**Exam 3 General Chemistry 1114 Alfred State College Wed 5 December 2012**

Your name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.1 Reaction Stoichiometry, Limiting Reagent and % Yields (5 pts each/15 points total)**

a) How many grams of water are formed in the reaction below when 1.4074 g of C8H18 are

burned with excess O2 in the balanced reaction below ? (Must show work for credit)

**Molecular mass 114 32 44 18 g/mol**

**2C8H18 + 25 O2 🡪 16CO2+ 18H2O**

**\_\_\_\_\_ g H2O**

b) Using the same balanced reaction above, predict the grams of CO2 expected if 3.409 g of O2

and 3.8863 g C8H18 are burned together. (Must show work for credit)

**\_\_\_\_\_\_ g CO2**

c) Using the same balanced reaction above, compute the % yield for the reaction if 1.14 g of C8H18 in excess O2 yields 0.810 g H2O. (Must show work for credit)

**\_\_\_\_\_\_\_ % yield**

**\_\_\_/15**

**3.2 Lewis Structures and Formal Charges (4 pts each/28 pts total)**

Draw the best Lewis structures for the compounds below. Make sure to show all lone pairs, formal charge and write an `R’ next to your structure if resonance exists. (Remember that the best Lewis structure sometimes requires breaking the octet rule to minimize formal charge.)

**CO SOCl2🡪 Cl-O-S-Cl**

**O O**

**| |**

**SO3 🡪 O-S-O NO3- 🡪 O-N-O**

Draw the best Lewis structure for the compounds below. Make sure to show all lone pairs and indicate any formal charges. (Remember that the best Lewis structure sometimes requires breaking the octet rule to minimize formal charge.)

**PCl5 SO2**

**\_\_\_/28 COCl2**

**3.3. Metatheses Reactions (11 Pts)**

a) Write the complete balanced molecular, complete ionic and net ionic equation for the

reaction of silver nitrate (AgNO3) with calcium chloride (CaCl2) given that both are

soluble in water and form an insoluble silver chloride precipitate. (6 pts/2 pts per line)

**Complete Molecular**

**Complete Ionic**

**Net Ionic**

b) List three characteristics common to metatheses reactions

**1.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**3.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

c) In the complete ionic equation: Hg2+ + 2NO3- + 2Na+ + S2- 🡪 HgS(s) + 2NO3- +2Na+

what specie(s) are spectator ions ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) What’s another name for metatheses reactions ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3.4 Acid-Base Reactions (14 pts)**

a)An Arrhenius acid= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ A Bronsted acid = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b)An Arrhenius base=\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ A Bronsted base= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c)In the Arrhenius theory:

Acid+Base = \_\_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 pt

d)In the Bronsted theory:

Acid + Base = \_\_\_\_\_\_\_\_\_\_\_ + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 1 pt

e)Which are not Arrhenius bases, but can be Bronsted bases in the list below: (2 pts)

CO32- HBr Cl- OH‑  NH4+

f) Identify the base (B), acid(A), conjugate acid (CA) and conjugate base (CB) below:

i) NH3 + HBr 🡪 NH4+ + Br- 2 pts

ii) H3PO4 + Na3PO4 🡪 NaH2PO4 + HNa2PO4 2 pts

g)List two characteristics common to Acid-Base Reactions

1)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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**3.5. Redox Reactions (24 pts)**

1. What exchange/change is common and defining for redox reactions ?

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

1. Oxidation means \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Reduction means\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. At which electrode does oxidation occur ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. At which electrodes does reduction occur ?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Determine the oxidation numbers for all the elements in the compounds below:

MgCl2 Mg\_\_\_\_\_\_ Cl\_\_\_\_\_\_\_

PbSO4 Pb \_\_\_\_\_ S\_\_\_\_\_\_\_\_ O\_\_\_\_\_\_

KBr K\_\_\_\_\_\_ Br\_\_\_\_\_\_\_

KMnO4 K \_\_\_\_\_ Mn \_\_\_\_\_\_\_ O \_\_\_\_\_\_\_\_

1. Decide whether the reactions below are redox reactions

1. 4Fe + 6O2 🡪 2Fe2O3 redox not redox
2. H2CO3 🡪 H2O + CO2 redox not redox
3. Mgo + Cu2+🡪 Mg2++Cuo redox not redox
4. Fe2+ + O2- 🡪 FeO redox not redox
5. What are the reduction and oxidation half-cells for the redox reaction:

2Feo + 3Cu2+ 🡪 2Fe3+ + 3Cu0

Reduction half-cell:

Oxidation half-cell:

1. Determine who gets oxidized and who gets reduced in the reactions below: (3 pts)

2HCl + Mg🡪 Mg2+ + H2 + 2Cl- oxidized = \_\_\_\_\_\_\_ reduced = \_\_\_\_

Ge + MnO2 🡪 GeO + MnO oxidized=\_\_\_\_\_\_\_ reduced = \_\_\_\_\_

O2 + C 🡪 CO2  oxidized=\_\_\_\_\_\_\_\_\_ reduced = \_\_\_\_\_\_\_

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**3.6. Pressure and Basic Gas Law Calculations (6 pts total)**

1a) The preferred **chemical unit** for pressure in chemistry is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1b) Another common pressure measurement different than the one in (1a) is mm of Hg. This is

because: (circle your answer)

1. the air contains mercury, Hg
2. the height of Hg in a Torricelli barometer exposed to air is measured in mm
3. The distance to the edge of the stratosphere is measured in mm
4. The Mars Candy company trade marked pressure measurements in their product M&Ms.

2) At constant temperature and gas moles, a piston initially at 6 atm and 1 liter is expanded to 2 liters in volume. What is the new pressure, P2, in the piston? (2 pts)

P2= \_\_\_\_\_\_\_\_\_\_\_\_\_\_atm

3) At constant pressure and gas moles, a piston initially at 200 K and 1 liter shrinks to 0.25

liters, What is the new temperature, T2, of the piston? (2 pts)

T2 =\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ K

**3.7. Triviata (2 pts)**

Which chemist worked at Berkeley: Lewis Bronsted Arrhenius

Which chemist predicted global warming? Lewis Bronsted Arrhenius

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