

Name: \_\_\_\_\_

## CHM 101 Final Exam

### True/False

Indicate whether the statement is true or false.

- \_\_\_ 1. The formula weight of an ionic compound is analogous (similar) to a molecular weight of a covalent compound.
- \_\_\_ 2. Absolute zero is  $0^{\circ}\text{C}$ .
- \_\_\_ 3.  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$  are isoelectronic.
- \_\_\_ 4. The name for the compound formed between  $\text{Co}^{3+}$  and  $\text{O}^{2-}$  is cobalt(II) oxide.
- \_\_\_ 5. Attractive forces between solute and solvent molecules are an important factor in solution formation.
- \_\_\_ 6. The reactions  $\text{NaOH} + \text{HCl} \rightarrow \text{H}_2\text{O} + \text{NaCl}$  and  $\text{Ca}(\text{OH})_2 + 2\text{HBr} \rightarrow 2\text{H}_2\text{O} + \text{CaBr}_2$  have the same net ionic equation.
- \_\_\_ 7. Neutral isotopes of the same element have the same number of electrons.
- \_\_\_ 8. One mole of an element would weigh the same as a mole of an isotope of the same element.
- \_\_\_ 9. In the reaction  $\text{Zn} + \text{Cu}(\text{NO}_3)_2 \rightarrow \text{Cu} + \text{Zn}(\text{NO}_3)_2$ , the Zn is reduced.
- \_\_\_ 10. The number twelve, representing a dozen, has two significant figures.
- \_\_\_ 11. If 6526 is added to 15.0, the answer should have two significant figures.
- \_\_\_ 12. There is a 12 M aqueous HCl solution in the stock room, but a 6 M solution is required for an experiment. Doubling the volume of a 12 M sample with water will produce a 6 M solution.
- \_\_\_ 13. In an exothermic reaction, heat is liberated to the surroundings.

### Short Answer

14. If 5 grams of CO and 5 grams of  $\text{O}_2$  are combined according to the reaction  $2\text{CO} + \text{O}_2 \rightarrow 2\text{CO}_2$ , which is the limiting reagent?

15. A sample of gas collected at 21.0°C and a pressure of 0.698 atm has a volume of 1.83 liters. What volume in liters will the gas occupy at 38.0°C under a pressure of 0.658 atm?
16. Given the equation  $2\text{CO} + \text{O}_2 \rightarrow 2\text{CO}_2$ , how many grams of  $\text{CO}_2$  form if 34.0 grams of  $\text{CO}$  are combined with excess oxygen?
17. If urine has a density of 1.08 g/mL, what would be the mass of a 125 mL urine sample?
18. A 0.488 g sample of an unknown acid (monoprotic) requires 40.7 ml of 0.100 M  $\text{NaOH}$  for complete neutralization. What is the molecular weight of the acid in g/mol?
19. At 1.500 atm and 20 degrees C, it was found that 11.15 L of a gas weighed 30.76 g. What is its molecular mass in grams?
20. How many moles of  $\text{Na}_2\text{CO}_3$  would be needed to react with 750 mL of 0.250 M  $\text{H}_2\text{SO}_4$  solution?  
 $\text{Na}_2\text{CO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{CO}_2 + \text{H}_2\text{O}$



