



1) Given the following data:

Enthalpy of formation of propane: $\Delta H_f^\circ (\text{C}_3\text{H}_8) = -103 \text{ kJ/mol}$

Enthalpy of formation of carbon dioxide: $\Delta H_f^\circ \text{CO}_2(\text{g}) = -393.5 \text{ kJ/mol}$;

Enthalpy of formation of water: $\Delta H_f^\circ \text{H}_2\text{O}(\text{l}) = -285.5 \text{ kJ/mol}$.

Calculate the standard enthalpy of combustion of propane

- A) -141.5 kJ/mol
- B) -64.5 kJ / mol
- C) -2425.5 kJ/mol
- D) -2219.5 kJ/mol

2) Calculate the heat needed to raise the temperature of 1000 litres of water in a reservoir from 25 °C to 50 °C to be used as part of the heating system of a factory.

Data: Specific heat capacity of water is $4.187 \text{ kJ}\cdot\text{kg}^{-1}\cdot\text{K}^{-1}$; Density (H_2O , 25 °C) = $997.1 \text{ kg}\cdot\text{m}^{-3}$.

- A) -141.5 kJ/mol
- B) -64.5 kJ / mol
- C) -2425.5 kJ/mol
- D) -2219.5 kJ/mol

3. For which of the substances below is the enthalpy of formation equal to zero, $\Delta H_f^\circ = 0$?

- A) $\text{N}_2(\text{l})$
- B) $\text{He}_2(\text{g})$
- C) $\text{Ar}(\text{g})$
- D) C (diamond)

4. To which of the following reactions occurring at 25 °C does the symbol $\Delta H_f^\circ [\text{CH}_3\text{OH}(\text{l})]$ apply?

- A) $\text{C}(\text{graphite}) + 2\text{H}(\text{g}) + \text{O}(\text{g}) \rightarrow \text{CH}_3\text{OH}(\text{l})$
- B) $\text{C}(\text{graphite}) + 2\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{CH}_3\text{OH}(\text{l})$
- C) $\text{C}(\text{diamond}) + 2\text{H}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{CH}_3\text{OH}(\text{l})$
- D) $2\text{C}(\text{graphite}) + 4\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{CH}_3\text{OH}(\text{l})$

5. Which of the following compounds has the lowest entropy at 25 °C?

- A) $\text{CH}_3\text{CH}_2\text{OH}(\text{l})$
- B) $\text{O}_2(\text{g})$
- C) $\text{KClO}_3(\text{s})$
- D) $\text{Ar}(\text{g})$

6. Among the following substances choose the one with the greatest entropy per mole

- A) $\text{Ar}(\text{g})$
- B) $\text{CO}(\text{g})$
- C) $\text{SO}_3(\text{g})$
- D) $\text{CH}_4(\text{g})$

7. Without using data from tables, predict the sign of ΔS for the following reaction: $\text{CaCO}_3(\text{s}) \leftrightarrow \text{CO}_2(\text{g}) + \text{CaO}(\text{s})$.

- A) $\Delta S = 0$
- B) $\Delta S < 0$
- C) $\Delta S > 0$
- D) More information is needed to make a reasonable prediction.

8. The temperature of vaporization of rubidium is 960.15 K and its entropy of vaporization 71.9 J/K.mol. Calculate the heat of vaporization of rubidium:

- A) 687 kJ/mol
- B) 28.8 J/mol·K
- C) 32 kJ/mol·K
- D) 69 kJ/mol