

Name

~~_____~~

First assignment

General Chemistry for dentistry

n. ~~_____~~

(1)

1	2	3	4	5	6	7
b	a	b	c	a	b	b
8	9	10	11	12	13	14
d	a	¹⁰ 10	b	c	a	c
15	16	17	18			
a	a	b	b			

Part (2)

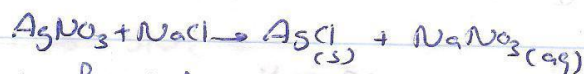
$$\begin{aligned}
 (1) \quad 25 \text{ g Al(NO}_3)_3 &\times \frac{1 \text{ mol Al(NO}_3)_3}{(26 + 9 \times 16 + 3 \times 14) \text{ g Al(NO}_3)_3} \times \frac{3 \text{ mol N}}{1 \text{ mol Al(NO}_3)_3} \times \frac{14 \text{ g N}}{1 \text{ mol N}} \\
 &= 4.952 \text{ g N}_2.
 \end{aligned}$$

(2)

$$\begin{aligned}
 (a) \quad \text{number of mol of AgNO}_3 &= \frac{MV}{\text{molarity}} \rightarrow \text{volume} = 0.33 \times 10^{-3} \times 26 \\
 &= 8.58 \times 10^{-3} \text{ mol AgNO}_3
 \end{aligned}$$

$$\text{number of mol of NaCl} = MV = 50 \times 10^{-3} \times 25 = 0.0125 \text{ mol of NaCl}$$

...then we calculate the Number of mol of product



number of mol of AgCl

$$= 8.58 \times 10^{-3} \text{ AgNO}_3 \times \frac{1 \text{ mol AgCl}}{1 \text{ mol AgNO}_3} = 8.58 \times 10^{-3} \text{ AgCl}$$

$$\text{number of mol of AgCl} = 0.0125 \text{ mol of NaCl} \times \frac{1 \text{ mol AgCl}}{\text{NaCl}}$$

$$= 0.0125 \text{ mol AgCl}$$

0.0125

the limiting reactant AgNO_3

$$b \text{ the concentration of reactant } \frac{12,5 \times 10^{-3} - 8,58 \times 10^{-3}}{12,5 \times 10^{-3} + 8,58 \times 10^{-3}} \\ = 18,95\% \text{ of } \text{AgCl} \text{ NaCl}$$

$$c) \text{ the theoretical is } 8,58 \times 10^{-3} \text{ mol of } \text{AgCl} \times 35,45 + 167,87 \text{ AgCl} \\ \text{1 mol of AgCl} \\ = 1,258 \text{ g}$$

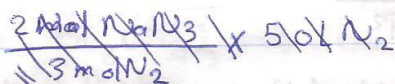
$$d) \text{ the percentage yield } \frac{\text{actual yield}}{\text{theoretical yield}} \times 100 \\ = \frac{980}{1255} \times 100\% = \underline{\underline{78,05\%}}$$

$$[3] \text{ Percent of Ca is } \frac{3 \text{ mol Ca}}{1 \text{ mol } (\text{Ca}_3(\text{PO}_4)_2)} \times \frac{40,08 \text{ g Ca}}{(40,08 \times 3) + (8 \times 16) + (30,97 \times 2)} \\ = 38,76\%$$

$$P = \frac{2 \text{ mol of P}}{1 \text{ mol } (\text{Ca}_3(\text{PO}_4)_2)} \times \frac{30,97 \text{ g of P}}{(30,97 \times 2) + (8 \times 16) + (3 \times 40,08)} \text{ Ca}_3(\text{PO}_4)_2 \\ = 19,46\%$$

