

Worksheet: Chemical Kinetics

IGCSE · Class 12 · Chemistry · 11 questions · 34 marks

Name: _____

Date: _____

Score: _____ / 34

Q1. For the reaction $\text{N}_2 + 3\text{H}_2 \rightarrow 2\text{NH}_3$, ammonia is formed at 0.06 mol/L/s . Find the rate of the reaction and the rate at which hydrogen is consumed. *[2 marks]*

Q2. A reaction has rate constant $3.2 \times 10^{-4} \text{ L mol}^{-1} \text{ s}^{-1}$. What is its order, and why? *[2 marks]*

Q3. A first order reaction has a half-life of 20 minutes. What fraction of the reactant remains after one hour? *[2 marks]*

Q4. A first order reaction is 20% complete in 10 minutes. Calculate the rate constant and the time for 75% completion. *[3 marks]*

Q5. For a reaction $\text{A} + \text{B} \rightarrow \text{products}$, doubling $[\text{A}]$ doubles the rate and doubling $[\text{B}]$ leaves it unchanged. Write the rate law and state the overall order. *[3 marks]*

Q6. The rate constant of a reaction is 1.5×10^{-3} per second at 300 K and 6.0×10^{-3} per second at 320 K. Calculate the activation energy. *[3 marks]*

Q7. A zero order reaction has $k = 0.02$ mol/L/s and an initial concentration of 0.5 mol/L. Find the half-life and the time for the reaction to go to completion. *[3 marks]*

Q8. A reaction has an activation energy of 209 kJ/mol and a rate constant of 1.6×10^{-5} per second at 600 K. At what temperature will the rate constant be 100 times larger? *[4 marks]*

Q9. For the reaction $2\text{NO} + \text{O}_2 \rightarrow 2\text{NO}_2$, doubling $[\text{NO}]$ at fixed $[\text{O}_2]$ multiplies the rate by four, and doubling $[\text{O}_2]$ at fixed $[\text{NO}]$ doubles it. Write the rate law, give the overall order and the units of k , and comment on the molecularity. *[4 marks]*

Q10. For the gas-phase first order decomposition $\text{X(g)} \rightarrow 2\text{Y(g)}$ at constant volume, the initial pressure of X is 0.4 atm and the total pressure after 300 s is 0.55 atm. Calculate the rate constant. *[4 marks]*

Q11. For a reaction with a rate law $\text{Rate} = k[\text{A}]^2[\text{B}]^{-1}$, describe how the rate changes when $[\text{A}]$ is doubled and $[\text{B}]$ is tripled simultaneously. *[4 marks]*