

**Moorpark College Chemistry 11**  
**Fall 2009**

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Instructor: Professor Torres

Examination #2: Section Two  
October 5, 2009

Name: \_\_\_\_\_ (print)

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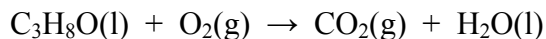
**Directions:** Make sure your examination contains ELEVEN total pages (including this cover sheet) when instructed to do so. Answer all the questions in the spaces provided. Be sure to show all your work for partial credit.

Question	Points
1. – 25. (50 pts.)	
26. (20 pts.)	
27. (30 pts.)	
<b>TOTAL (100 points)</b>	

Chemistry 11 Fall 2009  
Examination #2

For the first portion of this exam, select the best answer choice for the questions below and mark the answers on your scantron. Then answer the free response questions that follow (100 pts. total; multiple choice 2 pts. each).

1. When the following reaction is balanced using smallest whole-number integers, what is the coefficient for oxygen?



- A. 1  
B. 3  
C. 5  
D. 7  
E. 9
2. An empty aerosol can at 25 °C contains gas at 760 mm Hg. If an empty can is thrown into a 475 °C fire, what is the final pressure in the heated can?
- A.  $1.44 \times 10^4$  atm  
B. 19.0 atm  
C. 2.51 atm  
D. 0.398 atm  
E.  $5.26 \times 10^{-2}$  atm
3. Determine the percent by weight of vitamin C in a solution made by dissolving 1.30 g of vitamin C ( $\text{C}_6\text{H}_8\text{O}_6$ ) in 55.0 g of water.
- A. 0.195%  
B. 0.242%  
C. 2.31%  
D. 2.36%  
E. 42.3%
4. Which one of the following compounds behaves as an acid when dissolved in water?
- A. RaO  
B.  $\text{C}_4\text{H}_{10}$   
C. HI  
D. RbOH  
E.  $\text{NH}_3$

5. Determine the compound below that exhibits hydrogen bonding:
- A.  $\text{CH}_3\text{Cl}$
  - B.  $\text{CH}_4$
  - C.  $\text{CH}_3\text{OCH}_3$
  - D.  $\text{HCl}$
  - E.  $\text{NH}_3$
6. Calculate the mass (in g) of  $8.50 \times 10^{22}$  molecules of  $\text{NH}_3$ .
- A. 2.40 g
  - B. 120. g
  - C. 0.141 g
  - D. 0.417 g
  - E. 0.00830 g
7. What is the concentration of  $\text{HCl}$  in a final solution when 65 mL of a 12 M  $\text{HCl}$  solution is mixed with pure water to a total volume of 0.15 L?
- A. 0.028 M
  - B. 5.2 M
  - C. 28 M
  - D. 120 M
  - E. 5200 M
8. If the percent yield for the following reaction is 75.0%, and 45.0 g of  $\text{NO}_2$  are consumed in the reaction, how many grams of nitric acid,  $\text{HNO}_3(\text{aq})$ , are produced?
- $$3 \text{NO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) \rightarrow 2 \text{HNO}_3(\text{aq}) + \text{NO}(\text{g})$$
- A. 22.5 g
  - B. 30.8 g
  - C. 41.1 g
  - D. 54.8 g
  - E. 69.3 g
9. Of the species listed below, which is predicted to have the greatest boiling point?
- A.  $\text{CH}_2\text{Cl}_2(\text{l})$
  - B.  $\text{CH}_4(\text{l})$
  - C.  $\text{Br}_2(\text{l})$
  - D.  $\text{HF}(\text{l})$
  - E.  $\text{HCl}(\text{l})$

10. A balloon filled with helium gas at 68 °F occupies 2.91 L at standard pressure. The balloon is immersed in liquid nitrogen at -196 °C, raising the pressure to 76.4 psi. What is the volume of the balloon in the liquid nitrogen?

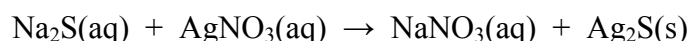
(Note: 1 atm = 14.7 psi, or 14.7 pounds per square inch!)

