AP Chemistry PracTest: Thermochemistry

a.) Classify as (endo)thermic or (exo)thermic:

b.) _____ $H^+_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)}$ (Hess's Law Lab)

c.) _____ $I_{2(g)} \longrightarrow I_{2(s)}$

d.) _____ solid gold is melted

e.) _____ $\frac{1}{2}$ Hg + $O_2 \longrightarrow \frac{1}{2}$ HgO

f.) _____ brake pads rub against the drum to stop a truck.

g.) _____ $C_{210}H_{380}O_{24} + 305\ O_2 \longrightarrow 210\ CO_2 + 190\ H_2O$

h.) _____ ΔH = -350 kJ/mol

2.) A balloon contains 9.0×10^8 g of He at a pressure of 1.00 atm. The volume of the balloon is 6.4×10^9 liter. The temperature is decreased by 15ºC as the volume decreases to 5.0×10^8 liter, the pressure remains constant. Calculate *q*, *w*, and ΔE in Joules for the helium in the balloon. (The molar heat capacity of helium gas is 20.8 J/ºC·mol. 101.3 J = 1 L.atm)

3.) Consider the following reaction: $2\ C_4H_{10(g)} + 13\ O_{2(g)} \longrightarrow 8\ CO_{2(g)} + 10\ H_2O_{(g)}$ ΔH= -5300 kJ

Calculate the change in enthalpy if 8.4×10^5 liter of C_4H_{10} at 825 torr and 16ºC is reacted with 9.3×10^6 liter of oxygen at 13325 torr and 4.0ºC.

4.) A 37.2 g sample of dysprosium metal is heated to 98.5ºC and placed in a coffee cup calorimeter containing 212 g of water at 18.5ºC. After the metal cools, the final temperature of the metal and water is 20.2ºC. Calculate the specific heat and molar heat capacity of dysprosium.

5.) A bomb calorimeter has a heat capacity of 8.82 kJ/ºC. When a 2.285 g sample of a fuel ($C_{18}H_{28}O_6$) was burned in the calorimeter, the temperature increased by 7.1ºC. Calculate the energy of combustion of one mole of ethylene.

6.) A 26.62 gram sample of Iraq crude oil is burned in a bomb calorimeter, which causes the temperature of the calorimeter to increase by 31.2ºC. The calorimeter contains 2.00 kg of water and the heat capacity of the empty calorimeter is 0.66 kJ/ºC. How much heat is released per gram of oil when burned?

7.) In a coffee cup calorimeter, 200.0 ml of 0.150 *M* $AgNO_3$ and 300.0 ml of 0.250 *M* Na_2SO_4 are mixed together to yield the following equation: $2\ Ag^+_{(aq)} + SO_4^{-2}{}_{(aq)} \longrightarrow Ag_2SO_{4(s)}$, The two solutions were initially at 23.0ºC, and the final temperature is 25.5ºC. Calculate the heat that accompanies the formation of <u>one</u> mole of silver sulfate in kJ. *(Assume that the solution has the same properties as water*.) Remember to include the proper sign.

8.) Write reactions (you must include phase notation) for which the enthalpy change will be …

a.) ΔH_f^o = solid ammonium bromide

b.) ΔH_f^o = gaseous vinyl chloride (C_2H_3Cl)