

Chapter 5

Enthalpy

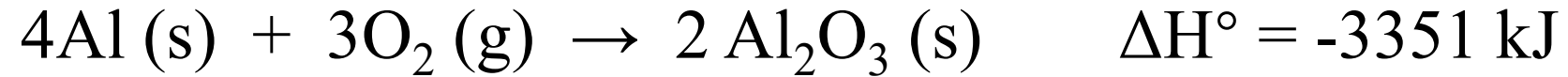
1. Which one of the following conditions would always result in an increase in the internal energy of a system _____?

- A) The system loses heat and does work on the surroundings.
- B) The system gains heat and does work on the surroundings.
- C) The system loses heat and has work done on it by the surroundings.
- D) The system gains heat and has work done on it by the surroundings.
- E) None of the above is correct.

2. Which one of the following statements is true _____?

- A) Enthalpy is an intensive property.
- B) The enthalpy change for a reaction is independent of the state of the reactants and products.
- C) Enthalpy is a state function.
- D) H is the value of q measured under conditions of constant volume.
- E) The enthalpy change of a reaction is the reciprocal of the ΔH of the reverse reaction.

3. The reaction



is _____, and therefore heat is _____ by the reaction.

- A) endothermic, released
- B) endothermic, absorbed
- C) exothermic, released
- D) exothermic, absorbed
- E) thermoneutral, neither released nor absorbed

4. Under what condition(s) is the enthalpy change of a process equal to the amount of heat transferred into or out of the system _____?

- (a) temperature is constant
- (b) pressure is constant
- (c) volume is constant

- A) a only
- B) b only
- C) c only
- D) a and b
- E) b and c

5. The British thermal unit (Btu) is commonly used in engineering applications. A Btu is defined as the amount of heat required to raise the temperature of 1 lb of water by 1 °F. There are _____ joules in one Btu. 1 lb = 453.59 g; °C = (5/9)(°F - 32°); specific heat of H₂O(l) = 4.184 J/g-K.

A) 3415

B) 60.29

C) 1054

D) 5.120×10^{-3}

E) Additional information is needed to complete the calculation.

6. A 22.44 g sample of iron absorbs 180.8 J of heat, upon which the temperature of the sample increases from 21.1 °C to 39.0 °C. What is the specific heat of iron _____?

- A) 0.140
- B) 0.450
- C) 0.820
- D) 0.840
- E) 0.900

$$180.8/(22.44 \times 17.9)$$

7. Of the following, ΔH_f° is not zero for _____.

A) O_2 (g)

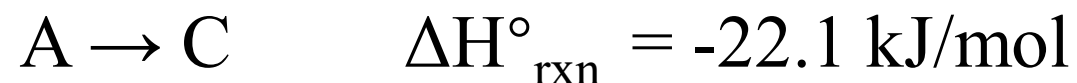
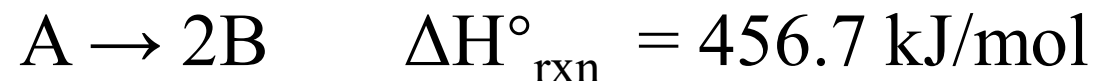
B) C (s, graphite)

C) N_2 (g)

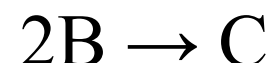
D) F_2 (s)

E) Cl_2 (g)

8. Consider the following two reactions:



Determine the enthalpy change for the process: _____



A) -478.8 kJ/mol

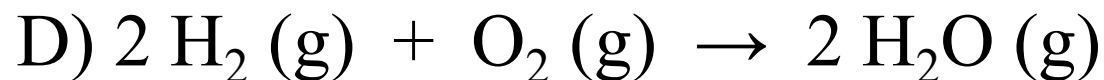
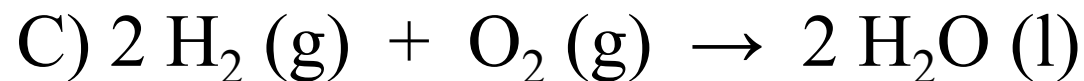
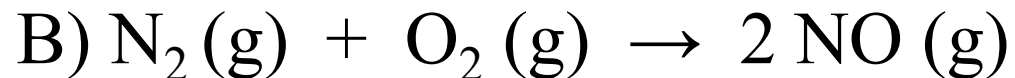
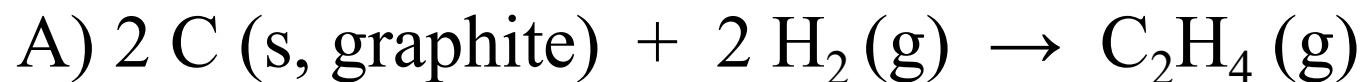
B) -434.6 kJ/mol

C) 434.6 kJ/mol

D) 478.8 kJ/mol

E) More information is needed to solve the problem.

9. For which one of the following reactions is the value of $\Delta H^\circ_{\text{rxn}}$ equal to ΔH°_f for the product _____?



- **Enthalpies of formation (ΔH_f):** the enthalpy change associated with the process of the formation of a compound from its constituent elements.
- **Standard state:** 1atm, 298 K (25°C)
- **Standard enthalpy change of a reaction (ΔH^0):** the enthalpy change when all reactants and products are in their standard states.
- **Standard enthalpy of formation of a compound (ΔH_f^0):** the enthalpy change for the reaction that forms one mole of the compound from its element with all substance in their standard states.

Note: the standard enthalpy of formation of the most stable form of any element is zero.