

I'm here after school today
until 5pm.

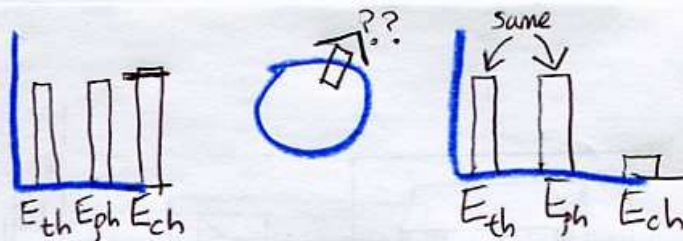
I'm here after school Friday
until 4:15
Our next big test is Monday.

Purpose:

Learn how to write a detailed description of
energy flow in a reaction.

WARMUP :

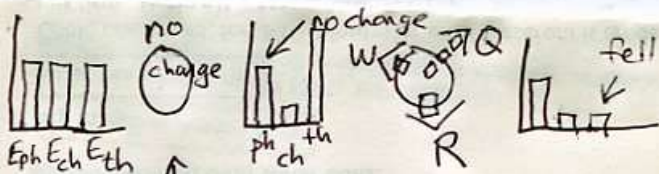
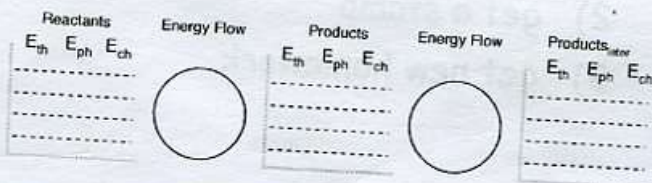
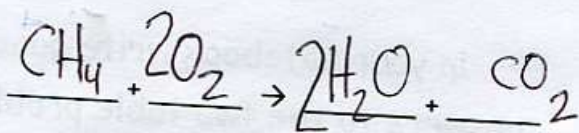
Fill this in for a potato an hour after you eat it



{ WHAT CAN ENTER OR
LEAVE THE CIRCLE : }

Q heating W working R radiating

Fill this in for burning CH₄



the circle represents the system, which in this case is the CH₄

Energy in Reactions

Chemistry: <http://genest.weebly.com>

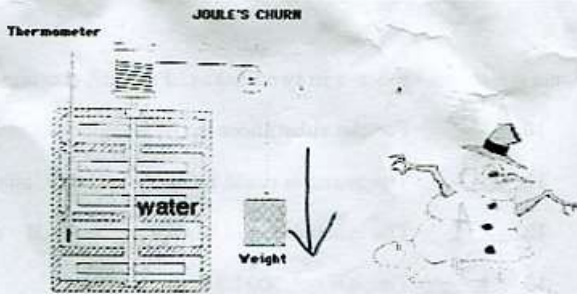
Stop in for help every day at lunch and Tues & Thurs after school!



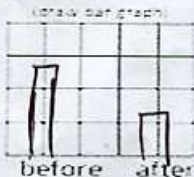
Name ANSWERS

Period _____

SKIP
#17c

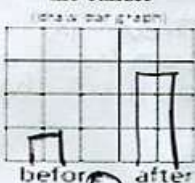


1. If the **candle** is the system draw two bars in your bar graph and circle the correct choices:



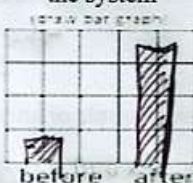
Heat is (entering / leaving) the system.

2. If the system is **THE AIR** above the candle



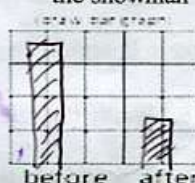
Heat is (entering / leaving).
Energy of the system is (increasing / decreasing).

3. If the **water** in Joule's churn is the system



The change to the system is (exothermic / endothermic).

4. If the system is **THE AIR** around the snowman



The change to the system is (exothermic / endothermic).



