

Name: Key
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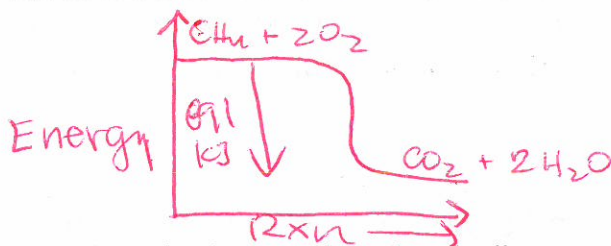
Chemistry 11 ENDOTHERMIC vs EXOTHERMIC REACTIONS

Be sure to read both sides of the handout before you attempt this worksheet.

1. a. Write a chemical equation that indicates an EXOTHERMIC reaction with the heat term on the PRODUCTS side:



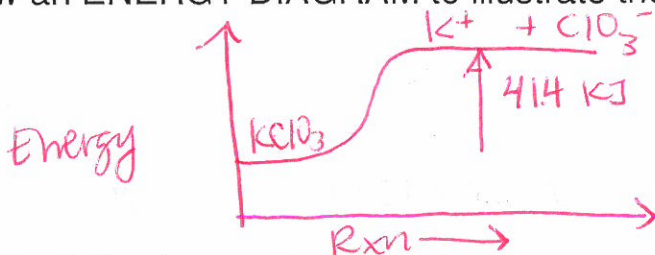
b. Draw an ENERGY DIAGRAM to illustrate the above reaction:



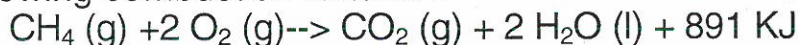
2 a. Write a chemical equation that indicates an ENDOTHERMIC reaction with the heat term on the REACTANT side:



b. Draw an ENERGY DIAGRAM to illustrate the above reaction:



3. For the following combustion reaction:



Imagine that it occurs in TWO STEPS (which it DOESN'T)

Step 1: $\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{C} + 4\text{H} + 4\text{O}$ (the reactants are broken down)

Step 2: $\text{C} + 4\text{H} + 4\text{O} \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}$ (the individual atoms assemble)

- a. Does Step 1 absorb or give off energy? *absorb (break bonds)*
b. Does Step 2 absorb or give off energy? *give off (form bonds)*
c. Since the overall reaction is EXOTHERMIC, which step involves more energy, step 1 or step 2? *b/c overall it gives off heat!*

4. The energy required to break an H-Cl bond is 432 KJ:
 $\text{HCl} + 432 \text{ kJ} \rightarrow \text{H} + \text{Cl}$. How many kilojoules of energy are given off in the reverse reaction? $\text{H} + \text{Cl} \rightarrow \text{HCl} + \underline{432 \text{ KJ}}$? Why?

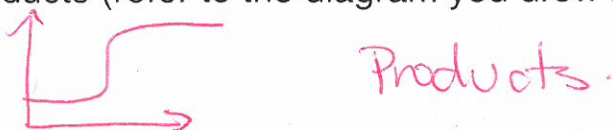
Same amount of energy required will be the energy given off.

5. Is the burning of wood exothermic or endothermic?

6. Is the melting of sugar exothermic or endothermic?

7. A beaker becomes warm when a reaction occurs in it. Are the chemicals in the beaker gaining or losing energy? Is the reaction exo or endothermic?

8. Which contain more energy in an endothermic reaction, the reactants or the products (refer to the diagram you drew in # 2)



9. In an exothermic reaction do you have to add or remove energy in order to allow the products to form? (refer to the diagram you drew in #1)



10. **ENTHALPY**, H, refers to the HEAT CONTENT of the system

H = the change in enthalpy during a chemical reaction

$$\Delta H = H_{\text{PRODUCTS}} - H_{\text{REACTANTS}}$$

When ΔH is POSITIVE the reaction is ENDOTHERMIC

When ΔH is NEGATIVE the reaction is EXOTHERMIC

a. Is $\Delta H > 0$ or $\Delta H < 0$ for an endothermic reaction?

$$\Delta H > 0$$

b. Is $\Delta H > 0$ or $\Delta H < 0$ for an exothermic reaction?

$$\Delta H < 0$$