Video worksheet – Enthalpy calculations

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l) \quad \Delta H=-890kJ$$

1. Find the mass, in grams, of methane that completely combusts, according to the equation above, if 200 kJ of energy is released.

2. Find the volume, in litres, of oxygen gas required to burn enough methane so as to release 350 kJ of heat energy at SLC.

3. Consider the incomplete combustion of methane shown below

   $$2CH_4(g) + 3O_2(g) \rightarrow 2CO(g) + 4H_2O(l) \quad \Delta H= ? \text{ kJ/mol.}$$

   If 0.888 grams of water was formed with the release of 18.5 kJ of energy, calculate the ΔH for the reaction.

4. Consider the reaction given below.

   $$CaCO_3(s) \rightarrow CaO(s) + CO_2(g) \quad \Delta H = +178 \text{ kJ/mol}$$

   This reaction was used to cool 100g of water by 30.0 ^oC. Calculate the mass, in grams, of $CaCO_3$ dissolved in the water.

5. Consider the reaction given below.

$$3H_2(g) + N_2(g) \rightarrow 2NH_3(g) \quad \Delta H = -96 \text{ kJ/mol}$$

150 litres of hydrogen gas is mixed with 100 litres of nitrogen gas and allowed to react at SLC. Calculate the amount of heat energy released by this reaction.

6. Consider the reaction given below.

$$3H_2(g) + N_2(g) \rightarrow 2NH_3(g) \quad \Delta H = -96 \text{ kJ/mol}$$

The energy from burning 2.80 grams of nitrogen gas in excess hydrogen gas is used to increase the temperature of 0.300 litres of water by 5.00 ^{o}C. Calculate the efficiency of the heating vessel.

7. A calorimeter was calibrated using the chemical reaction shown below.

$CaO(s) + H_2O(l) \rightarrow 2Ca(OH)_2(aq) \quad \Delta H = -65.2$ kJ/mol

0.1120 g of $Ca(OH)_2$ (74.0 g/mol) was dissolved in 100 grams of water, at 20.0 ^{o}C and allowed to react according to the equation shown above. The final temperature of the water reached 42.0 ^{o}C. Find the calibration factor (C_f) of the calorimeter, in J/^{o}C.

Refer to video for solutions