

**EXAM 4A**  
**Physiological Chemistry I / CHEM 1402**

Name: \_\_\_\_\_  
ss#: \_\_\_\_\_  
Lab: **A** (mon) **B** (wed)

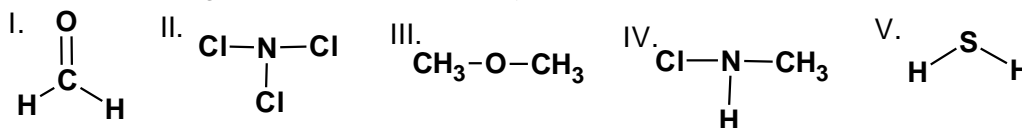
**Multiple Choice.** Clearly write the letter corresponding to the correct answer in the space provided.  
**(3 points each)**

\_\_\_ 1) Which of the following compounds would likely be soluble in water?

- I. LiI      II. CaCO<sub>3</sub>      III. NH<sub>4</sub>Cl      IV. MgO      V. Ba(NO<sub>3</sub>)<sub>2</sub>

(a) I and III (b) I, II, III (c) II, IV and V (d) I, III and V (e) none are polar molecules

\_\_\_ 2) Which of the following compounds would likely be soluble in water?



(a) I, II, III, IV and V (b) I, II, III and IV (c) IV, V (d) I, III and V (e) IV only

\_\_\_ 3) Which of the compounds in # 2 above would be the **most** soluble in water?

(a) I (b) II (c) III (d) IV (e) all are equally soluble in water

\_\_\_ 4) Dilutions involve a change in

- I. concentration      II. # of moles of solute      III. volume      IV. Molarity

(a) I, III and IV (b) I, II and IV (c) I, II, III and IV (d) IV only  
(e) None of these combinations is correct.

\_\_\_ 5) The net ionic equation for the reaction of nitric acid with potassium hydroxide is

- (a) KOH + HNO<sub>3</sub> → NaNO<sub>3</sub> + H<sub>2</sub>O  
(b) K<sup>+</sup> + OH<sup>-</sup> + H<sup>+</sup> + NO<sub>3</sub><sup>-</sup> → K<sup>+</sup> + NO<sub>3</sub><sup>-</sup> + H<sub>2</sub>O  
(c) K<sup>+</sup> + OH<sup>-</sup> + H<sup>+</sup> + NO<sub>2</sub><sup>-</sup> → K<sup>+</sup> + NO<sub>2</sub><sup>-</sup> + H<sub>2</sub>O  
(d) H<sup>+</sup> + OH<sup>-</sup> → H<sub>2</sub>O  
(e) None of the above

\_\_\_ 6) Which of the following types of compounds are soluble in water?

- (a) ammonium salts (b) monovalent salts (group 1 & 7) (c) nitrates  
(d) ammonia (e) all of the above

\_\_\_ 7) What is the value of Kw if the hydrogen ion concentration is 1 X 10<sup>-5</sup> M?

- (a) 5 (b) 1 X 10<sup>-5</sup> (c) 1 X 10<sup>-9</sup> (d) 9 (e) none of the above

\_\_\_ 8) Which of the following will have the lowest pH value? A 0.01 M solution of:

- (a) CH<sub>3</sub>CH<sub>2</sub>COOH (b) CH<sub>3</sub>-NH-CH<sub>3</sub> (c) HI (d) H<sub>2</sub>SO<sub>3</sub> (e) H<sub>3</sub>PO<sub>4</sub>

Name \_\_\_\_\_

\_\_\_9) What is the  $[\text{OH}^-]$  of a solution with a pH of 3?

- (a) 11      (b)  $1 \times 10^{-14}$       (c)  $1 \times 10^{-11}$       (d)  $1 \times 10^{-3}$       (e) none of the above

\_\_\_10) Which of the following are strong bases?

