

# SCH 3U FINAL EXAM: PRACTICE

## PART A: Multiple Choice:

Identify the letter of the choice that best completes the statement or answers the question.

- The substance  $\text{HBr}_{(\text{aq})}$  is called
  - aqueous bromine
  - aqueous hydrogen bromine
  - hypobromic acid
  - hydrobromic acid
  - bromic acid
- The mass found in 0.10 mol of  $\text{KHC}_4\text{H}_4\text{O}_6$  is
  - 4.6 g
  - 19 g
  - 23.7 g
  - 37.6 g
  - 55.8 g
- The limiting reagent of a chemical reaction is
  - the reactant of a chemical process that is not consumed completely
  - the product of a chemical process that is consumed completely
  - the product of a chemical process that is not consumed completely
  - the reactant of a chemical process that is consumed completely
  - none of the above
- Zinc and sulphur react to form zinc sulfide, as shown in the following chemical equation:  
 $\text{Zn} + \text{S} \rightarrow \text{ZnS}$   
If 8.00 g of zinc and 8.00 g of sulphur are available for this reaction, the limiting reagent will be
  - Zinc
  - Sulphur
  - zinc sulfide
  - both zinc and sulphur
  - cannot be determined
- In an experiment, 8.50 g of methane,  $\text{CH}_4$ , was reacted with 15.9 g of oxygen gas as shown in the following equation:  $\text{CH}_{4(\text{g})} + 2\text{O}_{2(\text{g})} \rightarrow \text{CO}_{2(\text{g})} + 2\text{H}_2\text{O}_{(\text{g})}$   
Determine the percentage yield if 9.77 g of carbon dioxide was obtained in the lab.
  - 78.4%
  - 81.9%
  - 82.3%
  - 87.1%
  - 89.4%
- Which of the following is not a solution?
  - oxygen in water
  - tin in copper (bronze)
  - sand in water
  - sugar in water
  - seawater
- The separation of ions that occur as ionic compounds dissolve in water is known as
  - Dissociation
  - Separation
  - Protonation
  - dissolving
  - deportation
- The dissociation equation  $\text{K}_3\text{PO}_{4(\text{s})} \rightarrow 3\text{K}^+_{(\text{aq})} + \text{PO}_4^{3-}_{(\text{aq})}$  represents
  - soluble potassium phosphate
  - insoluble sodium phosphate
  - soluble potassium carbonate
  - soluble potassium phosphide
  - soluble potassium phosphite
- The most important step in the water treatment process is
  - Softening
  - Disinfection
  - Aeration
  - fluoridation
  - none of the above
- What volume of water should be added to 500 mL of a 1.0 mol/L  $\text{CuSO}_4$  solution to dilute it to 0.5 mol/L?
  - 500 mL
  - 1.0 L
  - 250 mL
  - 125 mL
  - 375 mL
- A solution that contains the maximum quantity of a solute at a specific temperature is
  - Saturated
  - Unsaturated
  - Supersaturated
  - dissolved
  - none of the above

12. Which of the following is the correct net ionic equation for aluminum metal placed into copper(II) chloride?
- $2\text{Al}_{(s)} + 3\text{Cu}^{2+}_{(aq)} \rightarrow 3\text{Cu}_{(s)} + 2\text{Al}^{3+}$
  - $\text{Al}_{(s)} + \text{CuCl}_{2(aq)}$
  - $\text{Al}_{(s)} + \text{Cu}^{+}_{(aq)} \rightarrow \text{Cu}_{(s)} + \text{Al}^{3+}_{(aq)}$
  - $3\text{Al}_{(s)} + 2\text{Cu}^{2+}_{(aq)} \rightarrow 2\text{Cu}_{(s)} + 3\text{Al}^{3+}$
  - none of the above
13. Screening, flotation, settling, and filtering out of solid particles in wastewater occurs during the
- secondary treatment
  - tertiary treatment
  - primary treatment
  - quaternary treatment
  - all of the above
14. Which of the following anions in solution would precipitate the silver ion,  $\text{Ag}^{+}$ ?
- $\text{SO}_4^{2-}$
  - $\text{S}^{2-}$
  - $\text{Cl}^{-}$
  - all of the above
  - a and b only
15. Which of the following compounds is insoluble in water?
- $\text{CaCl}_2$
  - $\text{Al}(\text{NO}_3)_3$
  - $\text{PbBr}_2$
  - $\text{Li}_2\text{CO}_3$
  - $\text{NH}_4\text{OH}$
16. Which of the following is the correct dissociation reaction for calcium hydroxide?
- $\text{Ca}(\text{OH})_{2(s)} \rightarrow \text{Ca}^{2+}_{(aq)} + 2\text{OH}^{-}_{(aq)}$
  - $\text{CaOH}_{(s)} \rightarrow \text{Ca}^{+}_{(aq)} + \text{OH}^{-}_{(aq)}$
  - $\text{Ca}(\text{OH})_{2(s)} \rightarrow 2\text{Ca}^{2+}_{(aq)} + \text{OH}^{-}_{(aq)}$
  - $\text{Ca}(\text{OH})_{3(s)} \rightarrow \text{Ca}^{3+}_{(aq)} + 3\text{OH}^{-}_{(aq)}$
  - $\text{Ca}(\text{OH})_{2(s)} \rightarrow 2\text{Ca}^{2+}_{(aq)} + 2\text{OH}^{-}_{(aq)}$
17. Which of the following is NOT a property of bases?
- They react with active metals.
  - They taste bitter and feel slippery.
  - They have a pH greater than 7.
  - They turn red litmus blue.
  - They neutralize acids.
18. Which statement about 0.1 mol/L acetic acid and 0.1 mol/L hydrochloric acid solutions is true?
- HCl dissociates almost completely into ions.
  - $\text{HC}_2\text{H}_3\text{O}_2$  does not dissociate completely into ions.
  - There is no difference in pH.
  - both a and b
  - none of the above
19. A lab procedure involving the careful addition of an acid from a buret is called
- titration
  - dilution
  - endpoint
  - standard
  - distillation
20. The state of matter characterized by a definite volume and a shape based on the form of the container is
- gas
  - liquid
  - solid
  - plasma
  - glass
21. The constant bombardment on the walls of a rigid container by gas molecules can be used to determine what characteristic of the gas?
- pressure
  - mass
  - volume
  - density
  - rate of diffusion
22. Doubling the initial pressure while keeping the temperature constant causes the volume of a gas to go from 1000 mL to
- 2000 mL (double)
  - 500 mL (halved)
  - 1000 mL (constant)
  - about 900 mL (slight decrease)
  - 1100 mL (increase slightly)

