Question:

1. A sample of iron absorbs 81.0 J of heat, upon which the temperature of the sample increases from 17.9 °C to 32.5 °C. If the specific heat capacity of iron is 0.450 J/g K, what is the mass (in grams) of the sample?
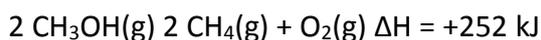
$$Q = mC\Delta T$$

$$m = \frac{Q}{C\Delta T}$$

$$m = \frac{81}{0.45 \times (32.5 - 17.9)}$$

$$m = 12.33g$$

2. Consider the following reaction. (Molar mass of CH_3OH = 32.04186 g/mol)
2 CH_3OH(g) 2 CH_4(g) + O_2(g) ΔH = +252 kJ
a) Is this reaction exothermic or endothermic?

Endothermic

b) Calculate the amount of heat transferred when 24.0g of CH_3OH(g) is decomposed by this reaction at constant pressure.

$$n = \frac{m}{M}$$

$$n = \frac{24}{32}$$

$$n = 0.75$$

$$\Delta H = \frac{252 \times 0.75}{2}$$

$$\Delta H = 94.5$$

c) For a given sample of CH_3OH(g), the enthalpy change during the reaction is 82.1 kJ. How many grams of methane gas are produced?

$$n(CH_4) = n(CH_3OH)$$

$$n(CH_4) = \frac{81 \times 2}{252}$$

$$n(CH_4) = \frac{81 \times 2}{252}$$

$$n(CH_4) = 0.64$$

$$m = n \times M$$

$$m = 0.64 * 16$$

$$m = 10.24$$

d) How many kj of heat are released when 35.8 g of CH_4(g) reacts completely with O_2(g) to form CH_3OH(g) at constant pressure?

$$\Delta H = \frac{35.8 \times 81}{10.24}$$

$$\Delta H = 304.5$$

3. The ΔE of a system that releases 10.4 J of heat and does 8.7 J of work on the surroundings is _____ J.

19.1