

Name: Answer Key Hour: _____

Chapter 11 Test Review (Honors Chemistry)

1. Know the following Vocabulary:

- Mole
- Avogadro's Number
- Representative Particle (Give examples)
- Atom
- Molecule
- Formula unit
- STP
- Molar mass
- Percent Composition
- Hydrate
- Anhydrous salt
- Empirical Formula
- Molecular Formula
- GMM
- GAM
- GFM

2. Given 1 mole of Nitrogen trihydride gas at STP, answer the following:

Formula: NH₃

a. What is the volume, in liters?

22.4 - L

b. How many representative particles exist? (*Be specific about the type of representative particle*)

6.02×10^{23} molecules

c. What is the molar mass?

17-g/mol

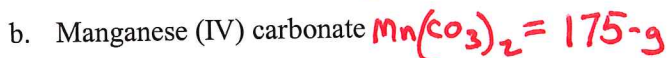
d. What is the density?

$\frac{17 \text{ g} / 1 \text{ mol}}{\text{mol} / 22.4 \text{ - L}} = .76 \text{ g/L}$

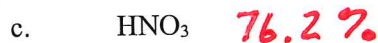
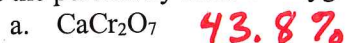
3. What are the 3 ways in which matter is measured and what are the units used?

Counting, Mass, Volume

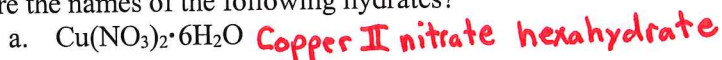
4. What is the molar mass of the following substances:



5. What is the percent by mass of oxygen in the following substances?



6. What are the names of the following hydrates?



7. Heating 7.0-grams of a hydrate produced 5.4-grams of anhydrous salt. What percentage of water was in the hydrate?

$$\frac{1.6-g H_2O}{7.0-g Hydrate} \times 100 = 22.9\% H_2O$$

8. What mass of anhydrous $CuSO_4$ remains after heating 75.0-grams of $CuSO_4 \cdot 5H_2O$?

MOLAR MASS = 250-g

$$\frac{166-g CuSO_4}{250} \times 100 = 64\% \quad 75 \times .64 = 48-g \text{ Anhydrous } CuSO_4$$

9. How many oxygen atoms are in 3.4 moles of glucose, $C_6H_{12}O_6$?

3.4 mol $C_6H_{12}O_6$	6.02×10^{23} molecules	6-O atoms	=	1.23×10^{25} O atoms
	1 mol	1 molecules		

10. How many chlorine ions are in 5.0 moles of the compound $MgCl_2$?

5.0 mol $MgCl_2$	6.02×10^{23} FU	2- Cl^- ions	=	6.02×10^{24} Cl^- ions
	1 mol	1 FU		

11. What are the empirical formulas for the following compounds?



12. Which of the following gases has a density of 1.965 g/L at STP? (CO , CO_2 , NH_3 , O_2)

$$\frac{1.965-g}{L} \times \frac{22.4-L}{1 mol} = 44 g/mol = CO_2$$

13. If the density of a gas at STP is 2.857 g/L, what is the molar mass of the gas?

$$\frac{2.857 g}{L} \times \frac{22.4-L}{1 mol} = 64 g/mol$$

14. What is the empirical formula of a substance containing 22.1% aluminum, 25.4% phosphorus, 52.5% oxygen?

Al: $\frac{22.1-g Al}{27-g} \times \frac{1 mol}{.819} = 1$ O: $\frac{52.5-g}{16-g} \times \frac{1 mol}{3.28} = 4$

P: $\frac{25.4-g}{31-g} \times \frac{1 mol}{.819} = 1$



15. A compound has a molar mass of 210-grams and an empirical formula of $C_3H_6N_2$. What is the molecular formula of the compound? $EFM = 70-g$

$$\frac{210}{70} = 3 \times C_3H_6N_2 = \boxed{C_9H_{18}N_6}$$

16. What is the density of nitrogen gas at STP? (Do not use Scientific Notation)

$$\frac{28-g}{mol} \bigg| \frac{1mol}{22.4-L} = \boxed{1.25 \text{ g/L}}$$

17. A compound with a molar mass of 120-g has a percent composition of 40.0% Carbon, 53.4% Oxygen, and 6.6% Hydrogen. What is the molecular formula? $EF = CH_2O$

$$C: \frac{40-g}{12-g} \bigg| \frac{1mol}{3.33} = 1$$

$$O: \frac{53.4-g}{16-g} \bigg| \frac{1mol}{3.33} = 1$$

$$H: \frac{6.6-g}{1-g} \bigg| \frac{1mol}{3.33} = 2$$

$$EFM = 30-g$$

$$\frac{120-g}{30-g} = 4 \times CH_2O = \boxed{C_4H_8O_4}$$

18. What is the mass of oxygen present in a 563-gram sample of Chromium (III) chlorate?

$$Cr(ClO_3)_3 = \text{molar mass } 302.5 \quad \frac{144}{302.5} \times 100 = 47.6\%$$

