

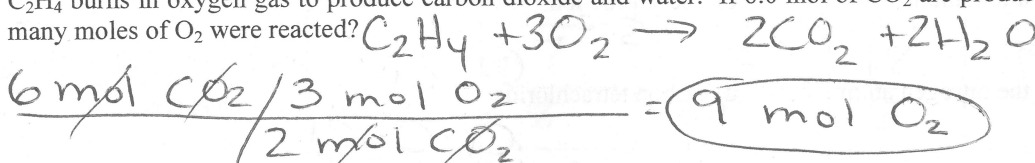
KEY

Review for Chemistry Final

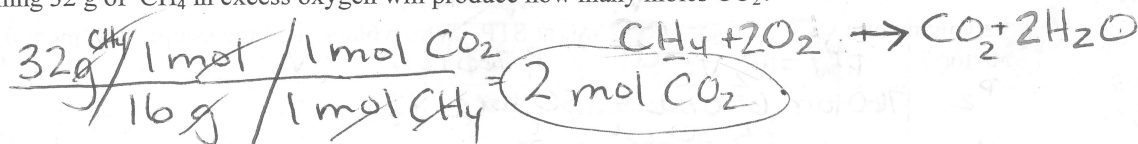
Know:

- 1) Know the Acids – Strong and Weak *list on notecard!*
- 2) How to count Sig figs *review rules*
- 3) How to round numbers to sig figs
- 4) How to name organic molecules *review P. point notes*
- 5) How to identify Lipids, Carbohydrates, and proteins (**NOT Seniors**)
- 6) How to identify molecule geometry (Linear, Bent or v-shape, and tetrahedral) *remember central e⁻*
- 7) How to calculate density ($D = m/V$)
- 8) How to calculate molar mass *use P.T*
- 9) How to convert units *g $\rightarrow$ mol g $\rightarrow$ g*
- 10) How to convert temperatures (K, °F, °C) $K = C + 273$
- 11) Water properties
- 12) How to use the heat equation ($Q = mC_p\Delta T$) **specific heat 4.184 J/g°C (H₂O)*
- 13) How to use the change in state heat formula ($Q = mH$)
- 14) How to use the periodic table to identify metals, non metals, special groups, ionic bonds, covalent bonds, the seven diatomics, etc. *L R + - - -*
- 15) The 3 basic subatomic particles and their properties *P, n, e,*
- 16) How to use the ideal gas law – both forms!
- 17) How to convert pressure units $1 \text{ atm} = 760 \text{ torr} = 760 \text{ mmHg} = 14.7 \text{ psi} = 101.3 \text{ kPa}$
- 18) How to calculate pH, POH, and concentrations of H and OH ions
- 19) How to balance reactions *use coefficients – cannot change subscripts*
- 20) How to calculate limited reactants *stoich!*
- 21) How to convert moles to grams and number of molecules

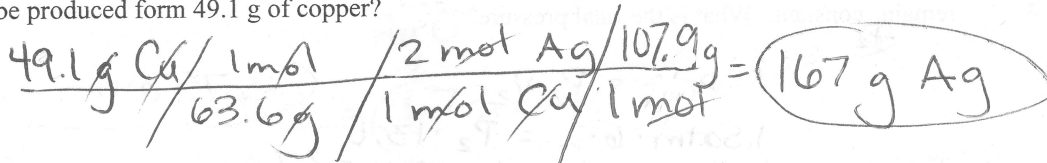
1. C_2H_4 burns in oxygen gas to produce carbon dioxide and water. If 6.0 mol of CO_2 are produced, how many moles of O_2 were reacted? *use molar mass* $6.022 \times 10^{23} \text{ molecules} = 1 \text{ mol}$



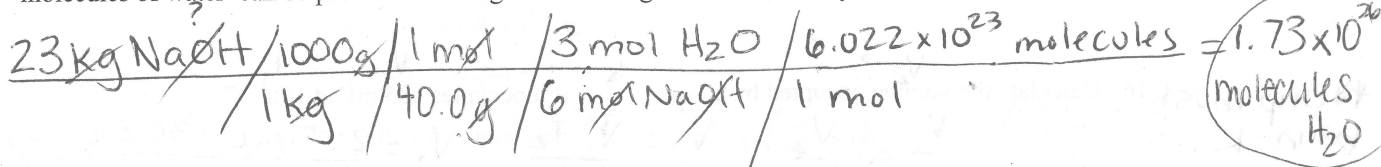
2. Burning 32 g of CH_4 in excess oxygen will produce how many moles CO_2 ?