23. How many moles of  $\text{KClO}_3$  are needed to form 2.8 L of  $\text{O}_2$ , measured at STP, according to the following reaction:  $2\text{KClO}_3 \rightarrow 2\text{KCl} + 3\text{O}_2$
- |              |             |
|--------------|-------------|
| a. 0.083 mol | d. 0.25 mol |
| b. 0.17 mol  | e. 0.50 mol |
| c. 0.33 mol  |             |
24. What volume of chlorine gas, measured at  $0^\circ\text{C}$  and 101.325 kPa, is required to react completely with 5.61 g of  $\text{KOH}$  in the following reaction:  $\text{Cl}_2(\text{g}) + 2\text{KOH} \rightarrow \text{KCl} + \text{KClO} + \text{H}_2(\text{g})$
- |           |           |
|-----------|-----------|
| a. 0.56 L | d. 4.48 L |
| b. 1.12 L | e. 22.4 L |
| c. 2.24 L |           |
25. The number of molecules in 1.00 L of  $\text{O}_2$  gas at STP is
- the same as the number of molecules in 1.00 L of  $\text{H}_2$  gas at STP
  - 16 times the number of molecules in 1.00 L of  $\text{H}_2$  at STP
  - $\frac{1}{16}$  times the number of molecules in 1.00 L of  $\text{H}_2$  at STP
  - $6.02 \times 10^{23}$
  - variable due to the porosity of the container
26. Blackberries have a  $[\text{H}^+_{(\text{aq})}] = 4.0 \times 10^{-4}$  mol/L. What is their pH?
- |        |        |
|--------|--------|
| a. 3.4 | d. 8.0 |
| b. 4.0 | e. 5.0 |
| c. 2.0 |        |

### PART B: Short Answer

(15 marks)

Answer all questions in the space provided.

- For each pair, state one **SIMILARITY** and one **DIFFERENCE**. Use **EXAMPLES** to show how the terms in each pair are different. Proper sentences must be used.
  - Concentration and strength of an acid
  - Charles' Law and Boyle's Law

### PART C: Problems

(20 marks)

Answer all questions in the space provided. Show complete solutions for full marks.

All answers must be expressed using correct significant digits.

- What is the empirical formula of a compound whose percentage composition is found to be 2.20% hydrogen, 26.7% carbon, and 71.1% oxygen?  
(4 marks)
- Sodium hydroxide and hydrogen sulphide combine to form sodium sulphide and water. Determine the mass of sodium sulphide produced when 9.19 g of hydrogen sulphide is combined with 16.1 g of sodium hydroxide.  
(5 marks)
- For a chemical analysis, 750 mL of a 0.480 mol/L potassium permanganate solution,  $\text{KMnO}_4(\text{aq})$  is to be prepared. Calculate the mass of potassium permanganate crystals that will be dissolved to make this solution.  
(3 marks)
- Determine the volume occupied by 3.45 g of carbon dioxide gas at SATP.  
(3 marks)
- Magnesium was added to hydrochloric acid,  $\text{HCl}$ , and produced 5.25 L of  $\text{H}_2$  gas at a temperature of 325 K and a pressure of 100 kPa. What mass of  $\text{Mg}$  was used in this single displacement reaction?  
(5 marks)