A.P. Chemistry Quiz: Hess's Law and Calorimetry

Name_____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) For a given process at constant pressure, ΔH is negative. This means that the process is _____.
   A) exothermic
   B) equithermic
   C) energy
   D) endothermic
   E) a state function

2) The value of ΔH° for the reaction below is –72 kJ. How many kJ of heat are released when 1.0 mol of HBr is formed in this reaction?

   $H_2\,(g) + Br_2\,(g) \rightarrow 2HBr\,(g)$

   A) 144 B) –72 C) 36 D) 72 E) 0.44

3) The value of ΔH° for the reaction below is –126 kJ. The amount of heat that is released by the reaction of 25.0 g of Na_2O_2 with water is _____ kJ.

   $2Na_2O_2\,(s) + 2H_2O\,(l) \rightarrow 4NaOH\,(s) + O_2\,(g)$

   A) –126 B) 40.4 C) 67.5 D) 80.8 E) 20.2

4) A sample of aluminum metal absorbs 9.86 J of heat, upon which the temperature of the sample increases from 23.2°C to 30.5°C. Since the specific heat capacity of aluminum is 0.90 J/g–K, the mass of the sample is _____ g.
   A) 72 B) 8.1 C) 1.5 D) 65 E) 6.6

5) ΔH for the reaction

   $IF_5\,(g) \rightarrow IF_3\,(g) + F_2\,(g)$

   is _____ kJ, give the data below.

   $IF\,(g) + F_2\,(g) \rightarrow IF_3\,(g)$ $\Delta H = -390$ kJ

   $IF\,(g) + 2\,F_2\,(g) \rightarrow IF_5\,(g)$ $\Delta H = -745$ kJ

   A) –1135 B) +35 C) +1135 D) –35 E) +355

Answer Key
Testname: QUIZ_HESS_CALORIMETRY_CH_06.TST

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) A
ID: chem9b 5.1–30

2) C
ID: chem9b 5.1–34

3) E
ID: chem9b 5.1–36

4) C
ID: chem9b 5.1–53

5) E
ID: chem9b 5.1–62

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version A

(1) exothermic

(2) $H_2 + Br_2 \rightarrow 2HBr$

$$1.0 \text{ mol } HBr \times \frac{-72 \text{ kJ}}{2 \text{ mol } HBr} = -36 \text{ kJ}$$ (C)

$\Delta H^\circ = -36$ kJ, thus 36 kJ of heat is released

(3) $$25.0 \text{ g } Na_2O_2 \times \frac{1 \text{ mol } Na_2O_2}{78.0 \text{ g } Na_2O_2} \times \frac{-126 \text{ kJ}}{2 \text{ mol } Na_2O_2} = -20.2 \text{ kJ}$$

23
23
16
16
78 g/mol

$\Delta H^\circ = -20.2$ kJ; 20.2 kJ of heat is released (E)

(4) $q = +9.86$ J

$\Delta T = T_f - T_i = 30.5 - 23.2 = 7.3^\circ C = 7.3 K$

$C = \frac{0.90 \text{ J}}{\text{g K}}$

$q = MC\Delta T \Rightarrow M = \frac{q}{C\Delta T} = \frac{9.86 \text{ J}}{\left(\frac{0.90 \text{ J}}{\text{g K}}\right)(7.3 \text{ K})} = 1.50 \text{ g}$

$= 1.5$ g

(C)

Version A (cont'd)

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eqn 2 reversed: $IF_5 \rightarrow \cancel{IF} + \cancel{2}F_2$ $\Delta H = +745\,k$

\+ eqn 1: $\cancel{IF} + \cancel{F_2} \rightarrow IF_3$ $\Delta H = -390\,k$

$IF_5 \rightarrow F_2 + IF_3$ $\Delta H = +355\,k$

E