CHEM 121 Final Exam Practice Problems for Part I

1. Provide the correct name or formula for each the following compounds:
   a. K₂CrO₄ ___________________________
   b. N₂O₅  ___________________________
   c. Pb(CO₃)₂ ___________________________
   d. HgS  ___________________________
   e. carbon tetrachloride _________________
   f. silver nitrate   _________________
   g. sodium phosphide _________________
   h. sulfuric acid  _________________

2. For each of the following,
   i. Identify the type of reaction using the letters designated below:
      – Combination (C)   – Double Replacement/Precipitation (P)
      – Decomposition (D) – Acid-Base Neutralization (N)
      – Single Replacement (SR) – Combustion (B)

   TYPE ii. Balance the equation

   _____ a.  _____ Al(s) + _____ Cu(NO₃)₂(aq) → _____ Cu(s) + _____ Al(NO₃)₃(aq)
   _____ b.  _____ NaOH(aq) + _____ H₃PO₄(aq) → _____ H₂O (l) + _____ Na₃PO₄(aq)
   _____ c.  _____ K₂CrO₄(aq) + _____ Mg(NO₃)₂(aq) → _____ MgCrO₄(s) + _____ KNO₃(aq)
   _____ d.  _____ LiHCO₃(s)  Δ→ _____ Li₂CO₃(s) + _____ H₂O(g) + _____ CO₂(g)

3. For each of the following sets of reactants, write “NR” for “no reaction” OR write the formulas for the products (including physical states) and balance the equation if a reaction occurs.

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<td>a.</td>
<td>Zn(s) + HCl(aq) →</td>
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<tr>
<td>b.</td>
<td>LiOH(aq) + H₂SO₄(aq) →</td>
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<tr>
<td>c.</td>
<td>C₃H₁₂(l) + O₂(g)  Δ→</td>
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<tr>
<td>d.</td>
<td>HNO₃(aq) + KHCO₃(aq) →</td>
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<td>e.</td>
<td>Mg(s) + H₂O(l) →</td>
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Nuclear Chemistry Practice Problems:

1. The inhalation of radon-222 and its decay to form other isotopes poses a health hazard. Write balanced nuclear equations for the decay of radon-222 to lead-206 in eight steps.

   a. Step 1: Radon-222 decays by alpha emission. (Radon has the element symbol Rn.)
   
   b. Step 2: The daughter product in part a decays by alpha emission.
   
   c. Step 3: The daughter product in part b decays by beta and gamma emissions.
   
   d. Step 4: The daughter product in part c decays by beta and gamma emissions.
   
   e. Step 5: The daughter product in part d decays by beta emission.
   
   f. Step 6: The daughter product in part e decays by alpha emission.
   
   g. Step 7: The daughter product in part f decays by beta and gamma emissions.
   
   h. Step 8: The daughter product in part g decays by alpha and gamma emissions.

   The final stable isotope is **lead-206**.

General Practice Problems

2. Indicate the number of protons, neutrons, and electrons in the following isotopes: phosphorus-32, iodine-131, oxygen-18, Rn-222, chromium-51, fluorine-21, potassium-40, copper-64

3. For each of the following molecules: H$_2$O, NH$_3$, PCl$_3$, OF$_2$, CH$_4$, CCl$_4$, CHF$_3$, O$_3$, CH$_2$O
   
   i. Draw the Lewis structure, and indicate the molecular geometry (3D shape) and bond angle(s).
   
   ii. Sketch the three-dimensional shape of the molecule, showing the dipole for each polar bond.
   
   iii. Indicate if each molecule is polar or nonpolar.
   
   iv. Indicate the intermolecular forces between molecules.

4. Which of the following changes is exothermic?
   
   melting  condensing  sublimation  freezing  vaporizing  deposition

5. Calculate the molarity of a solution prepared by dissolving 4.488 g of potassium hydroxide in 150.0 mL of solution.

6. Calculate the mass of solute present in 150.0 g of a 2.50% by mass AgNO$_3$ solution.

7. Calculate the concentration of solution prepared by diluting 5.00 mL of a 1.25% (w/v) KCl solution to make 100.0 mL of solution.

8. Calculate the concentration of solution prepared by diluting 8.00 mL of a 2.00M nitric acid solution with 100.0 mL of DI water.