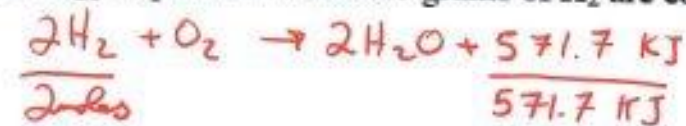


# Thermochemical Stoichiometry Practice:

name: SOLUTIONS

Given the equation:  $2 \text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2 \text{H}_2\text{O}(\text{l}) \quad \Delta H = -285.85 \text{ kJ/mol}$

- 1) a. How much energy is produced if 100.0 grams of  $\text{H}_2$  are converted to water?

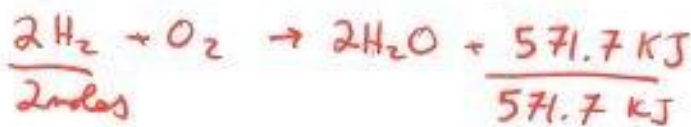


2 moles  
 $m = n \cdot M$   
 $m = 2(2)$   
 $m = 4 \text{g}$

$$\begin{array}{ccc} & 571.7 \text{ kJ} & \\ & \diagdown & \diagup \\ 100 \text{g} & & x \end{array}$$

$$x = 14290 \text{ kJ}$$

- b. How many grams of  $\text{H}_2$  would be required to produce 5000.0 kJ?



2 moles  
 $m = n \cdot M$   
 $m = 2(2)$   
 $m = 4 \text{g}$

$$\begin{array}{ccc} & 571.7 \text{ kJ} & \\ & \diagdown & \diagup \\ x & & 5000 \text{ kJ} \end{array}$$

$$x = 35 \text{g}$$

2) Given the equation:  $\underline{4 \text{Fe}(\text{s})} + 3 \text{O}_2(\text{g}) \rightarrow 2 \text{Fe}_2\text{O}_3(\text{s}) + \underline{1648 \text{ kJ}}$

- a. Assuming that the iron is converted to iron (III) oxide as in the above equation, how much heat can be provided by a hot pack that contains 50.0 g of iron?

4 moles

$m = n \cdot M$   
 $m = 4(55.8)$   
 $m = 223.2 \text{g}$

$$\begin{array}{ccc} & 1648 \text{ kJ} & \\ & \diagdown & \diagup \\ 50 \text{g} & & x \end{array}$$

$$x = 369 \text{ kJ}$$

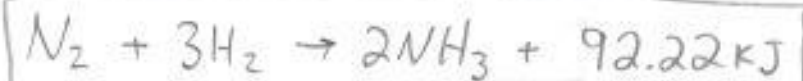
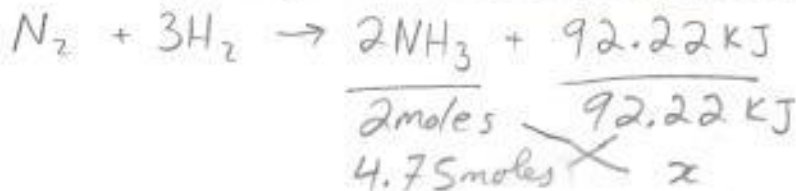
- b. If the hot pack from part a. gives off heat at the rate of 42.0 kJ/hour, how long will it stay warm?

$$\frac{369}{42} = 8.8 \text{ hrs}$$

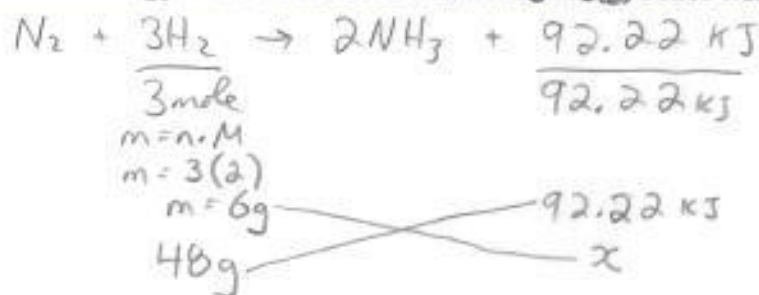
3)

Given the equation:  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$  $\Delta H = -46.11 \text{ kJ/mol}$   
Formation

