

Worksheet # 15

Energy

1. Define kinetic and potential energy and state the difference between them.
2. What is the first law of thermodynamics?
3. Define system and surroundings.
4. Define exothermic and endothermic.
5. The nutritional Calorie is the equivalent of 1 kcal. One pound of body fat is equivalent to about 4.1×10^3 Calories. Convert this to Joules and kJ.
6. Thermal decomposition of 5.0 metric tons of limestone to lime and carbon dioxide requires 9.0×10^6 kJ of heat. Convert this energy to joules and calories.

Energy and Chemical Change

7. "Hot packs" used by skiers, climbers, and others for warmth are based on the crystallization of sodium acetate from a highly concentrated solution. What is the sign of ΔH for this crystallization? Is the reaction exothermic or endothermic?
8. Classify the following processes as exothermic or endothermic: (a) freezing of water; (b) boiling of water; (c) digestion of food; (d) a person running; (e) a person growing; (f) wood being chopped; (g) heating with a furnace.
9. Draw an enthalpy diagram for a general exothermic reaction; label axis, reactants, products, and ΔH with its sign.
10. Draw an enthalpy diagram for a general endothermic reaction; label axis, reactants, products, and ΔH with its sign.
11. Write a balanced equation and draw an approximate enthalpy diagram for each of the following: (a) the combustion of 1 mol of methane in oxygen; (b) the freezing of liquid water.
12. Write a balanced equation and draw an approximate enthalpy diagram for each of the following: (a) the formation of 1 mol of sodium chloride from its elements (heat is released); (b) the vaporization of liquid benzene.
13. Write balanced equation and draw an approximate enthalpy diagram for each of the following changes: (a) the combustion of 1 mol of liquid ethanol (C_2H_5OH); (b) the formation of 1 mol of nitrogen dioxide from its elements (heat is absorbed).