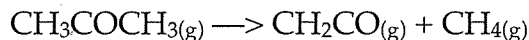


1) An 5.65 mol sample of acetone, CH_3COCH_3 , is placed in a 15.0 L evacuated rigid tank and heated to 372°C . At that temperature, all of the methanol is vaporized and some of the acetone decomposes to form ethyl ketone gas and methane gas, as represented in the equation below.



(a) The reaction mixture contains 2.30 mol of $\text{CH}_4(\text{g})$ at equilibrium at 327°C .

(i) Calculate the number of moles of $\text{CH}_2\text{CO}(\text{g})$ in the tank.

$$2.30 \text{ mol } \text{CH}_4 \cdot \frac{1 \text{ mol } \text{CH}_2\text{CO}}{1 \text{ mol } \text{CH}_4} = 2.30 \text{ mol } \text{CH}_2\text{CO}$$

(ii) Calculate the number of grams of $\text{CH}_3\text{COCH}_3(\text{g})$ remaining in the tank.

$$2.30 \text{ mol } \text{CH}_4 \cdot \frac{1 \text{ mol } \text{CH}_3\text{COCH}_3}{1 \text{ mol } \text{CH}_4} = 2.30 \text{ mol } \text{CH}_3\text{COCH}_3 \text{ used}$$

$$5.65 \text{ mol} - 2.30 \text{ mol} = 3.35 \text{ mol } \text{CH}_3\text{COCH}_3 \cdot \frac{58.08 \text{ g}}{1 \text{ mol } \text{CH}_3\text{COCH}_3} = 195 \text{ g } \text{CH}_3\text{COCH}_3$$

(iii) Calculate the total moles of gas in the tank.

$$3.35 \text{ mol } \text{CH}_3\text{COCH}_3 + 2.30 \text{ mol } \text{CH}_4 + 2.30 \text{ mol } \text{CH}_2\text{CO} = 7.95 \text{ moles of gas}$$

(iv) Calculate the mole fraction of $\text{CH}_4(\text{g})$ in the tank.

$$\frac{2.30 \text{ mol } \text{CH}_4}{7.95 \text{ mol}} = 0.289$$

2) Methane, $\text{CH}_4(\text{g})$, will combust to form carbon dioxide and water.

A) Write a balanced chemical equation for the reactions.