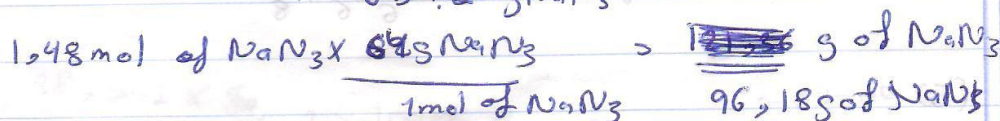
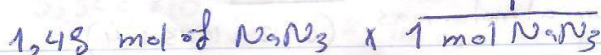
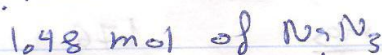
$$O = \frac{8 \text{ mol of O}}{1 \text{ mol } (\text{Ca}_3(\text{PO}_4)_2)} \times \frac{8 \times 16}{\text{mas of } (\text{Ca}_3(\text{PO}_4)_2)} = \frac{1056}{1360} = 77,6\% \\ \% 41,29$$

then the molecular formula is $C_{20}H_{24}N_2O_2$



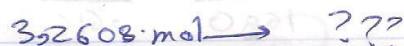
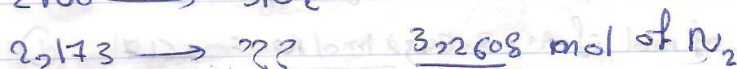
$50 \text{ L } N_2 = 50 \text{ L } N_2 \times \frac{1 \text{ mol } N_2}{22.4 \text{ L}} = 2.23 \text{ mol } N_2$

~~2.23~~



(2) 50g of Sodium.

$50 \text{ g} \times \frac{1 \text{ mol } Na}{22.99} = 2.173 \text{ mol of } Na$



$= \frac{73.043}{22.4} = 3.2608 \text{ mol} \quad (9)$

(4) $C_{12}H_{16}O_3 \rightarrow 1.8415 \text{ g of C}$
 0.206 g of H

2.453 g of O

$$\text{the number of mol of C} = \frac{1.8415 \text{ g}}{12} \times \frac{1 \text{ mol C}}{1} = \frac{0.1534}{0.153} = 1 \times 3 = 3$$

$$\text{the number of mol of H} = \frac{0.206 \text{ g}}{1} \times \frac{1 \text{ mol H}}{1} = \frac{0.206}{0.153} = 1.34 \times 3 = 4$$

$$\text{the number of mol of O} = \frac{2.453 \text{ g}}{16} \times \frac{1 \text{ mol O}}{1} = \frac{0.1533}{0.1533} = 1 \times 3 = 3$$

the empirical is $C_3O_3H_4$

$$\frac{\text{molar mass}}{\text{empirical molar mass}} = \frac{1.76}{(3 \times 12 + 16 \times 3 + 4)} = 2$$

the molecular formula is $C_6O_6H_8$

(5) $74.03 \text{ g} \rightarrow$

we suppose that we have 100 g of material

$$\text{the number of mol of C} = \frac{74.03 \text{ g}}{12 \text{ g of C}} \times \frac{1 \text{ mol of C}}{1} = \frac{6.169 \text{ mol}}{0.6162} = 10$$

$$\text{the number of mol of H} = \frac{7.47 \text{ g}}{1 \text{ g of H}} \times \frac{1 \text{ mol of H}}{1} = \frac{7.47 \text{ mol}}{0.6162} = 12.1$$

$$\text{the number of mol of N} = \frac{8.284 \text{ g}}{14 \text{ g of N}} \times \frac{1 \text{ mol of N}}{1} = \frac{0.5917}{0.616} = 1$$

$$\text{the number of mol of O} = \frac{9.86 \text{ g}}{16 \text{ g of O}} \times \frac{1 \text{ mol of O}}{1} = \frac{0.6162}{0.616} = 1$$

the empirical formula is $C_{10}H_{12}NO$

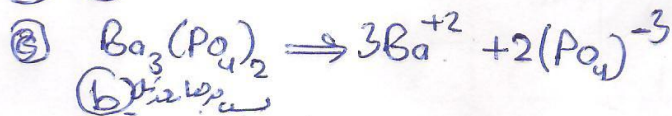
$$\frac{\text{molar mass}}{\text{empirical molar mass}} = \frac{325}{12 \times 10 + 16 + 14} = 2$$

① choose the correct answer.

