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## CHE1031 Lecture 8 examples: Thermochemistry

### 8.1: Energy basics

1. You push a watermelon off out of a third-floor window. How is energy transferred or transformed?
2. Calculate the heat capacity of two cast-iron frying pans, one large and one small. The temperature of each pan is increased by 50 degrees. That requires an input of 18,150 J of energy for the small pan, and 90,700 J for the large pan.
3. Calculate the specific heat of two cast-iron frying pans, one large and one small. The temperature of each pan is increased by 50 degrees. That requires an input of 18,150 J of energy for the small pan, and 90,700 J for the large pan. The mass of the small pan is 808 g and the large pan is 4040 g.





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**8.2: Calorimetry**

8. A 360-g piece of steel rebar is dropped into 425 mL of water at 24°C. Water temperature increased to 42.7°C. The specific heat of iron is 0.449 J/g·°C. What was the initial temperature of the rebar?
9. A 59.7-g piece of metal was submerged in boiling water and then quickly transferred into 60.0 mL of water whose Initial temperature was 22.0°C. The final temperature is 28.5°C. What is the specific heat of the metal? Its identity?
10. When 50.0 mL of 1.00 M HCl and 50.0 mL of 1.00 M NaOH, both at initial temperatures of 22.0°C, are mixed in a calorimeter, the temperature of the solution increases to 28.9°C. How much heat is produced by the reaction?
11. When 3.00 g of KCl is added to 3.00 E2 g of water in a calorimeter, the temperature decreased by 1.05°C. How much heat is involved in dissolution of KCl?

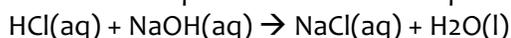


**8.3: Enthalpy**

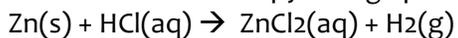
12. How much energy is produced when 28.5 g of water are made?



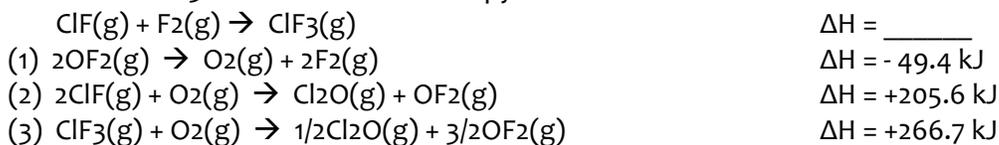
13. When 0.0500 mol of HCl reacts with 0.0500 mol of NaOH to form 0.0500 mol of NaCl, 2.9 kJ of heat are produced. What is  $\Delta\text{H}$  per mole of acid?



14. When 1.34 g of Zn reacts with 60.0 ml of 0.750 M HCl, 3.14 kJ of heat are produced. Determine the enthalpy change per mole of Zn:

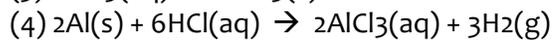
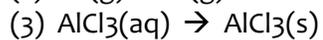
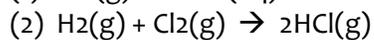
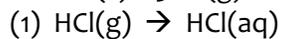
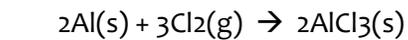


15. Use reactions 1-3 to calculate the enthalpy for this reaction:





16. Aluminum chloride can be formed from its elements:



$$\Delta H = \underline{\hspace{2cm}}$$

$$\Delta H = -74.8 \text{ kJ}$$

$$\Delta H = -185.0 \text{ kJ}$$

$$\Delta H = +323 \text{ kJ}$$

$$\Delta H = -1049 \text{ kJ}$$