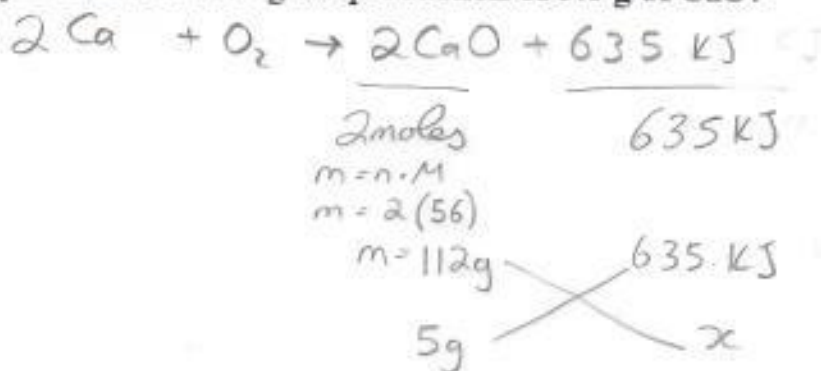
a. Re-write the chemical equation with the energy written inside the reaction

b. What is the enthalpy change associated with the formation of 4.75 mol  $\text{NH}_3$ ?

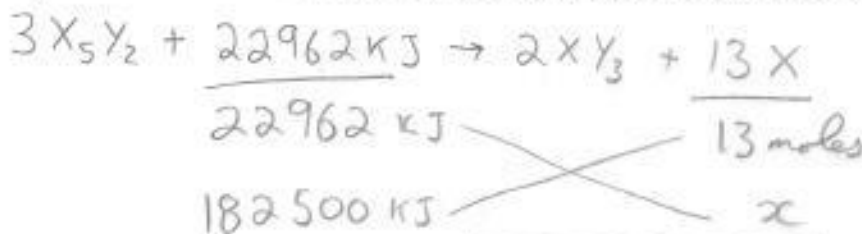
$$x = 219 \text{ kJ}$$

c. How much energy will be released when 48g  $\text{H}_2(\text{g})$  react with excess  $\text{N}_2(\text{g})$  to form  $\text{NH}_3(\text{g})$ ?

$$x = 734 \text{ kJ}$$

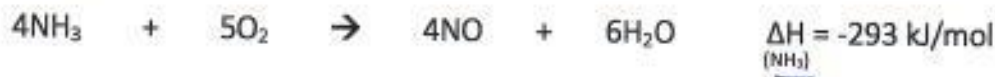
4) Given the equation:  $2\text{Ca}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2\text{CaO}(\text{s})$   $\Delta H = -317.5 \text{ kJ/mol}$ How much energy is released during the production of 5.0 g of  $\text{CaO}$ ?

$$x = 28.35 \text{ kJ}$$

5) Study the following hypothetical decomposition reaction. The enthalpy is given for decomposition of  $\text{X}_5\text{Y}_2$ .How many moles X would be produced if 182 500 kJ are used to decompose a given amount of  $\text{X}_5\text{Y}_2$ ?

$$x = 103.3 \text{ moles}$$

6) Study the following reaction:



a) How much energy is released when 16 moles of O<sub>2</sub> are used?



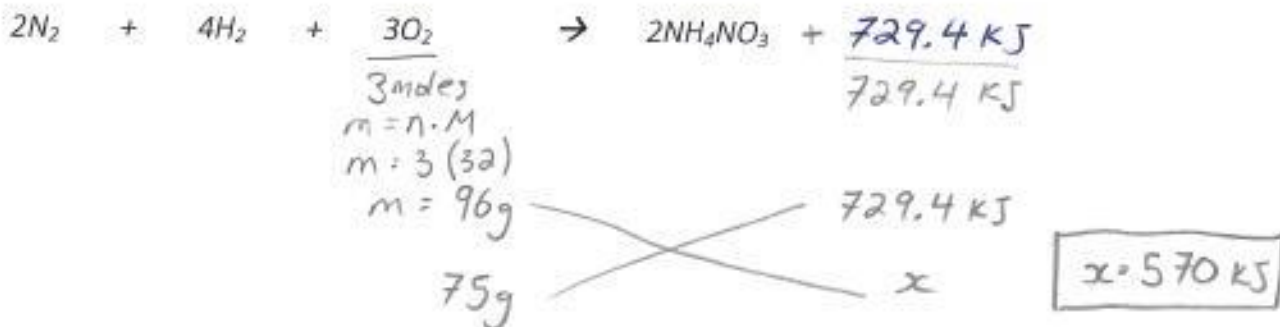
b) How much energy is released when 170g of ammonia (NH<sub>3</sub>) is used?



7) The following is a synthesis reaction for the formation of ammonium nitrate:



a) How much energy is produced when 75g of O<sub>2</sub> is used?



b) What mass of Nitrogen gas (N<sub>2</sub>) must be used to produce 5000 kJ of energy?