① $(8+14) + (4 \times 16) + 32$

$\frac{64}{132} \times 64 = 31$ (b) 30.7

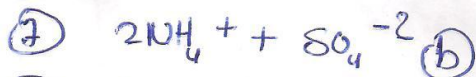
② (a)



④ c

⑤ a

⑥ (b)



⑧ d

⑨ $3.32 \times 10^{-5} \text{ g C} \times \frac{1 \text{ mol}}{242.06} = 1.37 \times 10^{-7}$ (a)

⑩

⑪

$28.992 \times \frac{90}{100} + 5.100 \times \frac{10}{100} \times 80.92 = 29.90$

$5.7892 + 80.92 + 5.8092 = 79.90$

1 = 5 $\frac{80.92}{100} = 0.8092$

$5.02 = 1.02$

(b) 49% = $\frac{49}{100} \times 100 = 49$

⑫

$\frac{1.3 \times 10^{12} \times 15}{1.3 \times 10^{12}} \rightarrow 15$
 $\frac{1.3 \times 10^{12}}{1} \rightarrow 15$

(c)

$\frac{1.538 \times 10^{-11} \times 1 \text{ mol}}{10 \times 1.24} \times \frac{6.022 \times 10^{23} \text{ atoms}}{55.85 \text{ g/mol}}$

⑬

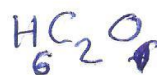
$52.2 \times \frac{1 \text{ mol}}{13} = \frac{4.35}{13 \text{ mol}} \times 2 = 2$

$13 \times \frac{12}{1 \text{ mol}} = \frac{4.35}{13 \text{ mol}} \times 2 = 6$

$\frac{34 \times \text{mol}}{16} = \frac{2.125}{16}$

$\frac{2.125}{16} \times 2 = 0.2656$

$2485 \times 2 = 4970$



(a)

First assignments 1st 2012-13 General chemistry for dentistry

Name: Amjad Al karriri

Part II: Choose the most correct answer

1. Determine % by weight of oxygen in 64.00 g of $(\text{NH}_4)_2(\text{SO}_4)$.
 $\frac{182}{84} \rightarrow 64$
 $\frac{84}{31.03} \rightarrow 31.03$
 $\frac{31.03}{64}$
 a. 48.5% b. 30.7% c. 36.2% d. 79.0%
2. An atom becomes an anion if it
 a. Gains electron b. Loses electron c. Shares electrons d. (a) and (b)
3. Identify the ions in $\text{Ba}_3(\text{PO}_4)_2$
 a. Ba^{2+} , P^{3-} , and O^{2-} c. 2Ba^+ and PO_4^{3-}
 b. 3Ba_2^{2+} and 2PO_4^{3-} d. 2Ba^{2+} and $3(\text{PO}_4)^{3-}$
4. An atom containing which one of the following is an isotope of carbon?
 a. 6 neutrons and 7 protons b. 7 neutrons and 6 protons
 b. 12 neutrons and 12 protons d. 13 neutrons and 13 protons
5. In a chemical reaction, the chemicals one starts with are called the:
 a. Reagents b. Reacting chemicals c. Products d. All of the above
6. An atom becomes a cation if it
 a. Gains electron b. Loses electron c. Shares electrons d. Both of a and b
7. Identify the ions in $(\text{NH}_4)_2\text{SO}_4$
 a. N^{3-} , H^+ , S^{2-} , and O^{2-} c. NH_2^{2+} and H_2SO_4
 b. 2NH_4^+ and $(\text{SO}_4)^{2-}$ d. NH_4^+ and $(\text{SO}_4)^-$
8. What is the mass number of an atom of nitrogen that has 8 neutrons?
 a. 8 b. 7 c. 14 d. 15
9. How many moles are in 3.32×10^{-5} g of the element Californium (Cf)?
 TIP: This element belongs to the "Actinides" row of the periodic table.
 a. 1.32×10^{-7} b. 9.81×10^{-5} c. 2.22×10^{-6} d. 5.14×10^{-4}
10. In which of the following pairs do the ions have the same number of electrons?
 a. H^+ and H^- b. Fe^{3+} and Ca^{2+} c. Ba^{+2} and Na^{+1} d. F^- and Cl^-
11. Bromine (Br) has two isotopes, with masses of 78.92 and 80.92 amu. What is the natural abundance of the heavier isotope?
 a. 53% b. 49% c. 13% d. 68%

