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Chemistry 30

Unit 2: Chemical Kinetics

Assignment 1: 1-1 to 1-3

You are required to show work for all calculations.

1. During the combustion of methane, CH_4, shown by the reaction

$$CH_4(g) + O_2(g) \rightarrow CO_2(g) + H_2O(g)$$

the concentration of methane was measured at various time intervals and the following results were obtained:

Time (s)	$[CH_4]$ ($mol \cdot l^{-1}$)
10	2.40
20	1.20
30	0.80
40	0.60

Calculate the average rate of loss of methane during the 10 to 40 second time period.

2. Consider the following reaction: $N_2(g) + 3\ H_2(g) \rightarrow 2\ NH_3(g)$

If the rate of decomposition of $N_2(g)$ is 0.03 $mol \cdot L^{-1} \cdot s^{-1}$, what is the rate of formation of $NH_3(g)$?

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3. Measurements taken during the reaction $CO(g) + NO_2(g) \rightarrow CO_2(g) + NO(g)$

   showed a concentration of carbon monoxide of 0.019 mol at 27 min and of 0.013 mol at 45 min. Calculate the average rate, in $\cdot L^{-1} \cdot min^{-1}$ over this 18 min period, of each of the following:

   a) the loss of carbon monoxide, CO

   b) the gain of carbon dioxide, CO_2

4. In the following reaction the average rate of loss of carbon monoxide, over a set period, is 0.15 mol $\cdot L^{-1} \cdot s^{-1}$.

   $$2\ CO(g) \rightarrow CO_2(g) + C(s)$$

   What is the average rate of production of carbon dioxide during the same period.

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