heat units during chemical reactions

CAeMis+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

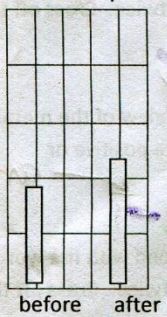
Name Answer

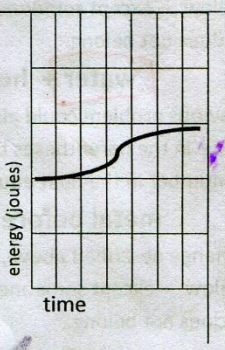
Period

1. List two units for measuring energy besides Calories with a capital C

a. joules b. calories

kilojoules okay too!

Graph of energy of a rock on a campfire:	IF the rock is the system the change was : -Exothermic -Endothermic IF the fire under the rock is the system the change was : -Exothermic -Endothermic
1. 	

Graph of the chemical energy of a sugar cane plant during 6 hours of photosynthesis	The change to the sugar cane plant was (circle one) : -Exothermic -Endothermic What lost energy in the surroundings that caused the plant to gain energy? sunlight
2. 	

3. An electric battery has 45 joules in the morning and has 50 joules at lunchtime
   a. For the battery, this change was (circle one) endothermic exothermic.
   b. What lost energy in the surroundings that caused the plant to gain energy?

the electrical system of Madison

4. Which temperature represents absolute zero?
   (1) 0 K (2) 0°C (3)273 K (4) 273°C
5. At which temperature does a water sample have the highest average kinetic energy? (1) 0°C, (2) 100°C, (3) 0 K, (4) 100 K

Because 100°C is 373 kelvins

6. Convert 56 kilojoules to calories

$$56\ kJ \times \left(\frac{1000\ J}{1\ kJ}\right) \times \left(\frac{1\ calorie}{4.184\ J}\right) = 13384 \approx 13000$$

7. Calculate using unit conversions the number of joules that would be given off by burning 34 grams of ammonia. Assume that burning 2.5 grams of ammonia gas gives off 820 calories of heat.

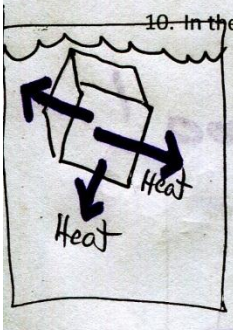
$$34g \times \frac{820\ cal}{2.5g} \times \left(\frac{4.184\ J}{1\ cal}\right) = 47000\ J$$

8. Convert 1365 calories to Calories

$$1365 \text{ calories} \times \frac{1 \text{ Calorie}}{1000 \text{ calories}} = 1.365 \text{ Calories}$$

9. Touching a test tube that has a reaction that contains an exothermic reaction your hand will feel (hot / cold) because heat will flow towards (your hand / the test tube reaction). If your hand is considered the system, the change is therefore (exothermic / endothermic). ← note!

10. In the box sketch a hot metal cube that has just been dropped into a glass of water.



   a. In your cartoon draw an arrow to show where heat is flowing.
   b. If the water is the system this change was (exothermic / endothermic)
   c. If the metal is the system this change was (exothermic / endothermic)
   d. Write + or – in the parentheses to show whether you would expect a positive or negative number in the heat equation ← answer

water before → water after ΔH = (+)

   e. For the change described above, the energy flow can also be described with the words shown below -- except someone accidentally wrote the word *heat* twice. Cross off the one that does not belong.

water + heat → water after

11. The change in the previous problem could also be considered from the point of view of the metal.
   a. Write + or – in the parentheses to show whether you would expect a positive or negative number in the heat equation ← answer

metal before → metal after ΔH = (–)

   b. For the change described above, the energy flow can also be described with the words shown below -- except someone accidentally wrote the word *heat* twice. Cross off the one that does not belong.

metal + heat → metal after + heat

12. How much heat is released when 4.9 moles of methane gas are burned in a constant pressure system? (890. kJ are given off if 1 mole of methane is burned)

$$4.9 \text{ moles} \times \frac{890 \text{ kJ}}{1 \text{ mole}} = 4361 \approx 4400 \text{ kJ}$$

13. In an experiment, liquid heptane, C_7H_{16} (l), is completely combusted to produce CO_2 (g) and H_2O (l), as represented by the following equation.

$$C_7H_{16}(l) + 11O_2(g) \rightarrow 7\,CO_2(g) + 8H_2O(l)$$

The heat of combustion, ΔH°_{comb}, for one mole of C_7H_{16}(l) is -4.85×10^3 kJ. Calculate how much heat would be released if 3.11×10^{-4} moles of heptane were combusted

$$3.11 \times 10^{-4} \text{ mol} \times \frac{4.85 \times 10^3 \text{ kJ}}{1 \text{ mole}} = 1.50835 \approx 1.51 \text{ kJ}$$