**Exam 2: Chem 1114 Spring 2018**

**Version B 100 points**

**Your name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 pt**

1) **The molecular mass of crystal meth (C10H13N) is 149 g/mol.**

a) How many grams of crystal meth are formed from 16.107 g C? The atomic mass of C=12 g/mol SHOW WORK

\_\_\_\_\_\_ g meth 7 pts

2a) A sweet-tasting white powder contains 20.00 g C, 3.333 g H and 26.665 g O.

What is the powder’s empiric formula ?

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Element** | **Mass (g)** | **Atomic mass (g/mol)** |  |  |
| **C** |  | **12** |  |  |
| **H** |  | **1** |  |  |
| **0** |  | **16** |  |  |

Empiric formula = C H O 7 pts

2b) A sugar with the molecular weight 720 g/mol has the following masses of C, H and O in a 10 gram

sample. What is the molecular formula for the sugar ?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Element** | **Mass (g)** | **Atomic mass (g/mol)** |  |  |  |
| **C** | **8.000** | **12** |  |  |  |
| **H** | **1.334** | **1** |  |  |  |
| **O** | **10.666** | **16** |  |  |  |

Molecular formula = C H O 7 pts

3a) A 14.6732 gram sample of Ni is burned in oxygen to produce a 22.6732 gram sample of a nickel oxide compound. Given that the atomic masses of Ni and O are 58.693 and 16 g/mol respectively, what is the empiric formula of the nickel oxide compound? 7 pts

\_\_\_\_\_\_\_\_\_nickel oxide formula

\_\_/29 includes name

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3a)A hydrocarbon with the formula CxHy is burned to form 5.5 grams CO2 and 4.5 grams of H2O.

Given the molecular weights : CO2 = 44 g/mol, H2O=18 g/mol, provide a whole-numbered

formula for CxHy. SHOW WORK

CxHy= 7 pts

4. Balance the reactions below: (1 pt each/11 pts total)

a) \_\_MgSO3 + \_\_KCl -🡪 \_\_MgCl2 +\_\_\_ K2SO3

b) \_\_C6H14 +\_\_\_\_O2🡪 \_\_\_\_CO2 + \_\_\_H2O

c) \_\_\_\_Mg + \_\_\_\_O2 🡪 \_\_\_\_MgO

5)Octane (C8H18) has a molecular weight of 114 g/mol and burns according to the stoichiometrically balanced reaction below:

2C8H18 +25 O2 🡪 16CO2 + 18H2O

How many moles of O2 are consumed if we have formed 281.6 g of CO2 (MW=44 g/mol) ?

SHOW WORK

\_\_\_\_\_\_\_\_ mol O2 7 pts

6) Propane (C3H8) burns according to the stoichiometrically balanced reaction below:

C3H8 +5 O2 🡪 3CO2 + 4H2O

MW (g/mol) 44 32 44 18

a) How many grams of CO2 form when we burn 24.2424 grams of O2 ? (SHOW WORK !)

\_\_\_\_\_\_\_ g CO2 7 pts

7) Butane burns according to the balanced equation:

2C4H10 + 13O2 🡪 8CO2 +10H2O

MW 58 32 44 18

a) If we combine 11.6 g C4H10 and 11.8182 g O2 how many grams of CO2 can you form ? SHOW WORK

\_\_\_\_\_\_ g CO2 7 pts \_\_\_\_/39

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8. Pentane, C5H12, burns according to the balanced equation:

C5H12 + 8 O2  🡪 5CO2  + 6H2O

A 54 g sample of pentane (MW= 72 g/mol) is experimentally burned in excess O2 to produce 1.125 mol H2O. What is the % yield for the reaction ? SHOW WORK

\_\_\_\_=% yield 7 pts

9. In the Bronsted acid-base theory

a) An acid is a(n)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) A base is a(n)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) acids + bases 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) the conjugate base of NH3 is: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) Name of the reaction Bronsted introduces to explain how a base `splits’ water:

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reaction

10. In the Arrhenius acid-base theory:

a) An acid is a(n)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b) A base is a(n)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c) acids + bases 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

11. Identify the acid (A) , base (B) conjugate acid (CA) and conjugate base (CB) in the reaction below:

HCO3- + HPO3- 🡪 H2CO3 + PO32- 2 pts

\_\_\_ \_\_\_\_ \_\_\_\_ \_\_\_\_\_

12. What is the net ionic equation for: Ca2+ + 2NO3- + 2Na+ +SO42- 🡪 CaSO4(s) + 2 Na+ +2 NO3-

13. What are the oxidation numbers of all the elements in the compounds below: (1 pt each/ 7 pts total)

a) CO C oxidation #=\_\_\_\_ O oxidation # = \_\_\_\_\_\_

b) CuCl Cu oxidation #=\_\_\_ Cl oxidation #=\_\_\_\_\_\_

c) H2SO4 H oxidation #=\_\_\_ O oxidation # =\_\_\_\_ S oxidation #=\_\_\_\_

14. Oxidation = \_\_\_\_\_\_\_\_\_\_\_electrons

15. Reduction= \_\_\_\_\_\_\_\_\_\_\_ electrons

16. What are elements oxidized and reduced in the reactions below:

CH4 + 2O2 🡪 CO2 + 2H2O

\_\_\_\_\_oxidized \_\_\_\_\_\_ reduced

CoO + Zn 🡪 ZnO + Coo

\_\_\_\_ oxidized \_\_\_\_\_ reduced

17. What is Doc’s favorite animal ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (hint: they meow and chase mice)

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