

1. Exothermic vs. Endothermic
2. $Q = m c \Delta T$
3. Enthalpy of a reaction (ΔH)
4. How does the energy of the **products** of a reaction system compare with the energy of the **reactants** when the reaction is
 - a. Endothermic
 - b. Exothermic

5. How much energy is needed to raise the temperature of a 55 g sample of aluminum from 22.4°C to 94.6°C?
 (The specific heat of aluminum is 0.897 Joules/g °C)

$$94.6 - 22.4 = 72.2^\circ\text{C}$$

$$Q = m c \Delta T$$

$$55\text{g} \left(0.897 \frac{\text{J}}{\text{g}^\circ\text{C}} \right) (72.2^\circ\text{C}) = 3562 \text{ J} \text{ or } 3.6 \text{ kJ}$$

6. If 3.5 kJ of energy are added to a 28.2 g sample of iron at 20°C, what is the final temperature of the iron?
 (Specific heat of iron is 0.449 Joules/g °C)

$$\Delta T = \frac{Q}{m c} = \frac{3500 \text{ J}}{28.2 \text{ g} \cdot 0.449 \frac{\text{J}}{\text{g}^\circ\text{C}}} = 276.42^\circ\text{C}$$

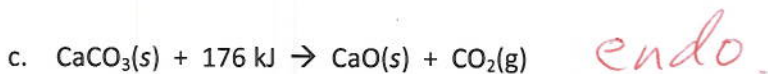
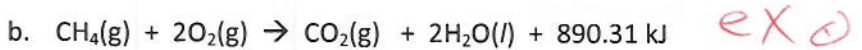
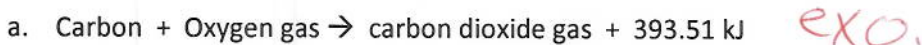
$$276.42^\circ\text{C} + 20^\circ\text{C} = 296^\circ\text{C}$$

s.f.
300°C

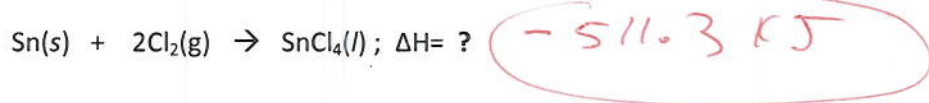
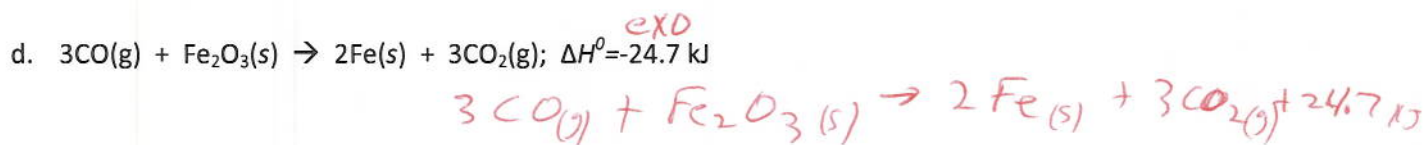
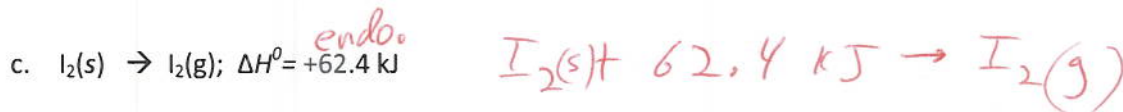
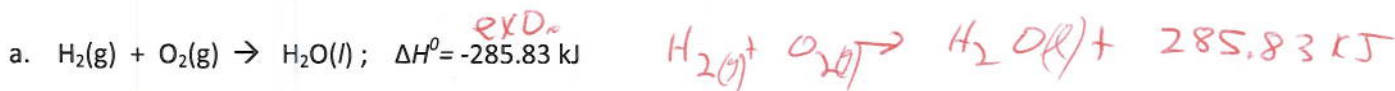
7. You need 70.2 J to raise the temperature of 34.0 g of ammonia, $\text{NH}_3(\text{g})$, from 23.0°C to 24.0°C. Calculate the specific heat of ammonia.

$$c = \frac{Q}{m \Delta T} = \frac{70.2 \text{ J}}{34.0 \text{ g} (1.0^\circ\text{C})} = 2.06 = 2.1 \frac{\text{J}}{\text{g}^\circ\text{C}}$$

8. For each equation listed below, determine if the reaction is endothermic or exothermic.



9. Rewrite each equation below with the ΔH value included with either the reactants or the products, and identify the reaction as endothermic or exothermic.



11. The standard enthalpy of formation for sulfur dioxide gas from sulfur and oxygen gas is -296.8 kJ/mol. Calculate the amount of energy given off in kJ when 30.0 g of $\text{SO}_2(\text{g})$ is formed from its elements.



$$\frac{30.0 \text{ g SO}_2}{64 \text{ g SO}_2} \times \frac{\text{mol SO}_2}{1 \text{ mol SO}_2} = 0.46875 \text{ mol SO}_2 \times \frac{296.8 \text{ kJ}}{1 \text{ mol SO}_2} = 139 \text{ kJ}$$