

Enthalpy Diagrams and Equations

1. Classify each enthalpy change as endothermic or exothermic:

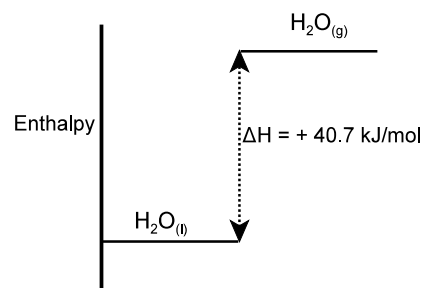
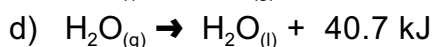
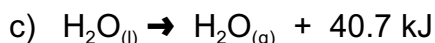
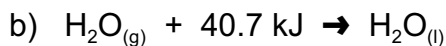
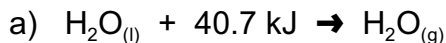
(a) methanol condensing _____

(c) aluminum melting _____

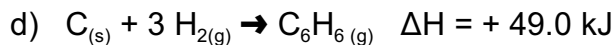
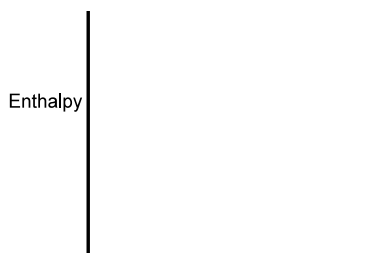
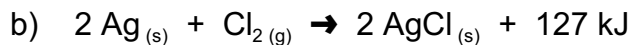
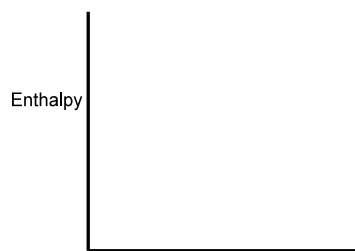
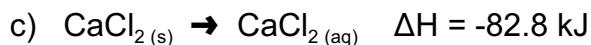
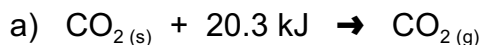
(b) water freezing _____

(d) octane evaporating _____

2. Which process is shown in this enthalpy diagram?



3. Sketch an enthalpy diagram for each of the following:



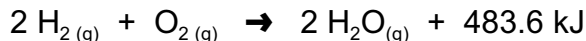
4. Write a thermochemical equation for the formation of one mole of sulfur hexafluoride from its elements. $\Delta H_f = - 1220.5 \text{ kJ/mol}$

5. Write a thermochemical equation for the formation of one mole of potassium bromide from its elements. $\Delta H_f = - 393.8 \text{ kJ/mol}$

6. Use the equation below to determine the molar enthalpy of formation of $\text{HgS}_{(s)}$?



7. Use the equation below to determine the molar enthalpy of formation of $\text{H}_2\text{O}_{(g)}$?



8. A *cold pack* consists of an inner pouch containing ammonium nitrate crystals and an outer pouch of water. Bending the pack breaks the inner pouch allowing the water and solute to mix. As the ammonium nitrate crystals dissolve, the temperature of their surroundings decreases.

- (a) Draw an enthalpy diagram to show the dissolving of ammonium nitrate. The energy change per mole of ammonium nitrate dissociated is 25.7 kJ.

- (b) Classify the energy change as endothermic or exothermic.



- (c) Write a thermochemical equation for the dissolving of ammonium nitrate showing the energy term within the equation.

9. Write a thermochemical equation for the formation of one mole of PH_3 from its elements. $\Delta H_f = +4.4 \text{ kJ/mol}$

10. The molar heat of combustion of ethyne, C_2H_2 , is -1300 kJ/mol . Write a thermochemical chemical equation for the combustion of ethyne.

11. Write a thermochemical equation for the vaporization of CH_3Cl . ($\Delta H_{\text{vap}} = +239.2 \text{ kJ/mol}$)

12. Nitrogen gas reacts with oxygen gas to produce dinitrogen monoxide gas.



- (a) Is this reaction endothermic or exothermic?

- (b) Draw an Enthalpy diagram for this reaction.

