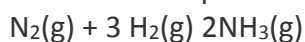**Answer on Question #55536 - Chemistry - General chemistry**

Question:
1. Ammonia is produced directly from nitrogen and hydrogen. The chemical reaction is
$N_2(g) + 3 H_2(g)$ $2NH_3(g)$
$N \equiv N$
a) Use Table 8.4 p 326 in textbook, to estimate the enthalpy change using the bond enthalpy for the reaction. Is it exothermic or endothermic?
b) Calculate the standard enthalpy change for this reaction, using standard enthalpies of formation $\Delta Hf°$.
2. A 1.800 g sample of phenol (C_6H_5OH) was burned in a bomb calorimeter whose total heat capacity is 11.66 kJ/°C. The temp of the calorimeter plus contents increased from
22.45 to 28.27°C.
a) Write a balanced chemical equation for the bomb calorimeter reaction.
b) What is the heat of combustion/gram of phenol?
c) What is the heat of combustion/mole of phenol?

Answer:

1)

    a) $N_2(g) + 3 H_2(g) \rightarrow 2 NH_3(g)$ is exothermic reaction because ΔH = -91.8 kJ/mol (ΔH<0)

    b)

    $\Delta H_{f,N2}$=0 kJ/mol

    $\Delta H_{f,H2}$=0 kJ/mol

    $\Delta Hf_{,NH3}$=-45.9 kJ/mol

$$\Delta H_{react} = (2\Delta Hf_{,NH3}) - (\Delta H_{f,N2} + 3\Delta H_{f,H2})$$

$$\Delta H_{react} = 2 \times (-45.9) - 0 - 3 \times 0 = -91.8 \text{ kJ/mol}$$

2)

a)

    $C_6H_5OH + 7O_2 \rightarrow 6CO_2 + 3H_2O$
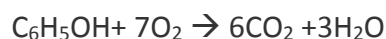
b)

    c=11.6 kJ/°C

    m=1.800 g

    $\Delta t = t_2 - t_1$ = 28.27-22.45 = 5.82 °C

    $Q = C \times \Delta t$

Q=11.6×5.82 = 67.86 kJ

Q_m=Q/m = 67.86/1.800 = **49.18 kJ/mol**

c)

m=1.800 g

M=91.4 g/mol

n=m/M

Q_n=Q_m×M = 49.18 × 91.4 = **4494.5 kJ/mol**