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SPECA

GCSE Combined Science (AQA Trilogy) · Chemistry

The Rate and Extent of Chemical Change · Tiered Worksheet

Section A: Foundation

Reaction rates and collision theory

1) A student reacted marble chips with hydrochloric acid and collected 48 cm³ of gas in 60 seconds. Calculate the mean rate of reaction. **[2]**

2) State four factors, other than the presence of a catalyst, that can affect the rate of a chemical reaction. **[4]**

3) Using collision theory, explain why increasing the concentration of a reactant in solution increases the rate of reaction. **[2]**

4) Using collision theory, explain why increasing the surface area of a solid reactant (e.g. by crushing it into smaller pieces) increases the rate of reaction. **[2]**

5) Explain why increasing temperature has a particularly large effect on reaction rate, in terms of both collision frequency and collision energy. **[2]**

6) Define a catalyst, and explain how a catalyst increases the rate of a reaction without being used up itself. **[2]**

7) A student is given the symbol equation for a reaction and told a catalyst was used. Explain how they could identify the catalyst from the equation. **[1]**

Reversible reactions and equilibrium

8) State what is meant by a reversible reaction, and write the general symbol used to represent one (e.g. A + B ⇌ C + D). **[2]**

9) A reversible reaction is exothermic in the forward direction. State whether it is exothermic or endothermic in the reverse direction, and explain your answer. **[2]**

10) Define equilibrium in a closed system. **[2]**

Section B: Higher (in addition to Section A)

Gradients and rate in moles

11) A graph shows the volume of gas produced against time for a reaction. Explain how you would use the graph to find the rate of reaction at a specific moment in time, rather than the mean rate over the whole reaction. **[2]**

12) A tangent drawn to a rate graph at t = 20 s rises by 12 cm³ over a horizontal distance of 8 s. Calculate the gradient of the tangent, and state what this value represents. **[2]**

13) 0.6 mol of a gas is produced in a reaction over 30 seconds. Calculate the rate of the reaction in mol/s. **[2]**

Le Chatelier's Principle

14) State Le Chatelier's Principle. **[2]**

15) The Haber process reaction, $N_2 + 3H_2 \rightleftharpoons 2NH_3$, is exothermic in the forward direction. Predict and explain the effect of increasing temperature on the amount of ammonia present at equilibrium. **[3]**

16) Using the same reaction, $N_2 + 3H_2 \rightleftharpoons 2NH_3$, predict and explain the effect of increasing the concentration of nitrogen on the amount of ammonia present at equilibrium. **[2]**

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17) The forward reaction $N_2 + 3H_2 \rightleftharpoons 2NH_3$ has four moles of gas on the reactants side and two moles of gas on the products side. Predict and explain the effect of increasing pressure on the position of this equilibrium. **[3]**

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