11.3 Review Questions Name: Mrs. Aitken.

DIRECTIONS: **Show ALL work** in the space provided for each question. Include proper chemical "conventions" (this means you must use correct symbols, notations and significant digits)

1. a) **determine** the molar enthalpy for potassium chlorate in the below reaction

$$2KClO_{3\,(s)} \rightarrow 2KCl_{\,(s)} + 3O_{2\,(g)} + 78.0kJ$$

Record the ± _____kJ/mol as a 3-digit answer in the grid provided

3	9	.	0

$\Delta H = -78\,kJ$ $\Delta_r H_m = ?$

$n_{KClO_3} = 2$ $\Delta_r H_m = \frac{-78\,kJ}{2\,mol} = -39.0\,kJ/mol$

2. **Calculate** the heat released when 40.0g of oxygen are produced in the reaction below? *Record the ± _____kJ as a 3-digit answer in the grid provided*

$$2KClO_{3\,(s)} \rightarrow 2KCl_{\,(s)} + 3O_{2\,(g)} + 78.0kJ$$

3	2	.	5

1. Find $\Delta_r H_m$ $_{O_2}$
2. find experiment moles
3. Find experiment $\Delta_r H$

1. $\Delta_r H_m$ $_{O_2} = \frac{-78\,kJ}{3\,mol} = 26\,kJ/mol$

2. $m = 40g$ $M = 32.0\,g/mol$ $n = m/M$
$n = 40/32 = 1.25\,mol$

3. $\Delta_r H = \Delta_r H_m \times n$
$\Delta_r H = 26\,kJ/mol \times 1.25\,mol =$ **$-32.5\,kJ$**

3. The energy released when 0.500 mol of AgI(s) is formed from its elements is_____kJ.
Record the ± _____kJ as a 3-digit answer in the grid provided

3	0	.	9

$\Delta_f H = ?$

$\Delta_f H_m$ $_{AgI}$ = data booklet = $-61.8\,kJ/mol$

$n = 0.5\,mol$

$\Delta_f H = -61.8\,kJ/mol \times 0.5\,mol$

$\Delta_f H = \Delta_f H_m \times n$ $\Delta_f H = -30.9\,kJ$

11.3 Review Questions Name: Exo

4. **Determine** the molar enthalpy for the complete combustion of propane (forming gaseous products) if burning 20.0g of propane releases 926.7 kJ of energy. Communicate your answer using a potential energy diagram

$\Delta_c H_m = ?$

$\Delta_c H = -926.7\,kJ$

$n = ?$

$\Delta_c H_m = \frac{\Delta_c H}{n}$

$C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_{(g)} + 926.7kJ$

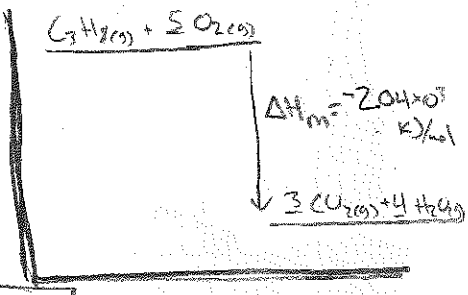
$m = 20g$

$M = 44.11 g/mol$

$n = m/M$

$n = 0.453\ldots mol$

$\Delta_c H_m = \frac{-926.7kJ}{0.453mol} = -2043.83\,kJ/mol = -2.04 \times 10^3\,kJ/mol$



5. A student conducted a calorimetry experiment to investigate the energy of a formation reaction. The student chose the formation of magnesium oxide as the reaction to study and constructed an aluminum calorimeter. **Use the data collected by the student to determine the molar enthalpy of formation for magnesium oxide.**

$\Delta_f H_m = ?$

Hints: You will need to use stoichiometry practices to answer this… and you must also consider the energy absorbed by the calorimeter for this question.

$2Mg + O_2 \rightarrow 2MgO$

Mass of magnesium reacted	2.01g
Mass of water in calorimeter	450.0g (H_2O)
Mass of aluminum calorimeter	375.0g (calorimeter)
Initial temperature of calorimeter and water	22.40°C
Final temperature of calorimeter and water	34.85°C
Specific heat capacity of aluminum (from data booklet)	0.900 J/g°C (calorimeter)

$\Delta t = 12.45°C$ increase in temp = Exothermic

$\Delta_f H_{m\,MgO} = ?$

$\Delta_f H_{m\,MgO} = \frac{\Delta_f H}{n}$

Magnesium

$m = 2.01g$

$M = 24.31 g/mol$

$n = \frac{m}{M}$

$n = \frac{2.01g}{24.31 g/mol}$

$n = 0.08268 mol$

STOICH moles of Mg = moles of MgO

$n = MgO = 0.08268 mol$

$\Delta_f H_m = \frac{-27.67kJ}{0.08268mol}$

$\Delta_f H_m = -335\,kJ/mol$

$Q_{total} = Q_{H_2O} + Q_{calorimeter}$

$Q_{H_2O} = mc\Delta t$

$Q_{H_2O} = 450g \times 4.19\frac{J}{g°C} \times 12.45°C$

$Q_{H_2O} = 23474.475\,J \div 1000 = 23.47kJ$

$Q_{cal} = mc\Delta t$

$Q_{cal} = 375g \times 0.900 J/g°C \times 12.45°C$

$Q_{cal} = 4201.875\,J \div 1000 = 4.2018\,kJ$

$Q_{total} = -27.6718\,kJ = \Delta_f H$

Exothermic