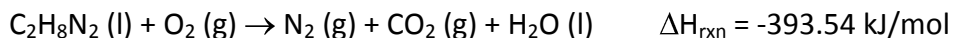


PRACTICE EXAM #3

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Chem20, Elementary Chemistry

1.) Dimethylhydrazine ($\text{C}_2\text{H}_8\text{N}_2$) is commonly used as rocket fuel in space shuttles. It combusts according to the following **UNBALANCED** chemical reaction: (23 pts)



- a.) Is this reaction exothermic or endothermic? _____
- b.) Balance the chemical reaction.



- c.) How much heat (in kJ) would be produced from the combustion of 125.6 g of $\text{C}_2\text{H}_8\text{N}_2$?
(The molecular weight (MW) for $\text{C}_2\text{H}_8\text{N}_2$ is 60.10 g/mol)

2.) A wave of electromagnetic radiation has a frequency, ν , of 7.64×10^{18} Hz. (12 pts)

- a.) Calculate the energy, E , for this wave in Joules ($h = 6.626 \times 10^{-34}$ J·s).

- b.) Calculate the wavelength, λ , for this radiation in meters ($c = 2.998 \times 10^8$ m/s).

3.) Predict the products for the following pairs of ionic compounds if a double displacement reaction were to occur. Write the balanced molecular, complete (total) ionic, and net ionic equations for each successful reaction. Indicate the spectator ions in each. If no reaction occurs, write **NO REACTION**. (12 pts)

a.) lithium sulfate and calcium chloride

MOLECULAR:

TOTAL IONIC:

NET IONIC:

SPECTATOR IONS:

b.) sodium hydroxide and copper(II) chloride

MOLECULAR:

TOTAL IONIC:

NET IONIC:

SPECTATOR IONS:

4.) Write the complete electronic configuration for the following elements (with or without noble gas configuration is acceptable). (9 pts)

- a.) Be _____
b.) S _____
c.) Pt _____

5.) Identify the following elements based on their electronic configuration. (9 pts)

- a.) $[\text{Ar}]4s^23d^3$ _____
b.) $[\text{Ne}]3s^23p^1$ _____
c.) $[\text{Xe}]6s^1$ _____

6.) In a vessel, 12.1 g of aqueous hydrochloric acid and 10.6 grams of solid calcium hydroxide are mixed and an acid-base neutralization reaction is observed. (35 pts)

- Write the **balanced** chemical equation for this reaction.
- Classify this reaction in as many ways as possible.
- Which is the **limiting reactant**? Calculate the **theoretical yield** of salt that forms, in g.
(MW for hydrochloric acid is 36.46 g/mol, and for calcium hydroxide, 74.09 g/mol)
- How many grams of the reactant in excess are left over after the reaction is complete?
- The reaction was performed in a laboratory and the percent yield of the produced salt was calculated to be 60.5%. What was the actual yield of this salt, in grams?