- \_\_\_ 29. Which of the following correctly arranges 1.00 M solutions of the strong electrolytes in order of increasing boiling point (lowest to highest)?
- a.  $\text{Al}(\text{NO}_3)_3 < \text{Mg}(\text{NO}_3)_2 < \text{NaNO}_3$       c.  $\text{Mg}(\text{NO}_3)_2 < \text{Al}(\text{NO}_3)_3 < \text{NaNO}_3$   
 b.  $\text{NaNO}_3 < \text{Mg}(\text{NO}_3)_2 < \text{Al}(\text{NO}_3)_3$       d. all have the same boiling point.
- \_\_\_ 30. What is the volume of a solid that has a density of  $3.14\text{g/cm}^3$  and has a mass of 7.04 grams?
- a.  $2.242\text{ cm}^3$   
 b.  $22.11\text{ cm}^3$   
 c.  $2.24\text{ cm}^3$   
 d.  $22.1\text{ cm}^3$
- \_\_\_ 31. What pressure will 3.20 mol of  $\text{N}_2$  gas exert if confined in a 15.0 L container at  $100^\circ\text{C}$ ?
- a. 13.0 atm  
 b. 6.53 atm  
 c. 3.27 atm  
 d. 1.75 atm
- \_\_\_ 32. How many unpaired electrons in As?
- a. 3      c. 1  
 b. 4      d. 2
- \_\_\_ 33. What is the oxidation number of Mn in  $\text{KMnO}_4$ ?
- a. +4      b. +7      c. +5      d. +9
- \_\_\_ 34. Iodine,  $\text{I}_2$ , is very slightly soluble in water, a polar solvent, but quite soluble in toluene, a nonpolar solvent. What can be inferred about the nature of the  $\text{I}_2$  molecule?
- a. It is polar.  
 b. It is ionic.  
 c. It is nonpolar.  
 d. Nothing can be inferred.
- \_\_\_ 35. Which element is represented by the distinguishing electron configuration  $5d^9$ ?
- a. Pd      b. Au      c. Ag      d. Pt
- \_\_\_ 36. A solution is made by dissolving 5.84 grams of NaCl in enough distilled water to give a final volume of 1.00 L. What is the molarity of the solution?
- a. 0.400      b. 1.00      c. 0.100      d. 0.0250
- \_\_\_ 37. How many electrons are in the outer shell of element 15?
- a. 3      b. 2      c. 5      d. 15
- \_\_\_ 38. What is the shell number for the outer shell electrons in bromine, Br?
- a. 6      b. 5      c. 3      d. 4
- \_\_\_ 39. Which of the following distinguishing electron configurations is characteristic of noble gases?
- a.  $ns^2$       b.  $nd^{10}$       c.  $nf^{14}$       d.  $np^6$

- \_\_\_ 40. The radius of a K atom is \_\_\_ a Ca atom.
- smaller than
  - inverted from
  - larger than
  - equal to

- \_\_\_ 41. In the reaction  $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$ , 2.0 mol water will produce how many grams of  $\text{O}_2$ ?

- a. 36                      b. 64                      c. 32                      d. 16

- \_\_\_ 42. Based on data obtained in an experiment, to determine the density of a metal, the following calculation is carried out. Express the answer to the correct number of significant figures.

$$\frac{57.675 \text{ g} - 3.047 \text{ g}}{25.65 \text{ mL} - 0.15 \text{ mL}} = 2.1422745098 \text{ g/mL}$$

- a. 2.1 g/mL                      c. 2.142 g/mL  
b. 2.14 g/mL                      d. 2.1423 g/mL

- \_\_\_ 43. The limit of physical subdivision of pure  $\text{H}_2\text{O}$  is
- the element
  - the atom
  - a proton
  - the molecule

- \_\_\_ 44.  $\text{NH}_3$  (ammonia) would have what electron group geometry according to VSEPR theory?
- tetrahedral
  - pyramidal
  - trigonal planar
  - none of these

- \_\_\_ 45. Ethylene dichloride is an effective cooling agent when allowed to evaporate. The heat of vaporization is 21.4 Joules per gram. How much heat could be removed from the skin if 2.70 grams of ethylene dichloride were sprayed on and allowed to evaporate?
- 31.6 J
  - 0.126 J
  - 57.8 J
  - 7.93 J

- \_\_\_ 46. Which element has the largest atomic radius?
- a. Cs                      b. Li                      c. I                      d. F

- \_\_\_ 47. Which of the following would you expect to be the most polar molecule?
- a.  $\text{H}_2\text{S}$                       b.  $\text{CO}_2$                       c. KCl                      d.  $\text{SiH}_4$