2.10 Rates of Reaction: Collision Theory and Measuring Rate: 10-minute Pack

Total Marks

EDEXCEL 4CH1 · Calculator allowed · about 10 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 State, in the context of collision theory, the two main requirements for reactant particles to react when they collide in a gas or solution.

(Total for Question 1 is 1 mark)

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2 A reaction is monitored by collecting gas in a gas syringe. The student records volume of gas every 10 seconds. Give one practical advantage of using a gas syringe compared with measuring loss of mass on a balance for a gas-producing reaction.

(Total for Question 2 is 2 marks)

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3 A student repeats the reaction of sodium thiosulfate and hydrochloric acid three times at the same concentration and records times for the cross to disappear: 32.0 s, 28.5 s, 30.5 s. Calculate the mean time and state one simple reason for repeating measurements.

(Total for Question 3 is 4 marks)

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4 Describe how increasing the concentration of a reactant in solution affects the rate of reaction, using collision theory to explain the change.

(Total for Question 4 is 2 marks)

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Mark scheme · 2.10 Rates of Reaction: Collision Theory and Measuring Rate: 10-minute Pack

Question 1

particles must collide with sufficient energy (≥ activation energy) and with the correct orientation **B1**

Answer: They must collide with enough energy (at least the activation energy) and with a suitable orientation

Question 2

more accurate measurement of gas volume than inferring from mass loss **B1**

gas syringe gives direct, continuous volume readings and is less affected by drafts or vibration **B1**

Answer: A gas syringe measures gas volume directly and continuously and is often more accurate and less affected by drafts or balance instability than measuring mass loss

Question 3

adds times: 32.0 + 28.5 + 30.5 = 91.0 s **M1**

divides by 3 to find mean = 30.333... s **M1**

gives mean time = 30.3 s cao to 3 s.f. **A1**

states reason: to improve reliability by reducing effect of random error or anomalies **B1**

Answer: Mean = (32.0 + 28.5 + 30.5) / 3 = 30.3 s; repeating improves reliability and reduces the effect of random error

Question 4

increasing concentration increases the number of particles per unit volume so collisions are more frequent **B1**

more frequent collisions lead to a higher rate of reaction **B1**

Answer: Higher concentration means more particles per unit volume so collisions happen more often, increasing the reaction rate

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