CONCEPT: CONSTANT-VOLUME CALORIMETRY

Heat of Combustion

- **Heat of Combustion**: amount of heat released when _____ of a substance is burned or combusted.
  - □ Recall, a combustion reaction normally involves a compound with _____ or _____ reacting with O_2.
  - □ Associated with any combustion reaction is a *heat of combustion* value (_____).

EXAMPLE: Which of the following statements is true about the combustion of propane?

$$\mathbf{1}\ C_3H_8\ (g) + \mathbf{5}\ O_2\ (g) \longrightarrow \mathbf{3}\ CO_2\ (g) + \mathbf{4}\ H_2O\ (g) \quad \Delta H^{o}_{comb} = -2222\ kJ$$

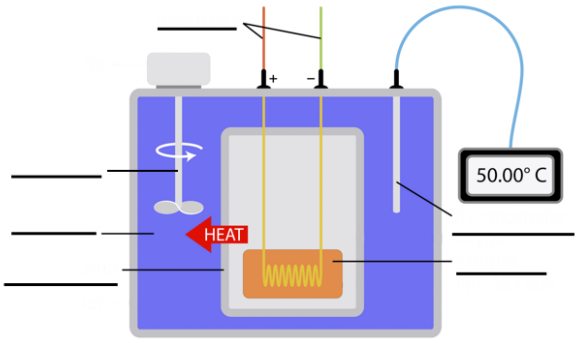
a) It is endothermic b) It is exothermic c) Absorbs heat from the surroundings d) None of the above

Bomb Calorimeter

- A **Bomb Calorimeter** is a steel container with a combustible sample submerged in a known quantity of water.
  - □ **Constant Volume Calorimetry** uses it to determine the heat released during a combustion reaction.
  - □ **Constant Volume**: The calorimeter has a fixed volume and doesn't expand after the sample is combusted.
  - □ Since the combustion reaction is exothermic: ΔH^{o}_{comb} = _____.

Constant–Volume Calorimetry

Bomb Calorimeter



Constant–Volume Formula

□ When both the liquid and calorimeter absorb heat from the hot object:

$$\_\_\_\ q_{lost} = \_\_\_\ q_{gained} + \_\_\_\_\_$$

□ Expanding them to their heat capacity formulas gives:

$$\Delta H^{o}_{Comb} = \_\_ m \cdot c \cdot \Delta T + \_\_ \cdot \_\_$$

EXAMPLE: The heat capacity of a bomb calorimeter was determined by burning 12.13 g ethane (heat of combustion = 1560 kJ/mol) in the bomb. If the temperature changed by 15.2 ºC, what is the heat capacity of the bomb?