THERMOCHEMISTRY CALCULATIONS WORKSHEET 1

Using reaction equation ratios

1. How much heat will be released when 6.44 g of Sulfur reacts with excess O_2 according to the following equation?
   $2S + 3O_2 \rightarrow 2SO_3 \quad \Delta H° = -791.4kJ$
2. How much heat will be released when 4.72 g of Carbon reacts with excess O_2 according to the following equation?
   $C + O_2 \rightarrow CO_2 \quad \Delta H° = -393.5kJ$
3. How much heat will be absorbed when 38.2 g of Bromine reacts with excess H_2 according to the following equation?
   $H_2 + Br_2 \rightarrow 2HBr \quad \Delta H° = 72.80kJ$
4. How much heat will be released when 1.48 g of Chlorine reacts with excess phosphorus according to the following equation? $2P + 5Cl_2 \rightarrow 2PCl_5 \quad \Delta H° = -886kJ$
5. How much heat will be released when 4.77 g of ethanol (C_2H_5OH) reacts with excess O_2 according to the following equation? $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O \quad \Delta H° = -1366.7kJ$
6. How much heat will be absorbed when 13.7 g of Nitrogen reacts with excess O_2 according to the following equation?
   $N_2 + O_2 \rightarrow 2NO \quad \Delta H° = -180kJ$
7. How much heat will be released when 11.8 g of Iron reacts with excess O_2 according to the following equation?
   $3Fe + 2O_2 \rightarrow Fe_3O_4 \quad \Delta H° = -1120.5kJ$
8. How much heat will be released when 18.6 g of Hydrogen reacts with excess O_2 according to the following equation?
   $2H_2 + O_2 \rightarrow H_2O \quad \Delta H° = -571.6kJ$
9. How much heat will be transferred when 14.9 g of ammonia reacts with excess O_2 according to the following equation? $4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O \quad \Delta H° = -1170kJ$
10. How much heat will be transferred when 5.81 g of graphite reacts with excess H_2 according to the following equation?
    $6C(graphite) + 3H_2 \rightarrow C_6H_6 \quad \Delta H° = 49.03kJ$

Using $\Delta H = mC\Delta T$

11. How many kilojoules of heat energy are required to heat all the aluminum (C_p of Al = .902J/g•°C) in a roll of aluminum foil (500.0 g) from room temperature (25.0 °C) to the temperature of a hot oven (250.0 °C)?
12. One way to cool down your cup of coffee is to plunge an ice-cold piece of aluminum into it. Suppose you store a 20.0 g piece of aluminum (C_p of Al = .902J/g•°C) in the refrigerator at 4.40 °C and then drop it into your coffee. The coffee temperature drops from 90.0 °C to 55.0 °C. How many joules of heat energy did the aluminum block absorb? (Ignore the cooling of the cup)
13. Suppose you pick up a 16.0-kilogram ball of iron (such as a "shot-put" ball at a track event). The iron (Cp = .451J/g•°C) ball has the same temperature as the atmosphere on a cool day say 16.0 °C. How many kilojoules of heat energy must the iron ball absorb to reach the temperature of your body (37.0°C)?
14. The specific heat of silver is 0.24 J/g°C. How much heat in joules must be added to a silver block of mass 86.0 g to raise its temperature by 9.00 °C?
15. An 18.7 g sample of platinum metal increases in temperature by 2.30 °C when 5.70 J of heat are added. What is the specific heat of platinum?

Answers: 1) -79.4kJ 2) -155kJ 3) 17.4kJ 4) -3.75kJ 5) -142kJ 6) -88.1kJ 7) -78.7kJ 8) -2660kJ 9) -256kJ 10) 3.96kJ 11) 101kJ 12) 912J 13) 152kJ 14) 186J 15) .132J/g°C