12. In the blood of an infant there are about 1.3×10^{12} red blood cells, which contain a total of 0.15 g of iron ions. On the average, how many iron ions are present in each red blood cell of an infant? NOTE: to solve this problem consider the atomic weight of an iron ion to be the same as the atomic weight of elemental iron.

a. 8.8×10^{23} b. 4.7×10^{13} c. 1.2×10^9 d. 3.0×10^8

13. What is the empirical formula of an unknown compound that contains 52.2% carbon, 13.0% hydrogen and 34.8% oxygen?

a. C_2H_6O b. C_3H_8O c. C_2H_5OCl d. $C_5H_{10}O$

14. The set of quantum numbers, $n = 3, l = 2, m_l = 0$

a. is not allowed
b. describes an electron in a 2d
c. orbital describes one of five orbitals of a similar type
d. describes an electron in a 3p orbital

15. Four electrons in an atom have the quantum number given below. Which electron is at the highest energy?

a. $n=3, l=0, m_l=0, m_s=-1/2$ b. $n=5, l=0, m_l=+1, m_s=+1/2$ c. $n=3, l=2, m_l=-2, m_s=+1/2$ d. $n=4, l=1, m_l=-1, m_s=-1/2$

16. Identify the subshell in which electrons with the quantum numbers $n = 6, l = 1$ may be found.

a. 6p b. 6f c. 6d d. 5p

17. Which of the following sets of quantum numbers is not allowed?

a. $n = 2, l = 1, m_l = 0$ b. $n = 3, l = 2, m_l = -1$ c. $n = 3, l = 0, m_l = -1$ d. $n = 4, l = 3, m_l = -1$

18. What is the total number of orbitals in the $n = 4$ level?

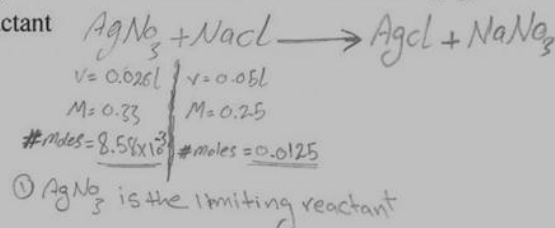
a. 8 b. 16 c. 32 d. 12

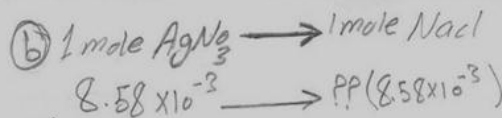
Part II: Solve the following problems: Show all your calculations.

- [1]. What is the mass of nitrogen in 25.0 g of $Al(NO_3)_3$?
25.0g $\rightarrow$ 42.9g N
25.0g $\rightarrow$ 4.929g

- [2]. If 26 mL of 0.33 M $AgNO_3(aq)$ are reacted with 50 mL of 0.25 M $NaCl(aq)$,

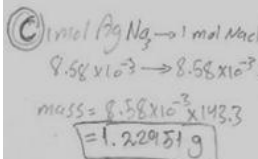
- a. What is the limiting reactant





of moles remaining without reacting = $0.0125 - 8.58 \times 10^{-3} = 3.92 \times 10^{-3} \text{ mole NaCl}$

$\times \frac{3.92 \times 10^{-3}}{0.026 + 0.05} = 0.051 \text{ M}$



b. what is the concentration of the remaining unreacted species at the end of the reaction?

c. What is the theoretical yield of the AgCl(s) that can be precipitated from the reaction.

d. If the actual AgCl(s) was 0.980 g, what is the percentage yield?

$\frac{0.98}{1.229} \times 100 = 79.6\%$

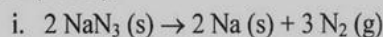
[3]. What is the percent composition of Ca, P, and O in rust, $\text{Ca}_3(\text{PO}_4)_2$?
 (Express each percentage to 4 sig figs.)