If you mix some Barium Chloride and distilled water in a test tube and hold it in your hand, it feels cold!

5. If **the water and chemicals** are defined as the system, the change in energy was
 $\Delta E =$ (positive / negative)

The change was (exothermic / endothermic)

6. If **YOUR HAND** is defined as the system, the change in energy was
 $\Delta E =$ (positive / negative)

The change was (exothermic / endothermic)

7. In exothermic reactions, is the energy of the products less or greater than that of the reactants?

LESS

8. In an endothermic reaction, is the energy of the products less than or greater than that of the reactants?

GREATER

9. Convert each of the following energy units:

a. 8.1 kcal to cal

b. 2.50 kcal to J



Some substances reacted in two flasks. For each statement below, choose either Reaction A or Reaction B

10. A For the substances in the reaction E_{ch} is decreasing
11. B The reaction could be written $A + \text{energy} \rightarrow B$ *The reaction took in energy.*
12. A The reaction could be written $A \rightarrow B \quad \Delta H = -500 \text{ kJ}$ *Like money leaving a bank account*
13. B The $\Delta H = +300 \text{ kJ}$
14. A The reaction is exothermic
15. B The reaction would feel cold if you held the flask in your hand.

Energy in Chemical Reactions

the reaction is sucking heat out of your hand

16. Classify the following as exothermic or endothermic:

- a. 550 kJ is released **EXOTHERMIC**
- b. The energy level of the products is higher than that of the reactants. **ENDOTHERMIC**
- c. The metabolism of glucose in the body provides energy. **EXO** if glucose is the system **ENDO** if the body is the system
- d. The energy level of the products is lower than that of the reactants. **EXOTHERMIC**
- e. 125 kJ is absorbed. **ENDOTHERMIC**

17. Classify the following as exothermic or endothermic reaction and give ΔH for each:

- a. Gas burning in a Bunsen burner: $\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O} + 890 \text{ kJ}$
EXOTHERMIC, $\Delta H = -890 \text{ kJ}$ because it LOST energy, so the change is negative
- b. Dehydrating limestone: $\text{Ca(OH)}_2 + 65.3 \text{ kJ} \rightarrow \text{CaO} + \text{H}_2\text{O}$
Endothermic, $\Delta H = +65.3 \text{ kJ}$
- c. Formation of aluminum oxide and iron from aluminum and iron(III)oxide:
SKIP
- d. $2\text{Al} + \text{Fe}_2\text{O}_3 \rightarrow \text{Al}_2\text{O}_3 + 2\text{Fe} + 850 \text{ kJ}$
EXOTHERMIC, $\Delta H = -850 \text{ kJ}$ THE CHEMICALS LOST ENERGY so THEIR ENERGY CHANGE IS NEGATIVE
- e. Combustion of propane: $\text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O} + 2200 \text{ kJ}$
EXOTHERMIC, $\Delta H = -2200 \text{ kJ}$
- f. Formation of table salt: $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl} + 2\text{H}_2\text{O} + 819 \text{ kJ}$
EXOTHERMIC, $\Delta H = -819 \text{ kJ}$
- g. Decomposition of phosphorous pentachloride: $\text{PCl}_5 + 67 \text{ kJ} \rightarrow \text{PCl}_3 + \text{Cl}_2$
ENDOTHERMIC, $\Delta H = +67 \text{ kJ}$

4/5

Five Reaction Types

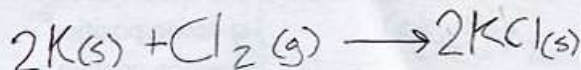
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To be completed with the help of the blue Addison - Wesley textbook *Chemistry*, by Wilbraham, et al

1a. There are three reactions on page 212. copy the first one into the box below

(It's the one with potassium in it...)



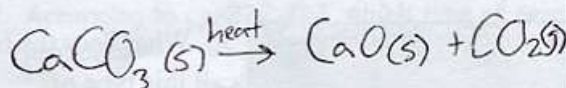
1b.

