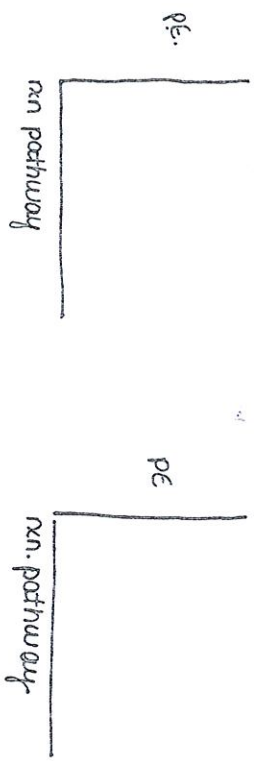


Kinetics & Equilibrium Revisit

- (1) What 2 things must be satisfied before reactants will react and form products according to the collision theory?
- (2) What is activation energy?
- (3) List 5 factors that can affect a reaction rate and explain what and how they can speed up a reaction?
- (4) Draw and label three potential energy diagrams, include ΔH , ΔH_p , ΔH_{rxn} , and E_a .



- (5) Write equilibrium expressions for the following reactions.
 - (a) $2CO(g) + O_2(g) \rightleftharpoons 2CO_2(g)$
 - (b) $2KClO_3(s) \rightleftharpoons 2KCl(s) + 3O_2(g)$
 - (c) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
 - (d) $4NH_3(g) + 3O_2(g) \rightleftharpoons 2N_2(g) + 6H_2O(g)$

(6) Calculate K_{eq} for the equilibrium reactions below:

- (a) $2CO(g) + O_2(g) \rightleftharpoons 2CO_2(g)$
 when $[CO] = .45M$, $[O_2] = .23M$, and $[CO_2] = .61M$
- (b) $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
 when $[N_2] = 1.20M$, $[H_2] = 1.20M$, $[NH_3] = 2.10M$.
- (c) $4NH_3(g) + 3O_2(g) \rightleftharpoons 2N_2(g) + 6H_2O(g)$
 when $[NH_3] = 1.00M$, $[O_2] = 2.00M$, $[N_2] = 3.00M$, & $[H_2O] = 2.00M$

(7) Which way will equilibrium shift in the following situations: left, right, or no shift

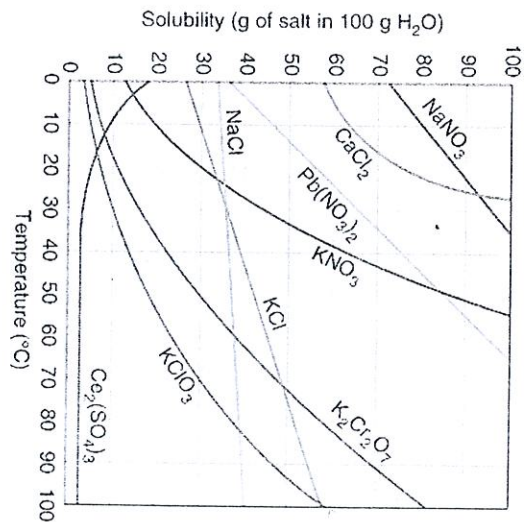
- (A) $2NO(g) + H_2(g) \rightleftharpoons N_2O(g) + H_2O(g)$ Q is negative
 - (i) NO is added (iv) the temperature is decreased
 - (ii) H_2 is removed (v) the volume decreased
 - (iii) N_2O is added (vi) a catalyst is added.
- (B) $CO_2(g) + H_2(g) \rightleftharpoons CO(g) + H_2O(g)$ Q is positive
 - (i) CO is added (iv) the temperature is increased
 - (ii) CO_2 is added (v) the volume increased
 - (iii) H_2 is removed (vi) a catalyst is removed.

Name: _____ Period: 2 3

1. Define the following terms:

- a. Solute
- b. Solvent
- c. Saturated
- d. Unsaturated
- e. Super saturated
- f. Concentrated
- g. Dilute
- h. Colligative property
- i. Freezing point depression
- j. Boiling point elevation

2. What are 3 factors that can speed up how fast a solute dissolves in a solvent and why?



3.

- a. In order to make a saturated solution of potassium chlorate at 70°C, how much potassium chlorate should be dissolved in 100 g of water?
- b. How many grams of NaCl should be dissolved in 500g of water in order to make a saturated solution at 90°C?
- c. Which is more concentrated: a saturated solution of sodium nitrate at 20°C or a super saturated solution of calcium chloride holding 83g of calcium chloride dissolved in 100g of water at 20°C?
- 4. Can a solution be dilute and saturated at the same time? Explain.