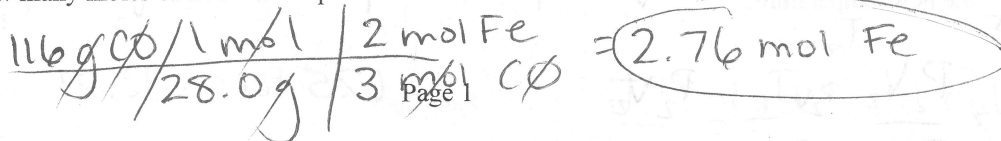
3. In the reaction: $Cu + 2AgNO_3 \rightarrow 2Ag + Cu(NO_3)_2$, what number of grams of silver can be produced from 49.1 g of copper?



4. In the reaction $3Cl_2 + 6NaOH \rightarrow 5NaCl + NaClO_3 + 3H_2O$, what number of molecules of water can be produced starting with 23 kilograms of sodium hydroxide and excess Cl_2 ?



5. Given: $Fe_2O_3 + 3CO \rightarrow 3CO_2 + 2Fe$. When 116 g of CO react with excess Fe_2O_3 , how many moles of iron will be produced?



SO₃

- 32.1

- 3x16

80.1 g/mol

Fe₃O₄

- 3x55.9

- 4x16

231.7 g/mol

6. Given: $2S + 3O_2 \rightarrow 2SO_3$, if 6.3 g of S are reacted with 10.0 g of O₂, show by calculation which one will be the limiting reagent.

$$\frac{6.3 \text{ g S}}{32.1 \text{ g/mol}} \cdot \frac{1 \text{ mol S}}{2 \text{ mol SO}_3} \cdot \frac{80.1 \text{ g SO}_3}{1 \text{ mol SO}_3} = 15.7 \text{ g SO}_3$$

$$\frac{10.0 \text{ g O}_2}{32.0 \text{ g/mol}} \cdot \frac{1 \text{ mol O}_2}{3 \text{ mol SO}_3} \cdot \frac{80.1 \text{ g SO}_3}{1 \text{ mol SO}_3} = 16.7 \text{ g SO}_3, \text{ O}_2 \text{ limiting reagent}$$

7. Fe₃O₄ reacts with CO according to the reaction $Fe_3O_4 + 4CO \rightarrow 4CO_2 + 3Fe$. If 201 g Fe₃O₄ is reacted with 234 g CO, what mass of CO₂ will be produced?

$$\frac{201 \text{ g Fe}_3\text{O}_4}{231.7 \text{ g/mol}} \cdot \frac{1 \text{ mol Fe}_3\text{O}_4}{4 \text{ mol CO}_2} \cdot \frac{44.0 \text{ g CO}_2}{1 \text{ mol CO}_2} = 153 \text{ g CO}_2$$

$$\frac{234 \text{ g CO}}{28.0 \text{ g/mol}} \cdot \frac{1 \text{ mol CO}}{4 \text{ mol CO}_2} \cdot \frac{44.0 \text{ g CO}_2}{1 \text{ mol CO}_2} = 369 \text{ g CO}_2$$

8. Metal atoms tend to lose electrons and form cation ions. (+)

9. What is the difference between ionic and covalent bonds? ionic - metal + nonmetal

10. What kinds of bonds do the following compounds contain? covalent - 2 non metals

11. The electron configuration for the Ca²⁺ ion is identical with all alkaline earth metals

12. Draw Lewis structures for:

a) ammonium

c) the sulfide ion

b) the nitrogen atom

d) carbon tetrachloride

13. The volume of a sample of gas is 650. mL at STP. What volume will the sample occupy at 0.0°C and 950. torr?

$$P_1 V_1 = P_2 V_2 \quad P_1 = 760 \text{ torr} \quad V_2 = ? \quad T_2 = 273 \text{ K}$$

$$P_2 = 950 \text{ torr} \quad 760 \text{ torr} \cdot 650 \text{ mL} = 950 \text{ torr} \cdot V_2$$

$$V_2 = \frac{760 \cdot 650}{950} = 520 \text{ mL}$$

14. A 6.5 L sample of nitrogen at 25 °C and 1.5 atm is allowed to expand to 13.0 L. The temperature remains constant. What is the final pressure?

$$P_1 V_1 = P_2 V_2$$

$$1.5 \text{ atm} \cdot 6.5 \text{ L} = P_2 \cdot 13.0 \text{ L}$$

15. The lowest possible temperature that can be reached is -273 °C or 0 K

temp must be in K.

