K8D Chemical Reactions: Exam Drill

AQA AQA KS3 Chemistry · Calculator allowed · about 75 minutes

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 Name the type of particle change that happens when a chemical reaction occurs.

(1)

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2 State whether each description matches an exothermic or an endothermic reaction.
(a) The temperature of the surroundings increases during the reaction.
(b) The temperature of the surroundings decreases during the reaction.

(a) The temperature of the surroundings increases during the reaction. **(1)**

(b) The temperature of the surroundings decreases during the reaction. **(1)**

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3 Write a word equation for the reaction when magnesium ribbon burns in oxygen to make magnesium oxide.

(2)

4 Amelia mixes vinegar and baking soda in an open container and sees fizzing. Which of the following is the gas produced?

A) Oxygen

B) Carbon dioxide

C) Hydrogen

D) Nitrogen

- [ ] A) Oxygen
- [ ] B) Carbon dioxide
- [ ] C) Hydrogen
- [ ] D) Nitrogen

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5 A student plans an experiment to investigate how temperature affects the rate of a reaction between potassium iodide solution and hydrogen peroxide that produces a brown colour. Identify one variable that must be kept the same to make this a fair test, and give a brief reason.

(2)

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6 The table shows the temperature change recorded during a reaction between chemicals P and Q in a cup. Time in seconds: 0, 30, 60, 90, 120. Temperature in degrees C: 20.0, 23.5, 25.0, 25.5, 25.5.

(a) Plot the general shape of the temperature-time graph in words: what happens to temperature from 0 to 120 s? (1)

(b) At what time does the reaction reach almost no further temperature change? (1)

(c) Suggest one reason why the temperature stops rising even though reactants are still present. (2)

(a) Describe the general shape of the temperature-time graph from 0 to 120 s. **(1)**

(b) At what time does the reaction reach almost no further temperature change? **(1)**

(c) Suggest one reason why the temperature stops rising even though reactants are still present. **(2)**

7 Using the data from question 6, calculate the average rate of temperature increase between 0 s and 60 s. Give your answer in degrees C per second to 3 significant figures.

(2)

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8 Describe how you would test a gas sample to show it is carbon dioxide using limewater. Include one observation you would expect.

(2)

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9 Callum adds a small amount of dilute hydrochloric acid to calcium carbonate chips. He collects the gas produced and tests it with a glowing splint. What would the glowing splint result show, and write a brief word equation for the reaction between hydrochloric acid and calcium carbonate.

(3)

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10 A student mixes aqueous silver nitrate with aqueous sodium chloride in separate beakers and then pours them together. Describe two observations the student might make, and name the type of reaction that has occurred.

(3)

11 Experiment design: Priya plans to compare rates of the reaction between magnesium ribbon and dilute hydrochloric acid using three different concentrations of acid. She will measure the time taken for the magnesium to completely dissolve.

(a) State one safety precaution Priya should take. (1)

(b) Identify one control variable she must keep the same. (1)

(c) Suggest one improvement to make her timing more accurate. (2)

(a) State one safety precaution Priya should take. **(1)**

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12 Extended response 6 marks. A student investigates the reaction between sodium thiosulfate solution and dilute hydrochloric acid. The student times how long it takes for the solution to become cloudy at different concentrations of sodium thiosulfate. Describe how the student should change one variable to investigate the effect of concentration, state two things they should keep the same, and explain how the results would show whether a higher concentration increases the rate. In your answer mention how you would present the results.

(6)

Mark scheme · K8D Chemical Reactions: Exam Drill

Question 1

- **B1** particles rearrange or bonds break and form (cao)
- Answer: **Particles rearrange (bonds break and new bonds form).**

Question 2

- (a) **B1** exothermic cao
- (a) Answer: **Exothermic**
- (b) **B1** endothermic cao
- (b) Answer: **Endothermic**

Question 3

- **M1** magnesium + oxygen -> magnesium oxide or equivalent word order
- **A1** magnesium + oxygen -> magnesium oxide cao
- Answer: **magnesium + oxygen -> magnesium oxide**

Question 4

- **B1** B cao
- Answer: **B) Carbon dioxide**

Question 5

- **M1** identify one fair test variable eg concentration of reactants OR volume of reactants OR amount of catalyst OR surface area; must say one
- **A1** reason linking that variable to rate, eg keep concentration the same so rate only changes due to temperature
- Answer: **Keep the concentration of hydrogen peroxide the same; otherwise any change in rate might be caused by concentration not temperature.**