What does the book call this type of reaction?

- single replacement reaction
- double replacement reaction
- combination reaction
- decomposition reaction

2a. From p. 214, copy the last reaction on the entire page into the box below

(It's the only one with carbonate anion in it...)



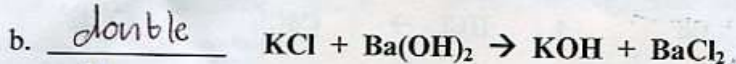
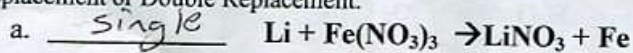
2b. What does the book call this type of reaction?

- single replacement reaction
- double replacement reaction
- combination reaction
- decomposition reaction

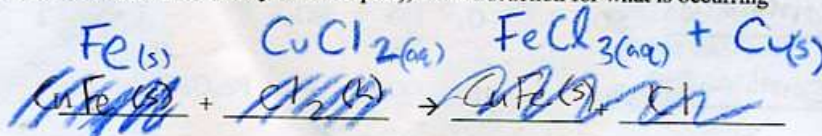
3. Based on what you wrote in 1 and 2 above, classify each of these as either a combination or a decomposition reaction



6. Based on the patterns you saw in #4 and #5, decide whether each of the following is Single Replacement or Double Replacement.



7. Look carefully at the first picture in Figure 8.9 on page 217. Based on our recent lectures and especially the lab (you may need to look at your notes or your lab report), write a reaction for what is occurring



8. According to pp. 222-223, which type of reaction always has two reactants and one product?

single replacement reaction

double replacement reaction

combination reaction yes

decomposition reaction

9. According to pp. 222-223, which type of reaction always has one reactant and two products?

single replacement reaction

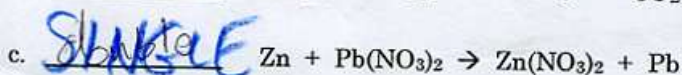
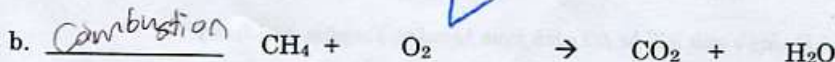
double replacement reaction

combination reaction

decomposition reaction ✓

10. classify each of the reactions below as one of the following reaction types
COMBUSTION, SINGLE REPLACEMENT,
DECOMPOSITION, DOUBLE REPLACEMENT
COMBINATION,

a. combustion ✓ any reaction that has oxygen as a reactant and water and carbon dioxide as products



- d. combination Mg + N₂ → Mg₃N₂
- e. Decomposition H₂O₂ → H₂O + O₂
- f. single Cd + HCl → CdCl₂ + H₂
- g. DOUBLE NiSO₄ + Li₃PO₄ → Ni₃(PO₄)₂ + Li₂SO₄
- h. combustion C₈H₁₈ + O₂ → CO₂ + H₂O
- i. combination SO₂ + O₂ → SO₃
- j. combination Fe + O₂ → Fe₂O₃
- k. single Fe + CuSO₄ → Fe₂(SO₄)₃ + Cu
- l. combination Li + N₂ → Li₃N
- m. combination Al + O₂ → Al₂O₃
- n. single ✓ The reaction we did in lab last week with the nail (see your notes)
- o. decomposition Na₂CO₃ → Na₂O + CO₂
- p. single Zn + H₃PO₄ → Zn₃(PO₄)₂ + H₂
- q. single Cl₂ + LiI → LiCl + I₂
- r. decomposition NaOH → Na₂O + H₂O
- s. SINGLE ~~Mg + 2 HCl → MgCl₂ + H₂~~
- t. DOUBLE ~~FeCl₃ + NaOH → Fe(OH)₃ + NaCl~~
- u. single Na + H₂O → NaOH + H₂

This material will be about a third of Friday's quiz.

Friday's quiz will be 1/3 each from Monday, Tuesday, and Today.