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Chapter 6 (397928)

About this Assignment

Description
Principles of Reactivity: Energy and Chemical Reactions

Instructions
Principles of Reactivity: Energy and Chemical Reactions

1. KT6 6.P.020. [489840] Show Details

The heat energy required to melt 1.00 g of ice at 0°C is 333 J. If one ice cube has a mass of 57.0 g, and a tray contains 16 ice cubes, what quantity of energy is required to melt a tray of ice cubes to form liquid water at 0℃?

4.0 [ ] J

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2. KT6 6.P.018. [489879] Show Details

A 237 g piece of molybdenum, initially at 100.0℃, i s dropped into 244 g of water at 10.0℃. When the system comes to thermal equilibrium, the temperature is 15.3℃. What is the specific heat capacity of molybdenum?

4.0 [ ] J/g ▪ K

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3. KT6 6.P.028. [467506] Show Details

Calcium carbide, CaC_2, is manufactured by the reaction of CaO with carbon at a high temperature. (Calcium carbide is then used to make acetylene.)

$$CaO(s) + 3\ C(s) \rightarrow CaC_2(s) + CO(g)\ \Delta H°_{rxn} = -464.8\ kJ$$

Is this reaction endothermic or exothermic?

- ○ exothermic
- ○ endothermic

If 19.7 g of CaO is allowed to react with an excess of carbon, what quantity of heat is absorbed or evolved by the reaction?

4.0 [ ] kJ

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4. KT6 6.P.032. [467265] Show Details

You mix 125 mL of 0.250 *M* CsOH with 50.0 mL of 0.625 *M* HF in a coffee-cup calorimeter, and the temperature of both solutions rises from 21.50℃ before mixing to 24.40℃ after the reaction.

$$CsOH(aq) + HF(aq) \rightarrow CsF(aq) + H_2O(l)$$

What is the enthalpy of reaction per mole of CsOH? Assume the densities of the solutions are all 1.00 g/mL and the specific heats of the solutions are 4.2 J/g ▪ K.

4.0 [ ] kJ/mol

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5. KT6 6.P.037. [467588] Show Details

Sulfur (1.81 g) is burned in a constant volume calorimeter with excess O_2(g). The temperature increases from 21.25℃ to 25.13℃. The bomb has a heat capacity of 923 J/K, and the cal orimeter contains 815 g of

water. Calculate the heat evolved, per mole of SO_2 formed, for the reaction

$$S_8(s) + 8\ O_2(g) \rightarrow 8\ SO_2(g)$$

4.0 ☑ [ ] kJ/mol

Sulfur burns in oxygen, with a bright blue flame, to give sulfur dioxide gas, SO_2. (*C.D. Winters*)

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6. KT6 6.P.039. [467575] Show Details

Suppose you burn 1.558 g of benzoic acid, $C_6H_5CO_2H$, in a constant volume calorimeter and find that the temperature increases from 22.50℃ to 31.85℃. The calorimeter contains 775 g of water, and the b omb has a heat capacity of 893 J/K. What quantity of heat is evolved in this combustion reaction, per mole of benzoic acid?

4.0 ☑ [ ] kJ/mol

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7. KT6 6.P.041. [467216] Show Details

An "ice calorimeter" can be used to determine the specific heat of a metal. A piece of hot metal is dropped into a weighed quantity of ice. The quantity of heat transferred from the metal to the ice can be determined from the amount of ice melted. Suppose you heat a 40.0 g piece of metal to 99.8℃ and then drop it onto ice . When the metal's temperature has dropped to 0.0℃, it is found that 7.03 g of ice has melted. What is the specific heat capacity of silver?

4.0 ☑ [ ] J/g ▪ K

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8. KT6 6.P.046. [467149] Show Details

You wish to know the enthalpy change for the formation of liquid PCl_3 from the elements shown below.

$$P_4(s) + 6\ Cl_2(g) \rightarrow 4\ PCl_3(l)\ \Delta H°_f = ?$$

The enthalpy change for the formation of PCl_5 from the elements can be determined experimentally, as can the enthalpy change for the reaction of $PCl_3(l)$ with more chlorine to give $PCl_5(s)$.

$$P_4(s) + 10\ Cl_2(g) \rightarrow 4\ PCl_5(s)\ \Delta H°_{rxn} = -1774.0\ kJ$$

$$PCl_3(l) + Cl_2(g) \rightarrow PCl_5(s)\ \Delta H°_{rxn} = -123.8\ kJ$$

Use these data to calculate the enthalpy change for the formation of 1.80 mol of $PCl_3(l)$ from phosphorus and chlorine.

4.0 ☑ [ ] kJ

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9. KT6 6.P.054. [467461] Show Details

The Romans used calcium oxide, CaO, to produce a strong mortar. The CaO was mixed with water to give $Ca(OH)_2$, which reacted slowly with CO_2 in the air to give $CaCO_3$.

$$Ca(OH)_2(s) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(g)$$

(a) Calculate the standard enthalpy change for this reaction.

[ ] kJ

(b) What quantity of heat is evolved or absorbed if 1.40 kg of $Ca(OH)_2$ reacts with a stoichiometric amount of CO_2?

4.0 ☑ [ ] kJ

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10. KT6 6.P.107. [467354] Show Details

You want to heat the air in your house with natural gas (CH_4). Assume your house has 241 m^2 (about 2453 ft^2) of floor area and that the ceilings are 2.20 m from the floors. The air in the house has a molar heat capacity of 29.1 J/mol ▪ K. (The number of moles of air in the house can be found by assuming that the average molar mass of air is 28.9 g/mol and that the density of air at these temperatures is 1.22 g/L.) What mass of methane do you have to burn to heat the air from 17.5℃ to 22.0℃?

4.0 ☑ [ ] g

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