CHEMISTRY 111-Vining  NAME: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

October 28, 2015 EXAM #2

**Points for each question in parentheses at end of question.**

**1.** What mass of Na2C2O4 (molar mass 134.0 g/mol) is needed to prepare 500. mL of a 0.0622 M solution? *(5)*

a) 1.04 g b) 4.17 g c) 10.7 g d) 8.33 g e) 0.834 g

**2a)** What type of reaction is each of the following? *(4)*

CaO(s) + CO2(g) → CaCO3(s)

a) decomposition b) combination c) single displacement d) double displacement

**2b)** Zn(s) + CuCl2(aq) → ZnCl2(aq) + Cu(s)

a) decomposition b) combination c) single displacement d) double displacement

**3.** 5.00 grams of glass at 80 oC is brought into contact with 5.00 g of wood at 20 oC. When thermal equilibrium is reached, both objects are at a temperature of 39 oC. Which has a greater specific heat capacity? *(4)*

a) glass b) wood c) not enough information is given to answer

**4.** Wood is burning in a fireplace. This reaction is... *(4)*

a) endothermic b) exothermic c) not enough information is given to answer

**5.** Circle the compounds below that are expected to be insoluble in water. *(8)*

Na3PO4 H3PO4 Ca(NO3)2 Cr2S3

**6.** You have an unlabeled vial that contains a solution. You mix portions of this solution with each of the following other solutions and observe the following results:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mix with: | KCl | Na2SO4 | Pb(NO3)2 | NaOH | HCl |
| Observe: | no reaction | precipitate | precipitate | precipitate | no reaction |

Which of the following could be the unknown solution? *(5)*

a) AgNO3(aq) d) Na2CO3(aq)

b)NaCl(aq) e) HCl(aq)

c) CaCl2(aq) f) Ba(NO3)2(aq)

**7.** Indicate the oxidation number of the noted element in each case: *(3)*

H in H2: \_\_\_\_\_\_ Fe in FeCl2: \_\_\_\_\_\_ N in NO3-: \_\_\_\_\_\_

**8.** Circle the compounds below that are strong electrolytes. *(7)*

HNO3 acetic acid Fe(NO3)2 FeS

What does the term “strong electrolyte” mean?

**9.** Consider the redox reaction: **Ni(s)** + **F2(g)**  **Ni2+(aq)** + **2F-(aq)**



*(8)*

Species oxidized: \_\_\_\_\_\_\_\_\_\_ Species Reduced: \_\_\_\_\_\_\_\_\_\_\_

Oxidizing agent: \_\_\_\_\_\_\_\_\_\_\_ Reducing agent: \_\_\_\_\_\_\_\_\_\_\_\_

**10.** Give net ionic equations for the following reactions. If no reaction occurs, just write “No Reaction”

*(16)*

a. NaCl + Pb(NO3)2

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

b. HCl + Ca3(PO4)2

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

c. HCl + NH3

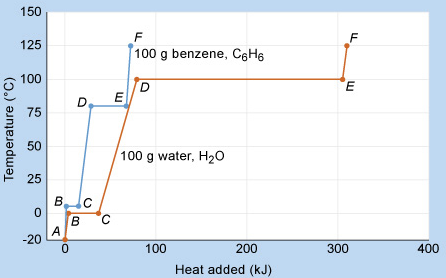
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d. Na2CO3 + HNO3

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

**11.** The heating curves for water and benzene are shown here. Answer the following questions regarding them. *(6)*

**Part 1.** Which has the greater heat of fusion?

 water or benzene

**Part 2.** From segment D to E for water, what   
 type of energy (if any) is increasing?

a ) no energy increase

b) kinetic energy

c) potential energy

d) both kinetic and potential energy

**Part 3.** Which has the higher melting point?

water or benzene

**12.** Consider the reaction below:

If 43.7 g Fe is allowed to react with 28.0 g O2, what mass of FeO can be produced? *(10)*

2 Fe(s) + O2 (g) 🡪 2 FeO(s)

\_\_\_\_\_ g FeO

If the experimental (actual) yield of FeO is 49.0 g, what is the percent yield?

\_\_\_\_ %

**13.** A titration is performed to determine the molar mass of an unknown monoprotic acid. A solution of

0.122 M NaOH is used to titrate 1.082 grams of acid. If 39.9 mL of the NaOH solution are required to titrate the acid, what is the molar mass of the acid? *(10)*

Molar mass = \_\_\_\_\_\_\_\_\_\_

**14.** The following information is given for **lead** at 1atm:

|  |  |
| --- | --- |
| boiling point = **1740 °**C | http://cxp.cengage.com/contentservice/assets/T=1445987912587/owms01h/mediaarchives/GenChem/Image/delta16-1.GIFHvap1740**°**C) = **858.2** J/g |
| melting point = **328.0 °**C | http://cxp.cengage.com/contentservice/assets/T=1445987912587/owms01h/mediaarchives/GenChem/Image/delta16-1.GIFHfus(**328.0 °**C) = **23.00** J/g |
| specific heat solid = **0.1300** J/g°C |  |
| specific heat liquid = **0.1380** J/g°C |  |

A **24.60** g sample of solid **lead** is initially at **304.0 °**C. If the sample is heated at constant pressure (P = 1 atm),  kJ of heat are needed to raise the temperature of the sample to **605.0 °**C. *(10)*

*\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* J

**15. Extra Credit: 6 points**

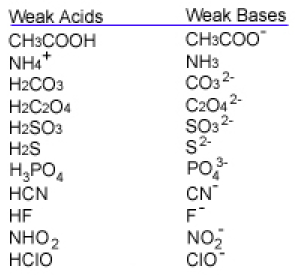
A compound is known to be a carbonate salt but the exact cation is not known but we do know the cation has a 2+ charge. So, the compound has the general formula MCO3. M represents an element.

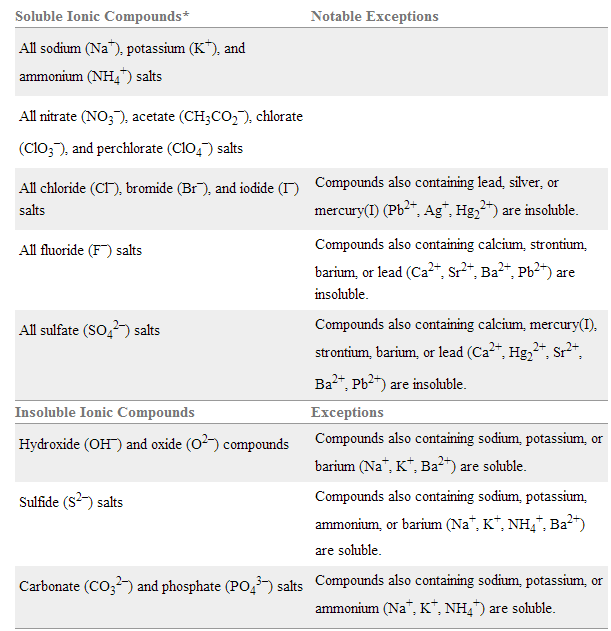
4.56 g of this compound is added to water. It does not dissolve. An excess of strong acid (HCl) is added and (as you would expect) the solution bubbles and the compound dissolves. The mass loss caused by escaping CO2 gas is 1.164 g.

To the remaining solution, an excess of sodium phosphate is added and a new precipitate forms.

Identify the element M and write the formula of the new precipitate.

Formula : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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