5.49a) The units for molar heat capacity are J/molc˚.
b) The units for specific heat are J/gc˚

5.50 a) Object A has the greater heat capacity. While it was at the same temperature as object B, it had more energy to transfer to the water, as demonstrated by the greater temperature change for the water.
b) From the given information, we can not make conclusions about the specific heats of the objects because we don't know their masses.

5.51a) The specific heat of water is 4.184J/gc°

b) The molar heat capacity of water is 75.4 J/mol·c°

(4.18 x 18.0gmol^{-1})

c) $\dfrac{185\text{g } H_2O \mid 4.184\text{J/c}^\circ}{\mid 1\text{g } H_2O} = 774\text{J/c}^\circ$

d) $q = mc\Delta T$

$q = 10000.00\text{g} \cdot 4.184\text{J/gc}^\circ \cdot (46.2\text{c}^\circ - 24.6\text{c}^\circ)$

$q = 903744\text{J or } 904\text{kJ}$

5.56 $q = mc\Delta T$

$q = 60.0\text{g} \cdot 4.184\text{J/gc}^\circ \cdot (21.8\text{c}^\circ - 14.0\text{c}^\circ)$

$q = 1958\text{J}$

$$\frac{1958\text{J} \mid 80.0\text{g } NH_4NO_3 \mid 1\text{ kJ}}{6.50\text{g } NH_4NO_3 \mid 1\text{ mol } NH_4NO_3 \mid 1000\text{ J}} = 24.1\text{ kJmol}^{-1}$$

5.63 $P_4O_6 + 2\ O_2 \Rightarrow P_4O_{10}$

~~$P_4 + 3\ O_2 \Rightarrow P_4O_6 \quad \Delta H = -1640.1\ kJ$~~

$P_4O_6 \Rightarrow P_4 + 3\ O_2 \quad \Delta H = +1640.1\ kJ$

$P_4 + 5\ O_2 \Rightarrow P_4O_{10} \quad \Delta H = -2940.1\ kJ$

$P_4O_6 + \cancel{P_4} + \frac{\cancel{5}}{2}\ O_2 \Rightarrow \cancel{P_4} + \cancel{3\ O_2} + P_4O_{10} \quad \Delta H = -1300.0\ kJ$

5.65 $C_2H_4 + 6F_2 \Rightarrow 2CF_4 + 4HF$

~~$H_2 + F_2 \Rightarrow 2HF \quad \Delta H = -537\ kJ$~~

$2H_2 + 2F_2 \Rightarrow 4HF \quad \Delta H = -1074\ kJ$

~~$C + 2F_2 \Rightarrow CF_4 \quad \Delta H = -680\ kJ$~~

$2C + 4F_2 \Rightarrow 2CF_4 \quad \Delta H = -1360\ kJ$

~~$2\ C + 2\ H_2 \Rightarrow C_2H_4 \quad \Delta H = +52.3\ kJ$~~

$C_2H_4 \Rightarrow 2C + 2H_2 \quad \Delta H = -52.3\ kJ$

$\cancel{2H_2} + 2F_2 + \cancel{2C} + 4F_2 + C_2H_4 \Rightarrow 4HF + 2CF_4 + \cancel{2C} + \cancel{2H_2}$

$\Delta H = -2486.3\ kJ$

5.69

a) Standard conditions refers to a system at 1 atm pressure at 298K (25˚C)

b) The enthalpy of formation represents the amount of heat lost or gained when 1 mole of a substance is formed from its component atoms.

c) The standard enthalpy of formation is the energy lost or gained when 1 mole of a substance is formed from its elements at standard conditions.

5.75a $\Delta H^\circ rxn = \sum \Delta H^\circ_f \text{ products} - \sum \Delta H^\circ_f \text{ reactants}$

$\Delta H^\circ rxn = 2\Delta H^\circ_f POCl_3 - (2\Delta H^\circ_f PCl_3 + \Delta H^\circ_f O_2)$

$\Delta H^\circ rxn = 2(-542.2kJ) - (2(-288.07kJ) + 0)$

$\Delta H^\circ rxn = -508.3kJ$

b $\Delta H^\circ rxn = \sum \Delta H^\circ_f \text{ products} - \sum \Delta H^\circ_f \text{ reactants}$

$\Delta H^\circ rxn = (\Delta H^\circ_f PbO + \Delta H^\circ_f CO_2) - \Delta H^\circ_f (PbCO_3)$

$\Delta H^\circ rxn = (-217.3kJ) + (-393.5kJ) - (-699.1kJ)$

$\Delta H^\circ rxn = 88.3kJ$