Hess’s Law Internal

1. The balanced equation for carbon disulfide, CS2, burning in air is:

CS2(l) + 3O2(g) CO2(g) + 2SO2(g)

Use the enthalpy (heat) of formation data below to calculate the enthalpy of combustion, H , for the above equation. Show all of your working.

fH(SO2(g)) = -297 kJmol-1

fH(CO2(g)) = -393 kJmol-1

fH(CS2(l)) = +88 kJmol-1

2. The balanced equation for the formation of propane gas, C3H8, being formed from its elements is:

3C(s) + 4H2(g) C3H8(g)

Use the enthalpy data for the reactions below to calculate the enthalpy of formation, fH, for propane. Show all of your working.

C(s) + O2(g)CO2(g) fH = -393 kJmol-1

H2O(l) H2(g) + 1/2O2(g) H = +285 kJmol-1

C3H8(g) + 5O2(g) 3CO2(g) + 4H2O(l) H = -2217 kJmol-1

3. The Contact Process for the manufacture of sulfuric acid involves three successive reactions

i) sulfur is burned in air S(s) + O2(g) SO2(g)

ii) sulfur dioxide is further oxidised SO2(g) + 1/2O2(g) SO3(g)

iii) sulfur trioxide is reacted with water SO3(g) + H2O(l) H2SO4(l)

Given that the enthalpy change for the overall reaction

S(s) + 3/2O2(g) + H2O(l) H2SO4(l) is H = -529 kJmol-1

and further that fH(SO2) = -297 kJmol-1

cH(SO2) = -396 kJmol-1

calculate the enthalpy change for reaction (iii) above ie, the reaction for sulfur trioxide with water. Show all of your working.

edited from an old internal “Enthalpy changes” Unit Standard 8948