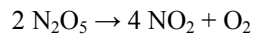


*Practice Questions Section 1.3***Calculating Reaction Rates**

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1. In the following decomposition reaction,

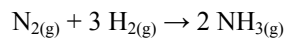


oxygen gas is produced at the average rate of  $9.1 \times 10^{-4} \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1}$ . Over the same period, what is the average rate of the following:

the production of nitrogen dioxide

the loss of nitrogen pentoxide

2. Consider the following reaction:



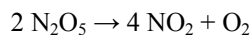
If the rate of loss of hydrogen gas is  $0.03 \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1}$ , what is the rate of production of ammonia?

## Practice Questions Section 1.3

## Calculating Reaction Rates

## Answers

1. In the following decomposition reaction,



oxygen gas is produced at the average rate of  $9.1 \times 10^{-4} \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1}$ . Over the same period, what is the average rate of the following:

the production of nitrogen dioxide

the loss of nitrogen pentoxide

**Solution:**

From the equation we see that for every 1 mole of oxygen formed, four moles of nitrogen dioxide are produced.

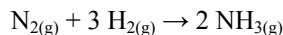
Thus, the rate of production of nitrogen dioxide is four times that of oxygen:

$$\begin{aligned} \text{rate NO}_2 \text{ production} &= 4 \times (9.1 \times 10^{-4} \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1}) \\ &= 3.6 \times 10^{-3} \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1} \end{aligned}$$

Nitrogen pentoxide is consumed at twice the rate that oxygen is produced:

$$\begin{aligned} \text{rate loss of N}_2\text{O}_5 &= 2 \times (9.1 \times 10^{-4} \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1}) \\ &= 1.8 \times 10^{-3} \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1} \end{aligned}$$

2. Consider the following reaction:



If the rate of loss of hydrogen gas is  $0.03 \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1}$ , what is the rate of production of ammonia?

**Solution:**

From the balanced equation we see that there are 2 moles  $\text{NH}_3$  produced for every 3 moles  $\text{H}_2$  used. Thus:

$$\begin{aligned} \text{rate NH}_3 \text{ production} &= \frac{2 \text{ mole NH}_3}{3 \text{ mol H}_2} \times \frac{0.03 \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1} \text{ H}_2}{1} \\ &= 0.02 \text{ mol} \cdot \text{L}^{-1} \cdot \text{s}^{-1} \end{aligned}$$