Question 6

- (a) **B1** temperature rises quickly then levels off/plateaus
- (a) Answer: **Temperature rises rapidly at first then levels off to a plateau.**
- (b) **B1** 90 s or 120 s acceptable; mark scheme accepts 90 s as when it first plateaus
- (b) Answer: **Around 90 s**
- (c) **M1** reason such as reaction has slowed due to smaller concentration of reactants near mixing zone OR heat loss to surroundings balancing heat released
- (c) **A1** explanation linking the reason to temperature plateau eg heat lost equals heat produced, or limiting reactant at local area, cao
- (c) Answer: **Heat produced is being lost to the surroundings at the same rate as the reaction produces it, so the measured temperature stops rising.**

Question 7

- **M1** calculate change in temperature 25.0 - 20.0 = 5.0 and divide by time 60
- **A1** 0.0833 degrees C/s cao
- Answer: **0.0833 degrees C/s**

Question 8

- **M1** description of method eg bubble gas through limewater or pass gas into limewater
- **A1** observation eg limewater goes cloudy or milky cao
- Answer: **Bubble the gas through limewater; the limewater will turn cloudy (milky).**

Question 9

- **M1** glowing splint will be extinguished or splint goes out because gas is carbon dioxide
- **M1** word equation showing acid and carbonate produce salt + water + carbon dioxide eg calcium carbonate + hydrochloric acid -> calcium chloride + water + carbon dioxide
- **A1** correct equation cao
- Answer: **The glowing splint is extinguished (carbon dioxide present); calcium carbonate + hydrochloric acid -> calcium chloride + water + carbon dioxide**

Question 10

- **M1** observation 1: a white (or pale) precipitate forms
- **M1** observation 2: the solution may become cloudy and the precipitate sinks or remains suspended
- **A1** name of reaction: precipitation OR insoluble salt forms (cao)
- Answer: **A white precipitate forms and the mixture becomes cloudy; this is a precipitation reaction.**

Question 11

- (a) **B1** safety point eg wear safety goggles OR use gloves OR add acid to water not water to acid OR work in fume cupboard if gas produced
- (a) Answer: **Wear safety goggles to protect eyes from splashes.**
- (b) **B1** control variable eg mass/length of magnesium OR volume of acid OR temperature; one needed
- (b) Answer: **Use the same mass (or length) of magnesium ribbon in each test.**
- (c) **M1** improvement such as use a stopwatch with start/stop by the same person OR repeat each concentration and take mean OR use a sensor to detect end point
- (c) **A1** explanation of how it improves accuracy eg repeats reduce random error OR sensor reduces human reaction time error
- (c) Answer: **Repeat each test and take the mean time, which reduces random error and gives a more reliable result.**

Question 12

- **Level 3** (5-6): Detailed method and clear reasoning: changes one independent variable correctly, two or more appropriate controls, and explains how results show effect with reference to rate and trends. Describes presentation of results (e.g. table and graph) and draws a supported conclusion.
- **Level 2** (3-4): Method sensible with one clear control and one change of concentration; gives a correct statement about expected trend and suggests table or graph but explanation lacks detail or precision.
- **Level 1** (1-2): Simple or partial statements such as change concentration and faster with higher concentration, with little or no detail about controls or data presentation.
- **Indicative content:**
  - Independent variable: change concentration of sodium thiosulfate by preparing a set of solutions of different known concentrations (eg 1.0, 0.8, 0.6, 0.4, 0.2) while keeping acid concentration the same.
  - Controls: keep temperature constant (use a water bath), keep volume of reactants the same, use same total volume and same mixing method, use same cross mark distance to judge cloudiness.
  - Method detail: start stopwatch when solutions mixed, stop when cross is obscured, repeat each concentration 3 times and take mean time.
  - How results show effect: calculate rate as 1 / time to cloudiness (or change in turbidity per second) and plot rate against concentration; a positive correlation (rate increases with concentration) supports the idea that more particles per volume give more frequent successful collisions.
  - Presentation: record raw times in a table, calculate mean times and rates, plot a graph of rate (y) against concentration (x), use the graph to draw conclusions and spot anomalies.