5. Use the equation for molarity to solve these problems: $M = n/V$

Acids/Bases

a. What is the molarity of a solution made by dissolving 130.0g of $\text{Cu}(\text{NO}_3)_2$ in enough water to make a 2.32L solution?

1. Define the following terms.

a. Arrhenius acid

b. Arrhenius base

c. Bronsted-Lowry acid

d. Bronsted-Lowry base

e. Conjugate acid

f. Conjugate base

g. Amphoteric

h. pH

b. How many moles of CrCl_3 were dissolved to make 0.75L of a 0.75M solution?

c. What is the mass of MgSO_4 used to create 10 mL of a 1.1M solution?

6. Use the equation for molality to solve these problems: $m = n/kg$

a. What is the molality of a solution made by dissolving 25.0g of Na_2S in 1.45kg of water?

2. Identify the Bronsted-Lowry acid, Bronsted-Lowry base, conjugate acid, and conjugate base in the reactions below:

a. $\text{HSO}_4^- + \text{NH}_3 \rightarrow \text{SO}_4^{2-} + \text{NH}_4^+$

b. $\text{H}_2\text{O} + \text{NO}_3^- \rightarrow \text{OH}^- + \text{HNO}_3$

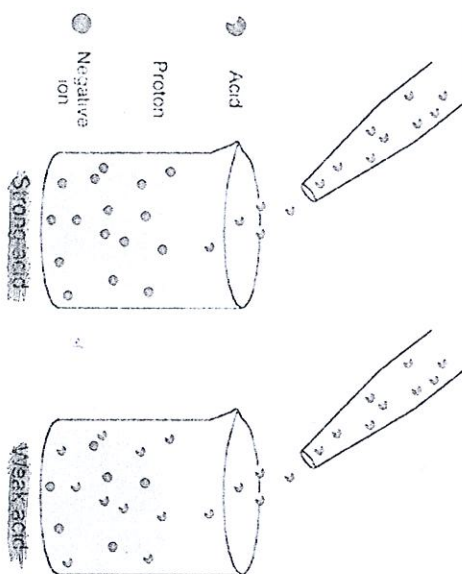
c. $\text{H}_2\text{O} + \text{HCO}_3^- \rightarrow \text{H}_3\text{O}^+ + \text{CO}_3^{2-}$

d. $\text{F}^- + \text{H}_2\text{SO}_4 \rightarrow \text{HF} + \text{HSO}_4^-$

b. How many moles of HF were dissolved in 1500g of water to make a 0.88m solution?

c. What mass of CO_2 was dissolved in 1220g of water to make a 1.25m solution?

3. Label the beaker in the picture that represents a strong acid. Label the beaker that represents a weak acid.



- What makes an acid or base strong?
 - What makes an acid or base weak?
 - List 7 strong acids.
 - List 8 strong bases.
4. List 4 properties of an acid. List 4 properties of a base.

5. Use the pH equations below to answer these questions.

$$\text{pH} = -\log[\text{H}^+]$$

$$\text{pOH} = -\log[\text{OH}^-]$$

$$\text{pH} + \text{pOH} = 14.00$$

$$[\text{H}^+] = 10^{-\text{pH}}$$

$$[\text{OH}^-] = 10^{-\text{pOH}}$$

$$[\text{H}^+] \times [\text{OH}^-] = 1.00 \times 10^{-14} \text{ M}^2$$

- Find the pOH of a solution of HNO_3 with a pH of 5.45.
- Calculate the pH of a solution of HCl with a concentration of $6.56 \times 10^{-2} \text{ M}$.
- Determine the pOH of a solution of HNO_3 with a $[\text{OH}^-]$ of $7.67 \times 10^{-11} \text{ M}$.
- Find the pH of a solution of RbOH with a concentration of $8.78 \times 10^{-6} \text{ M}$.
- Calculate the $[\text{H}^+]$ of an HClO_3 solution with a pH of 2.32.
- Calculate the $[\text{OH}^-]$ of a solution of HI with a $[\text{H}^+]$ of $9.89 \times 10^{-4} \text{ M}$.
- Calculate the $[\text{H}^+]$ of a solution of KOH with a pOH of 3.43.