CHAPTER (1)

1.1 An exothermic reaction causes the surroundings to:

(A) become basic (B) decrease in temperature

(B) (C) increase in temperature (D) decrease in temperature

1.2A gas expands in volume from 20mL to 50 mL at constant temperature. Calculate the work done (in joules) if the gas expands (a) against a vacuum, (b) against a constant pressure of 3 atm?

1.3 A gas is allowed to expand at constant temperature from a volume of 10.0 L to 20.0 L against an external pressure of 1.0 atm. If the gas also absorbs 250 J of heat from the surroundings, what are the values of q, w and ΔE?

1.4 How much heat is evolved when 320 g of SO_2 is burned according to the chemical equation shown below:

$$2SO_2\,(g) + O_2\,(g) \longrightarrow 2SO_3(g)\,,\ \Delta H^{o}_{rxn} = -198kJ$$

(A) 5.04×10^{-2} KJ (B) 9.9×10^{2} KJ (C) 207 KJ (D) 5×10^{2} KJ

1.5 The specific heat of aluminum is 0.214 cal/g°c. What is the energy, in calories, necessary to raise the temperature of a 55.5 g piece of aluminum from 23.0 to 48.6°C?

(A) 109 cal (B) 273 cal (C) 577 cal (D) 374 cal (E) 304 cal

1.6a. What is the heat capacity of a block of lead if the temperature of a 425 g block increases from 2.31°C when it absorbs 492 J of heat?

b. What is the specific heat of lead?

1.7To which of the following reactions, at 25°C, does the symbol of $\Delta H^{o}_{f}\,(H_2SO_4)$ refer:

(A) $2\,H\,(g) + 2S\,(g) + 2O_2\,(g) \longrightarrow H_2SO_4\,(g)$

(B) $H_2\,(g) + S\,(s) + 2O_2\,(g) \longrightarrow H_2SO_4\,(l)$

(C) $H_2\,(g) + S\,(g) + 2O_2\,(g) \longrightarrow H_2SO_4\,(l)$

(D) $H_2\,(g) + S\,(s) + 2O_2\,(g) \longrightarrow H_2SO_4\,(s)$

1.8 Calculate ΔH^{o}_{rxn} for the following combustion reaction

$$CH_4\,(g) + 2O_2\,(g) \longrightarrow CO_2\,(g) + 2H_2O(l)$$

$\Delta H^{o}_{f}(CH_4) = -74.85$ KJ/mol ; $\Delta H^{o}_{f}(CO_2) = -393.5$ KJ/mol ; $\Delta H^{o}_{f}(H_2O)_l = -285.8$ KJ/mol

(A) -604.2 KJ (B) 889.7 KJ (C) -997.7 KJ (D) -889.7 KJ (E) non of these answers

1.9 The combustion of benzoic acid is often used as a standard source of heat for calibrating combustion bomb calorimeters. The heat of combustion of benzoic acid has been accurately determined to be 26.42 KJ/g. When 0.80 g of benzoic acid was burned in a calorimeter containing 950 g of water, a temperature rises of 4.08°C was observed. What is the heat capacity of the bomb calorimeter (the calorimeter constant)?

1.10 Determine the enthalpy change of

$$C_2H_4 + 3\,O_2 \rightarrow 2\,CO_2 + 2\,H_2O \quad \Delta H = ?$$

from these reactions:

$C_2H_2 + H_2 \rightarrow C_2H_4 \quad \Delta H = -174.5$ kJ

$2\,C_2H_2 + 5\,O_2 \rightarrow 4\,CO_2 + 2\,H_2O \quad \Delta H = -1{,}692.2$ kJ

$2\,CO_2 + H_2 \rightarrow 2\,O_2 + C_2H_2 \quad \Delta H = -167.5$ kJ