- A. 0.0086 L  
B. 0.15 L  
C. 2.1 L  
D. 4.0 L  
E. 58 L
11. Arrange the following compounds in order of expected increasing solubility in water: KCl, CH<sub>3</sub>CH<sub>2</sub>COOH, CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub>, CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>OH, and CH<sub>3</sub>C(O)CH<sub>3</sub>
- A. KCl < CH<sub>3</sub>CH<sub>2</sub>COOH < CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub> < CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>OH < CH<sub>3</sub>C(O)CH<sub>3</sub>  
B. KCl < CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>OH < CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub> < CH<sub>3</sub>CH<sub>2</sub>COOH < CH<sub>3</sub>C(O)CH<sub>3</sub>  
C. CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub> < KCl < CH<sub>3</sub>C(O)CH<sub>3</sub> < CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>OH < CH<sub>3</sub>CH<sub>2</sub>COOH  
D. CH<sub>3</sub>CH<sub>2</sub>COOH < CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>OH < CH<sub>3</sub>C(O)CH<sub>3</sub> < CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub> < KCl  
E. CH<sub>3</sub>CH<sub>2</sub>CH<sub>3</sub> < CH<sub>3</sub>C(O)CH<sub>3</sub> < CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>OH < CH<sub>3</sub>CH<sub>2</sub>COOH < KCl
12. Which of the following compounds exhibits ONLY dispersion and dipole-dipole intermolecular interactions?
- A. Ne  
B. N<sub>2</sub>  
C. HBr  
D. CO<sub>2</sub>  
E. H<sub>2</sub>O
13. Determine the INCORRECT statement below:
- A. The kinetic molecular theory of gases neglects intermolecular forces of attraction between gas particles.  
B. A system in dynamic equilibrium features equal rates of evaporation and condensation.  
C. Surface tension is responsible for the tendency of liquids to form droplets.  
D. Volatile substances evaporate more quickly and hence possess relatively low vapor pressures.  
E. An open system consisting of a heated liquid can never reach dynamic equilibrium.

14. A 75.0 L steel tank at 20 °C contains acetylene gas, C<sub>2</sub>H<sub>2</sub>, at a pressure of 1.39 atm. How many grams of acetylene are in the tank?
- A. 1650 g
  - B. 113 g
  - C. 6.01 g
  - D. 4.33 g
  - E. 0.231 g
15. Determine the number of grams of AgNO<sub>3</sub> required to make 250. mL of a solution that is 0.135 M.
- A. 0.0338 g
  - B. 0.0917 g
  - C. 0.174 g
  - D. 5.73 g
  - E. 9.17 g
16. Consider the reaction of silver nitrate with barium chloride to form silver chloride and barium nitrate as partially shown below. How many grams of silver chloride are formed when 10.0 g of silver nitrate reacts with 15.0 g of barium chloride?



- A. 8.44 g AgCl
  - B. 9.40 g AgCl
  - C. 11.9 g AgCl
  - D. 18.8 g AgCl
  - E. No reaction occurs; 0.0 g of product are formed
17. Consider the UNBALANCED chemical equation shown below:



Calculate the milliliters of 0.260 M Na<sub>2</sub>S needed to react with 25.00 mL of 0.315 M AgNO<sub>3</sub>.

- A. 15.1 mL
- B. 20.6 mL
- C. 30.3 mL
- D. 41.3 mL
- E. 60.6 mL

18. How many milliliters of propyl alcohol are required to make an 8.52% v/v solution in a 500. mL volumetric flask?
- A. 1.70 mL
  - B. 4.26 mL
  - C. 17.0 mL
  - D. 42.6 mL
  - E. 58.8 mL
19. Which of the descriptions below does NOT describe the condition known as *acidosis*?
- A. The blood pH typically lies between 7.0 and 7.3.
  - B. The patient may feel tired and/or disoriented.
  - C. As a potential treatment,  $\text{NaHCO}_3$  could be administered to slightly elevate the blood pH.
  - D. This condition is sometimes caused by fever, anxiety, and/or hyperventilation.
  - E. Diabetes mellitus can lead to this condition.
20. Determine the species below that is MOST MISCIBLE in liquid propane,  $\text{CH}_3\text{CH}_2\text{CH}_3(\text{l})$ :
- A.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3(\text{l})$
  - B.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}(\text{l})$
  - C.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}(\text{l})$
  - D.  $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}(\text{l})$
  - E.  $\text{H}_2\text{O}(\text{l})$
21. Select the statement below that best qualitatively characterizes methanol,  $\text{CH}_3\text{OH}(\text{l})$ :
- A. Methanol is expected to possess a relatively low boiling point, low vapor pressure, and is not very volatile.
  - B. Methanol is expected to possess a relatively high boiling point, low vapor pressure, and is not very volatile.
  - C. Methanol is expected to possess a relatively high boiling point, high vapor pressure, and is not very volatile.
  - D. Methanol is expected to possess a relatively high boiling point, high vapor pressure, and is fairly volatile.
  - E. Methanol is expected to possess a relatively low boiling point, high vapor pressure, and is fairly volatile.

