Year 12 Science: Rates of reaction and collision theory

Name: _____ Date: _____

Try these without your notes first, then check the answer key.

Practice

1. 40 mL of hydrogen is made in the first 20 s of a reaction. What is the average rate?

2. A flask loses 0.66 g of CO_2 in 3.0 minutes. What is the average rate in g min^{-1}?

3. Which two factors increase the fraction of collisions that have enough energy to react?

4. Why does a graph of gas volume against time level off?

5. A catalyst lowers Ea from 80 kJ mol^{-1} to 50 kJ mol^{-1} for a reaction with $\Delta H = -30$ kJ mol^{-1}. What is ΔH with the catalyst?

Exam-style question: decomposing hydrogen peroxide

Hydrogen peroxide slowly breaks down: $2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$. A student adds manganese dioxide powder, a catalyst, to 50 mL of the solution and records the oxygen collected every 20 s: 0, 24, 40, 50, 55, 57 and 57 mL at 0 to 120 s.

6. Calculate the average rate of oxygen production over the first 40 s.

7. Describe how the rate changes over the 120 s, and explain the change using collision theory.

8. Explain how manganese dioxide speeds up the reaction, and state what it does to the final volume of oxygen.

9. Discuss how running the same reaction at a higher temperature would change the graph of volume against time.

Fix the mistake

10. Correct this statement: "A catalyst gives the particles more energy."

11. Correct this statement: "A higher concentration makes the particles move faster."

12. Correct this statement: "Powdered marble makes more gas than chips."

13. Correct this statement: "The rate is the number of collisions."