The overall reaction in a commercial heat pack can be represented as

$$4Fe(s) + 3O_2(g) \rightarrow 2Fe_2O_3(s) \quad \Delta H = -1652kJ$$

1. How much heat is released when 4.00 mol iron is reacted with excess O_2?
2. How much heat is released when 1.00 mol Fe_2O_3 is produced?
3. How much heat is released when 1.00g iron is reacted with excess O_2?
4. How much heat is released when 10.0g Fe and 2.00g O_2 are reacted?

Consider the combustion of propane:

$$C_3H_8(g) + 5O_2(g) \rightarrow 3CO_2(g) + 4H_2O(l) \quad \Delta H = -2221kJ$$

5. What mass of propane must be burned to furnish 1.3×10^8 J of heat if the heat transfer process is 60% efficient?

Calorimetry and Heat Capacity

Consider the substances in the table.

Substance	Specific Heat Capacity (J/ºCg)
$H_2O(l)$	4.18
$H_2O(s)$	2.03
Al(s)	0.89
Fe(s)	0.45
Hg(l)	0.14
C(s)	0.71

6. Which substance requires the largest amount of energy to raise the temperature of 25.0g of the substance from 15.0ºC to 37.0ºC?
7. Calculate the energy.
8. Which substance has the largest temperature change when 550. g of the substance absorbs 10.7kJ of energy?
9. Calculate the temperature change.

10. A 30.0 g sample of water at 280K is mixed with 50.0 g of water at 330K. Calculate the final temperature of the mixture assuming no heat is lost to the surroundings.

11. A 150.0g sample of a metal at 75.0ºC is added to a 150.0g of H2O at 15.0ºC. The temperature of the water rises to 18.3ºC. Calculate the specific heat capacity of the metal assuming that all the heat lost by the metal is gained by the water.

1. -1650kJ; 2. -826kJ; 3. -7.39kJ; 4. -34.4kJ; 5. 4400g; 6. $H_2O(l)$; 7. 2.30×10^3J: 8. Hg(l); 9. 140ºC; 10. 311K; 11. 0.25J/ºCg