

Enthalpy Calculations:

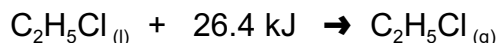
$$n = \frac{m}{M} \quad \text{and} \quad q = n\Delta H$$

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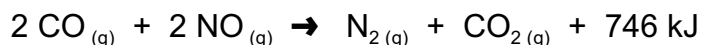
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1. A puncture in the tubing of a refrigerator can cause severe frostbite as chloroethane,  $\text{C}_2\text{H}_5\text{Cl}$ , vaporizes. Use this thermochemical equation to calculate the heat absorbed when 23.6 g of chloroethane vaporizes at its boiling point. (9.66 kJ)



2. This reaction occurs in the catalytic converter of an automobile.



- a) How much energy is released per mole of carbon dioxide gas produced? (-746 kJ/mol)
- b) How much energy is released when 945 g of  $\text{CO}_{2(g)}$  is produced? (-160 kJ)

3. Given that  $\Delta H_{\text{vap}}$  for ammonia,  $\text{NH}_3$ , is +23.4 kJ/mol, calculate the heat change for condensing 10.0 g of ammonia? (13.7 kJ)

4. Calculate mass of sodium hydroxide will cause the release of 11.13 kJ of heat when dissolved in water. ( $\Delta H_{\text{soln}} = -44.51 \text{ kJ/mol}$ ) (10.0 g)

5. Calculate the molar enthalpy of vaporization of ammonia if 34.25 kJ of heat is absorbed to vaporize 25.0 g of ammonia. (23.3 kJ/mol)

6. As Freon-12,  $\text{CCl}_2\text{F}_2(l)$ , absorbs energy from a refrigerator, it vaporizes. The vaporization of 5.00 g of Freon-12 requires 1.45 kJ of energy.
- a) Calculate the molar heat of vaporization of Freon-12. (35.1 kJ/mol)
- b) Calculate the amount of heat the Freon-12 must absorb in order to cool 115.3 g of air in a fridge from  $7^\circ\text{C}$  to  $5^\circ\text{C}$ . The specific heat capacity of air is  $1.01 \text{ J/g}\cdot^\circ\text{C}$ . (0.2 kJ)
7. Perform calculations to determine the enthalpy change for each species. (Include an appropriate thermochemical equation in each of your answers.)
- a) the condensation of 10.0 g of methanol,  $\text{CH}_3\text{OH}$ .  $\Delta H_{\text{vap}} = 39.23 \text{ kJ/mol}$  (12.2 kJ)
- b) the formation of 5.00 g of potassium iodide.  $\Delta H_f^\circ = -327.9 \text{ kJ/mol}$  (-9.88 kJ)
8. The molar heat for the combustion of ethyne is  $-1300 \text{ kJ/mol}$ . Calculate the enthalpy change that occurs when 15.4 g of ethyne is burned under standard conditions. (-770 kJ)
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9. Why does the molar heat of vaporization for a substance always seem to be greater than its molar heat of fusion?
10. Which event should cause a more severe burn: the condensation of 10.0 g of steam on skin or the cooling of 10.0 g of water from  $100^\circ\text{C}$  to  $37^\circ\text{C}$ ?
11. If you are lost in the woods and you become thirsty, would it be better to drink water from a stream than to eat snow? Explain your choice in terms of hypothermia.
12. Why do strawberry farmers spray their crops with a fine mist of water when there is a risk of frost?