QUIZ AT 2:30

Please take out your Elephant CAR SHEET

Purpose: How do we predict the last part of a thermochemistry equation?

Warmup, Copy this:

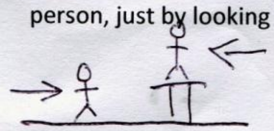
1. The thermochemical equation for the combustion of C_3H_8 looks like

C_3H_8 + 5 O_2 → 3 CO_2 + 4 H_2O ΔH = ???

2. Change of something ALWAYS looks like:

Δwhatever = finalWhatever - initialWhatever

3. What can you tell about the ABSOLUTE elevation of each person, just by looking



WE DON'T KNOW! WE CAN ONLY MEASURE WHERE IT IS RELATIVE TO SOME MADE-UP LOCATION

4. What can you tell about the ABSOLUTE energy of each substance in our warmup, just by looking NOTHING!

...to calculate the change of energy using Standard Heats of Reaction from a table. [See page 317 for several examples].

1. Write a balanced reaction
2. Look up the energies of each substance using a table of Standard Heat of Formation.
3. Plug the table numbers into the following equation
   ΔH = (ΔH of the products formation) – (ΔH of the reactants formation)
4. Remember to multiply each energy by its coefficient in the balanced reaction. Be careful of all the double negative signs. To be safe, punch your answer into the calculator more than once to avoid careless goofs.

Example #1. Find the energy released when Iron(III) Oxide reacts with carbon monoxide to form Carbon Dioxide, iron, and oxygen.

$Fe_2O_3 + CO \rightarrow 2Fe + CO_2 + O_2$

$\Delta H = (H \text{ of products}) - (H \text{ of reactants})$

$\Delta H = [2(Fe) + CO_2 + O_2] - [Fe_2O_3 + CO]$

Example #2. Find the energy released when methane (carbon tetrahydride) is combusted.

Do this for fun. Answer online.

NO HOMEWORK

ANSWER: ① Balanced reaction:

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

③ $\Delta H = (\text{products}) - (\text{reactants})$

look the values up in a table, like page

$\Delta H = [CO_2 + 2H_2O] - [CH_4 + 2O_2]$

$\Delta H = [(-393.5) + 2(-241.8)] - [(-74.86) + 2(0)]$

$\Delta H = -802.24 \text{ kJ}$

heat units during temperature changes

CλeMis+ry: http://genest.weebly.com

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

After-hours question? Email me at home: eagenest@madison.k12.wi.us

Name KEY

Period

1. Using your algebra skills rearrange Q = (m) (C) (ΔT) to isolate the indicated variable in each case (isolate means 'get it on one side of the equals sign by itself).

Isolate C	Isolate ΔT
$Q = mc\Delta T$ rearranges to $\frac{Q}{m\Delta T} = C$	$Q = mc\Delta T$ rearranges to $\frac{Q}{mc} = \Delta T$

2. How much heat is absorbed by 20g granite boulder as energy from the sun causes its temperature to change from 10°C to 29°C? (Specific heat capacity of granite is 0.1 cal/g°C)

$q = (20g)(0.1 \frac{cal}{g°c})(19°c)$

$q = 38 \approx 40$ calories

3. How much heat is released when 30 g of water at 96°C cools to 25°C? The specific heat of water is 1 cal/g°C.

$q = (30g)(1 \frac{cal}{g°c})(-71°c)$

$q = 2130$ cal ≈ 2000 cal

4. Applying the physicist's definition of the term heat, decide whether or not there is any heat occurring to the object in italics. For each object you should indicate whether the heat is negative, zero or positive.
   a) An *ice cube* is placed in a cup of hot coffee POSITIVE
   b) A pot of *hot tea* is sealed into a well-insulated thermos ZERO
   c) Some cold cream is poured into a cup of *hot coffee* NEGATIVE
   d) You blow *air* across a bowl of hot soup POSITIVE
   e) *You* jump into an ice cold pond NEGATIVE

5. How much heat will raise a pot of 800 g of water from 20 °C to 90 °C?

$q = (800g)(1 \frac{cal}{g°c})(+70°c)$

$q = 56000$ calories

6. What happens when you place two objects at different temperatures in contact with each other?

Heat flows from the hot object to the cold until they are equal temper

7. If a 3.1g ring is heated using 10.0 calories, its temperature rises 17.9°C. Calculate the specific heat capacity of the ring.

$q = mC\Delta T$ rearranges to $\frac{q}{m \Delta T} = C$ $\frac{(10.0 cal)}{(3.1g)(17.9°C)} = C$

ANSWER:

8. The temperature of a sample of water increases from 20°C to 46.6°C as it absorbs 5650 calories of heat. What is the mass of the sample? (Specific heat of water is 1.0 cal/g °C)

$\frac{q}{C \Delta T} = m$ $\frac{5650 cal}{(1.0 \frac{cal}{g°C})(26.6°C)} = m$ 210 = grams

9. The temperature of a sample of iron with a mass of 10.0 g changed from 50.4°C to 25.0°C with the release of 47 calories of heat. What is the specific heat of iron?

$\frac{q}{m \Delta T} = C$ $\frac{47 calories}{(10.0g)(-25.4°C)} = C$ $0.19 \frac{cal}{g°C}$ =

10. A 4.50 g coin of copper absorbed 54 calories of heat. What was the final temperature of the copper if the initial temperature was 25°C? The specific heat of copper is 0.092 cal/g°C. (1) FIND ΔT (2) THEN FIND FINAL temp

$\Delta T = \frac{q}{mc}$

$\Delta T = \frac{54 cal}{(4.50g)(0.092 cal/g°C)}$ $\Delta T = 130°C$

$\Delta T = T_f - T_i$

$\Delta T + T_i = T_f$

$(130) + (25) = T_f$

11. A 155 g sample of an unknown substance was heated from 25°C to 40°C. In the process, the substance absorbed 569 calories of energy. What is the specific heat of the substance?

$C = \frac{Q}{m \Delta T}$ $C = \frac{569 cal}{(155g)(+15°C)}$ $C = 0.24 \frac{calories}{g°C}$

12. What is the specific heat of an unknown substance if a 2.50 g sample releases 12 calories as its temperature changes from 25°C to 20°C?

$C = \frac{Q}{m \Delta T}$ $C = \frac{-12 calories}{(2.5g)(-5°C)}$ $C = 0.96 \frac{cal}{g°C}$