$\text{Ca} = 38.71\%$
 $\text{P} = 20.00\%$
 $\text{O} = 41.29\%$

[4]. Ascorbic acid is a hydrocarbon derivative, a compound that consists of carbon, hydrogen, and oxygen. A 4.500-g sample of ascorbic acid was analyzed and found to contain 1.841 g of carbon and 0.206 g of hydrogen. If ascorbic acid has a molar mass of 176 g/mol, determine both the empirical formula and the molecular formula for ascorbic acid.

[5]. Quinine is used as an antimalarial drug. An analysis of quinine indicates the compound consists of 74.03% carbon, 7.47% hydrogen, 8.64% nitrogen, and 9.86% oxygen. If quinine's molar mass is 325 g/mol, determine the empirical and molecular formulas for quinine.

[6]. An automobile airbag inflates when N_2 gas results from the explosive decomposition of sodium azide (NaN_3),



a. Calculate the mass of NaN_3 needed to produce 50.0 L of N_2 gas at STP.

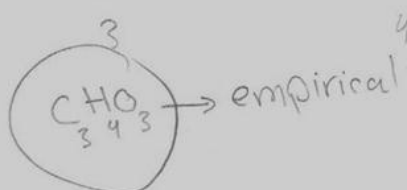
b. Calculate the volume of nitrogen gas produced when 50.0 g of sodium are produced at STP.

⑧ 1.841 g C, 0.206 g H, ascorbic
 $\text{mass} = 4.500 \text{ g}$
 $\text{molar mass} = 176 \text{ g/mol}$

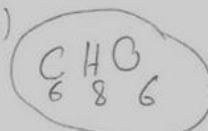
mole of C = $\frac{1.841}{12} = 0.1534 \text{ mol C}$ # mole of H = $\frac{0.206}{1} = 0.206 \text{ mol H}$

mole of O = $\frac{4.5 - (1.841 + 0.206)}{16} = 0.1533 \text{ mol O}$

$\frac{0.1534}{0.1533} = 1 \text{ C} / \frac{0.206}{0.1533} = 1.34 \text{ H} / \frac{0.206}{0.1533} = 1.34 \text{ H} \Rightarrow \times 3$



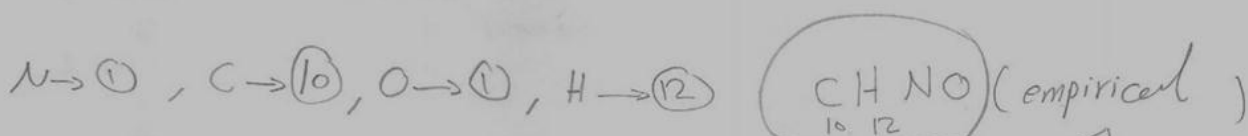
molecular formula = $\frac{176}{(3 \times 12 + 4 + 3 \times 16)} = 2$



$$Q5] \begin{array}{l} * 74.03\% \text{ C} \\ * 7.47\% \text{ H} \end{array} \quad \begin{array}{l} * 8.64\% \text{ N} \\ * 9.86\% \text{ O} \end{array}$$

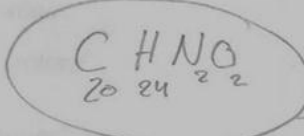
* molar mass of Compound is 325 g/mol

$$\begin{array}{l} \frac{74.03}{12} = 6.169 \text{ mole (C)} \\ \frac{7.47}{1} = 7.47 \text{ mole (H)} \end{array} \quad \begin{array}{l} \frac{8.64}{14} = 0.6171 \text{ mole (N)} \\ \frac{9.86}{16} = 0.6162 \text{ (O)} \end{array} \Rightarrow \div 0.6162$$



molar mass = 162 g/mol

$$\frac{325}{162} = 2$$



شكل بخوف

Q6

هذا سؤال غريب

Amjad Al-Kariri

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