- I.  $\text{Ca}(\text{OH})_2$       II.  $\text{CH}_3\text{CH}_2\text{OH}$       III.  $\text{CH}_3\text{NH}_2$       IV.  $\text{LiOH}$

- (a) I and IV      (b) I, III and IV      (c) I, II and IV      (d) I, II, III and IV      (e) II and IV

**Fill in the blank.** Clearly, write the answer to the question in the space provided. Include units if appropriate and give numerical answers to two decimal places. (2 points each)

- 11) A compound with a  $K_a = 2.3 \times 10^{-11}$  would be classified as a \_\_\_\_\_.
- 12) What volume of a 2.5 M  $\text{Ca}(\text{OH})_2$  solution would contain 1.25 moles of  $\text{OH}^-$ ? \_\_\_\_\_.
- 13) A solution with  $\text{pOH} = 10$  would have what  $[\text{H}^+]$ ? \_\_\_\_\_.
- 14) Formula for nitrous acid. \_\_\_\_\_.
- 15) A reaction between a strong acid and a strong base produce \_\_\_\_\_ and \_\_\_\_\_.
- 16) What are the products of a reaction between  $\text{HI}$  and  $\text{Ba}(\text{OH})_2$ ? \_\_\_\_\_.
- 17) The name of  $\text{Na}_2\text{SO}_3$  is \_\_\_\_\_.
- 18) The pH of a 0.0010 M  $\text{H}_3\text{PO}_4$  solution is \_\_\_\_\_.
- 19) Write the formula for any diprotic acid. \_\_\_\_\_.
- 20) When  $\text{HNO}_3$  is placed in water, what is the conjugate base? \_\_\_\_\_.
- 21) A solution with  $\text{pH} = 6.3$  has what  $[\text{H}^+]$ ? \_\_\_\_\_.
- 22) What is the molarity of a  $\text{HCl}$  solution if 10 mL of it requires 20 mL of 0.5 M  $\text{NaOH}$  for neutralization? \_\_\_\_\_.
- 23) Write an equation for the ionization of  $\text{CH}_3\text{CH}_2\text{COOH}$ . \_\_\_\_\_.
- 24) Write an equation for the ionization of  $\text{NH}_3$ . \_\_\_\_\_.
- 25) 2L of a 25 % (by volume) ethanol solution would require \_\_\_\_\_ mL ethanol + \_\_\_\_\_ mL  $\text{H}_2\text{O}$ .

**Short answer. Concisely** answer the following questions using 2 or 3 short sentences.

26) Give the name and formula of 3 strong acids (at least one must contain more than one proton).  
(6 points)

27) When performing a calculation using an equilibrium constant, an assumption must be made concerning the concentration of undissociated acid in solution. What is the assumption? (you can use equations to explain if you want). (4 points)

28) Briefly explain the effect of increasing temperature on solubility. (3 points)

29) What is meant by equivalence point? (3 points)

30) What is the difference between a strong acid and weak acid? (3 points)

**Calculation problems: Show** all your work! **Circle** your final answer. Dont forget units. Answers should be reported to 2 decimal places.

31) Two samples of blood are drawn from a patient, one arterial sample and one venous sample. The pH of the arterial sample is found to be 7.45 while the venous sample's pH is 6.60. (6 points)

(a) What are the  $[H^+]$  of the arterial blood and the venous blood?

(b) Briefly explain the reason for the difference in pH between arterial blood and venous blood.

32) A farmer who lives in a area that often receives acid rain has a bucket out in his yard. Before the rain, the bucket holding 2.5 L of water with pH = 7. After a storm, the farmer finds that the volume of bucket has increased by 500 mL. If the pH of the rain was 5.5, what is the final pH of the water in the bucket? (Hint: This is a dilution problem!) (5 pts)

33) A 30 mL sample of stomach acid (HCl) has a pH of 3.4. (5 points)

(a) what are the  $[H^+]$  and pOH of this sample?

(b) How many mL of an antacid solution containing  $1 \times 10^{-4}$  M NaOH would be necessary to neutralize the stomach acid sample?

34) Calculate the values of  $[H^+]$ , pH and pOH for a 0.010 M  $CH_3COOH$  solution. ( $K_a$  for  $CH_3COOH$  is  $1.8 \times 10^{-5}$ ). (5 points)