22. What is the pH of an aqueous solution at 25 °C that contains  $3.98 \times 10^{-9} \text{ M H}^+$ ?
- A. 8.400
  - B. 5.600
  - C. 9.000
  - D. 3.980
  - E. 7.000
23. Which solution below has the HIGHEST concentration of  $\text{OH}^-$ ?
- A. pH = 3.21
  - B. pH = 12.59
  - C. pH = 7.93
  - D. pH = 9.82
  - E. pH = 7.00
24. Based on your knowledge of acid/base chemistry, which of the following does NOT constitute a buffer?
- A.  $\text{H}_3\text{BO}_3$  and  $\text{H}_2\text{BO}_3^-$
  - B.  $\text{H}_2\text{PO}_4^-$  and  $\text{HPO}_4^{2-}$
  - C.  $\text{H}_2\text{CO}_3$  and  $\text{HCO}_3^-$
  - D.  $\text{CH}_3\text{COOH}$  and  $\text{CH}_3\text{COO}^-$
  - E. All of the above are examples of buffer solutions.
25. Determine the INCORRECT statement below concerning blood pressure:
- A. A patient exhibiting a blood pressure reading of 155/96 should take medication to counter Stage 1 Hypertension.
  - B. Blood pressure can be measured at the brachial artery in the arm using a sphygmomanometer.
  - C. As blood moves down the arteries and the heart prepares for another beat, the blood pressure drops temporarily, and the lowest pressure reached is called the systolic pressure.
  - D. A stethoscope is used to listen for the sound of blood as it first begins to flow through the constricted artery.
  - E. A proper dietary adjustment and increased exercise is a noteworthy suggestion for a patient with a blood pressure reading of 130/84.

END OF MULTIPLE CHOICE

26. (20 pts. total; 4 pts. each) Write BALANCED equations (net ionic where appropriate) for each laboratory situation described below. *Assume that solutions are aqueous unless otherwise indicated.* Write NR if no reaction occurs.

A. Solid sucrose ( $C_{12}H_{22}O_{11}$ ) is burned in air.

B. Sulfuric acid,  $H_2SO_4$ , is combined with barium hydroxide,  $Ba(OH)_2$ .

C. Hydrogen gas is reacted with gold(III) chloride.

D. Sodium chloride is mixed with ammonium phosphate.

E. Lithium sulfate is added to silver nitrate.

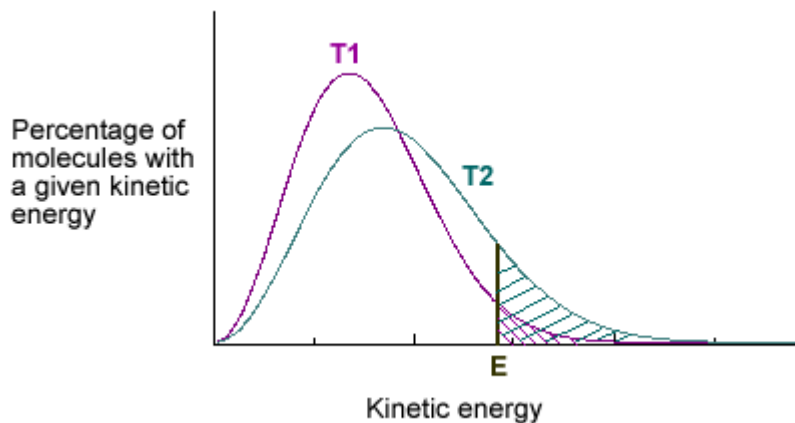
27. (30 pts. total) **APPLICATIONS AND OWL!**

A. (6 pts.) Consider the following vapor pressure and temperature data:

Liquid	Vapor Pressure (torr)	Temperature (°C)
$\text{CH}_3\text{CH}_2\text{NH}_2$	400	2.0
$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$	400	100.8

- 1) (3 pts.) In which liquid are the intermolecular attractive forces the weakest? Briefly explain.
- 2) (3 pts.) Which liquid would be expected to have the highest normal boiling point? Briefly explain.

B. (6 pts.) Consider the kinetic energy distribution of a hypothetical liquid at various temperatures  $T_1$  and  $T_2$ :



Is the vapor pressure of this liquid expected to be higher at  $T_1$  or  $T_2$ ? Briefly explain.

C. (6 pts.) A sample of argon gas at 304 K and 0.602 atm occupies a volume of 4.13 L. If the gas is compressed into a smaller volume while at the same time heated to a higher temperature, what can you conclude about the final gas pressure?

D. (6 pts.) **Figure It Out!** A solution contains one or more of the following ions:  $\text{Ag}^+$ ,  $\text{Ca}^{2+}$ , and/or  $\text{Cu}^{2+}$ . When NaCl is added to the solution, no solid is formed. When  $\text{Na}_2\text{SO}_4$  is added to the solution, a white solid is formed. The precipitate is filtered off, and  $\text{Na}_2\text{CO}_3$  is added to the remaining solution, producing another solid. Which ion(s) is/are present in the original solution? Briefly explain. NO CREDIT FOR GUESSING!

E. (6 pts.) Briefly define/explain each of the following terms:

1) (2 pts.) Arrhenius base

2) (2 pts.) STP

3) (2 pts.) indicator