16. Calculate the volume occupied by a gas at 35 °C if it occupies 285 mL at 100. °C.

$$\frac{V_1}{T_1} = \frac{V_2}{T_2} \quad V_2 = \frac{V_1 T_2}{T_1} \quad V_2 = \frac{285 \text{ mL} \cdot 308 \text{ K}}{373 \text{ K}} = 235 \text{ mL}$$

pressures must be in same units

17. A gas originally occupying 10.1 L at 0.925 atm and 25 °C, is changed to 12.2 L at 625 torr. What is the new temperature?

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2} \quad \frac{P_1 V_1 T_2}{P_2 V_2} = T_2$$

$$625 \text{ torr} \cdot 12.2 \text{ L} \cdot 298 \text{ K}$$

18. A 251-mL sample of gas at STP is heated to 45 °C. The final pressure is 1.10 atm. Calculate the volume of this gas under the new conditions.

$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

$$\frac{1 \text{ atm} \cdot 251 \text{ mL}}{273 \text{ K}} = \frac{1.10 \text{ atm} \cdot V_2}{318 \text{ K}}$$

$$V_2 = \frac{318 \text{ K} \cdot 1 \text{ atm} \cdot 251 \text{ mL}}{1.10 \text{ atm} \cdot 273 \text{ K}} = 266 \text{ mL}$$

19. A gas is collected over water at a certain temperature. The total pressure is 762 torr. The vapor pressure of water at this temperature is 17 torr. The partial pressure of the gas collected is 745 torr

$$P_T = P_1 + P_2$$

$$762 \text{ torr} = 17 \text{ torr} + P_2$$

20. How many liters of HCl measured at STP can be produced from 4.00 g of Cl_2 and excess H_2 according to the following equation: $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{HCl}(\text{g})$.

21. Calculate the pH of 0.0012 M HNO_3

$$\text{pH} = -\log[\text{H}^+] = -\log(0.0012)$$

$$\text{pH} = 2.92$$

$$K_w = \frac{[\text{H}^+]}{[\text{OH}^-]}$$

$$14 = \text{pH} + \text{pOH}$$

$$\text{pH} = -\log[\text{H}^+] \quad \text{pOH} = -\log[\text{OH}^-]$$

22. Fill in the chart below:

Periodic Group	Name	Symbol	#p	#n	#e	mass #
Alkaline	Sodium ion	Na^{+1}	11	12	10	23
Halogen	Chlorine ion	Cl^-	17	18	18	35
—	Oxygen	O	8	8	8	16
metal	Lead ion	Pb^{+4}	82	?	78	207
		$^{240}_{92}\text{U}$	92	148	92	240
Alkaline Earth metal	Calcium ion	Ca^{+2}	20	21	18	40

If you must be given mass # or neutrons to complete entire row.

23. Convert 375g of mercury(II)oxide to moles.

$$\frac{\text{Hg } 200.6}{0 \quad 16.0} = 216.6$$

$$\frac{375 \text{ g HgO}}{216.6 \text{ g}} = 1.73 \text{ mol HgO}$$

24. How many grams of sulfur are in one mole of sulfur?

$$32.1 \text{ g/mol}$$

25. How many molecules are in 795g of aluminum hydroxide?

$$\frac{795 \text{ g}}{78 \text{ g/mol}} = 10.19 \text{ mol}$$

$$10.19 \text{ mol} \times 6.022 \times 10^{23} \text{ molecules/mol} = 6.14 \times 10^{24} \text{ molecules}$$

$\text{Al}(\text{OH})_3$

Al - 27
O - 16 x 3
H - 1 x 3 = 3
78 g/mol