_1V_1=M_2V_2$ → V_1 = 3.68 mL (0.00368 L) NaOH soln

U9-31: Calculate the concentration of a saturated solution of KNO3 at 40.0C. (Assume in 100g H2O soln)

- Answer: Saturated grams of KNO_3 → mol ; 100g H_2O = 100mL H_2O; $M=mol/L_{soln}$ → 5.93 M KNO_3

U9-32: If 35.0g KClO3 is stirred in 50.0g H2O at 50.0C, what mass of KClO3 is expected to settle to bottom?

- Answer: At 50°C → 20g $KClO_3$ / 100g H_2O = 10g $KClO_3$ / 50g H_2O → 35.0g – 10.0g = 25.0g $KClO_3$ will NOT dissolve and settle to the bottom

U9-33: If pressure is increased in 1N2(g) + 3H2(g) <--> 2NH3(g), in which direction will EQ shift? Why?

- Answer: EQ will shift RIGHT towards products to re-establish EQ ; Why? Products have LESS moles of gas

U9-34: If volume is increased/decreased in a reaction, which TWO gas laws can be used to determine direction of EQ shift?

- Answer: Boyle's Law → Increase Vol=Decrease Pressure (vice versa)
- Charles' Law → Increase Vol=Increase Temp (vice versa)

U9-35: In order for EQ to shift right towards products in a closed system, this can only be done at the expense of the _____.

- Answer: Reactant(s)

U9-36: Provide the procedures necessary describing how you would prepare (create) a 150mL, 0.250M NaCl solution.

- Answer:
  - 1. M_{NaCl} → mol_{NaCl} → g NaCl ; Mass out 2.19g NaCl onto a scale.
  - 2. Dissolve fully in a 150mL volumetric flask.
  - 3. Fill up with water to 150mL graduated line in volumetric flask.