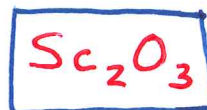
$$563 \times .476$$

$$\boxed{268-g \text{ O}}$$

19. What is the empirical formula when a sample is 65.2% Scandium and 34.8% Oxygen?

$$Sc: \frac{65.2-g}{45} \bigg| \frac{1.45}{1.45} = 1$$

$$O: \frac{34.8-g}{16} \bigg| \frac{2.18}{1.45} = 1.5$$



20. The density of a gaseous compound is 2.421 g/L at STP, what is the molar mass of the compound?

$$\frac{2.421 \text{ g}}{L} \bigg| \frac{22.4-L}{1mol} = \boxed{54.2 \text{ g/mol}}$$

21. What is the empirical formula for all of the following molecular formulas? (C_2H_6 , C_4H_{12} , C_6H_{18})



22. What are the 7 diatomic elements? $N_2, O_2, F_2, Cl_2, Br_2, I_2, H_2$

23. An unknown gas has a density of 1.96 g/L at STP, is it SO_2 , NH_3 , CO_2 , or F_2 ?

$$\frac{1.96 \text{ g}}{L} \bigg| \frac{22.4-L}{1mol} = 44 \text{ g/mol} = CO_2$$

24. The molar mass of a sample is 146 g. What is the molecular formula when the empirical formula is $C_3H_5O_2$?

$$EFM = 73-g$$

$$\frac{146-g}{73-g} = 2 \times C_3H_5O_2 = \boxed{C_6H_{10}O_4}$$

25. Calculate the empirical formula of a 1000-gram sample containing 247-grams of potassium, 347-grams of manganese, and 405-grams of oxygen.

$$K: \frac{247}{1000} \times 100 = \frac{24.7}{39} = \frac{.633}{.631} = 1$$

$$O: \frac{405}{1000} \times 100 = \frac{40.5}{16-g} \bigg| \frac{1mol}{.631} = \frac{2.53}{.631} = 4$$

$$Mn: \frac{347}{1000} \times 100 = \frac{34.7}{55} = \frac{.631}{.631} = 1$$



26. Convert 245 grams of Chlorine gas into representative particles

$$2.08 \times 10^{24} \text{ molecules}$$

$$\frac{245 \text{ g} \quad | \quad 1 \text{ mol} \quad | \quad 6.02 \times 10^{23} \text{ molecules}}{71 \text{ -g} \quad | \quad 1 \text{ mol}}$$

27. Convert 168 Liters of CO₂ at STP into molecules.

$$\frac{168 \text{ -L CO}_2 \quad | \quad 1 \text{ mol} \quad | \quad 6.02 \times 10^{23} \text{ molecules}}{22.4 \text{ -L} \quad | \quad 1 \text{ mol}}$$

$$4.52 \times 10^{24} \text{ molecules}$$

28. Convert 3.50 moles of Cobalt (III) Sulfate into grams.

$$\frac{3.50 \text{ mol Co}_2(\text{SO}_4)_3 \quad | \quad 406 \text{ -g}}{1 \text{ mol}}$$

$$1.42 \times 10^3 \text{ -g}$$

29. Convert 1.894×10^5 liters of NH₃ gas @ STP into grams

$$\frac{1.894 \times 10^5 \text{ -L NH}_3 \quad | \quad 1 \text{ mol} \quad | \quad 17 \text{ -g}}{22.4 \text{ -L} \quad | \quad 1 \text{ mol}}$$

$$1.437 \times 10^5 \text{ - grams}$$

30. Find the number of representative particles in 4.50 moles of silicon.

$$\frac{4.50 \text{ mol Si} \quad | \quad 6.02 \times 10^{23} \text{ atoms}}{1 \text{ mol}}$$

$$2.71 \times 10^{24} \text{ atoms}$$

31. How many moles are in 7.31×10^{25} molecules of CO₂?

$$\frac{7.31 \times 10^{25} \text{ molecules CO}_2 \quad | \quad 1 \text{ moles}}{6.02 \times 10^{23} \text{ molecules}}$$

$$1.21 \times 10^2 \text{ molecules}$$

32. What is the mass, in grams, of 4.53×10^{24} molecules of CO₂?

$$\frac{4.53 \times 10^{24} \text{ molecules CO}_2 \quad | \quad 1 \text{ mol} \quad | \quad 44 \text{ -g}}{6.02 \times 10^{23} \text{ molecules} \quad | \quad 1 \text{ mol}}$$

$$3.31 \times 10^2 \text{ grams}$$

33. How many moles are 143-grams of nitrogen gas?

$$\frac{143 \text{ -g} \quad | \quad 1 \text{ mol}}{28 \text{ -g}} = 5.11 \text{ -g}$$

34. Convert 7.601×10^{26} molecules of C₂H₆ into liters @ STP

$$\frac{7.601 \times 10^{26} \text{ molecules} \quad | \quad 1 \text{ mol} \quad | \quad 22.4 \text{ -L}}{6.02 \times 10^{23} \text{ molecules} \quad | \quad 1 \text{ mol}}$$

$$2.828 \times 10^4 \text{ -Liters}$$