cookie

Practice paper

GCSE Chemistry Higher, practice paper 2 (AQA style)

In the style of AQA GCSE Chemistry (8462) Paper 2 Higher

Practice paper written by cookie in the style of AQA GCSE Chemistry (8462) Paper 2 Higher. Not an AQA paper; not affiliated with or endorsed by AQA.

Time allowed: 1 hour 45 minutes

Total marks: 100

Name _____

Instructions

- This is a practice paper written by cookie in the style of AQA GCSE Chemistry Paper 2 Higher. It is not an AQA paper.
- Topics: the rate and extent of chemical change; organic chemistry; chemical analysis; chemistry of the atmosphere; using resources. Ideas from topics 1 to 3 may also be needed.
- Answer all questions in the spaces provided.
- You may use a calculator.
- In all calculations, show clearly how you work out your answer.
- Relative atomic masses (Ar) and other data are given in the questions where you need them.
- The maximum mark for this paper is 100. The marks for each part are shown in brackets.
- Questions marked with 6 marks are extended responses: you will be assessed on your ability to give a clear, logically structured answer.

Information

- The marks for each question are shown in brackets.
- The maximum mark for this paper is 100.

Do it online, timed and marked:
cookie.education/past-papers/gcse/cookie/chemistry-aqa-style

Answer all questions in the spaces provided.

0 1 This question is about the rate of a reaction. A student investigated the reaction between marble chips (calcium carbonate) and dilute hydrochloric acid:
$CaCO_3(s) + 2HCl(aq) \rightarrow CaCl_2(aq) + H_2O(l) + CO_2(g)$
The student collected the carbon dioxide in a gas syringe and recorded the volume every 20 seconds. The table shows the results.

Time in s	**0**	**20**	**40**	**60**	**80**	**100**	**120**	**140**
Volume of carbon dioxide in cm^3	0	18	32	42	48	51	52	52

0 1 . 1 Which unit could be used for the rate of this reaction? Choose one answer.

A cm^3 ☐

B cm^3/s ☐

C s/cm^3 ☐

D g/dm^3 ☐

[1 mark]

0 1 . 2 Calculate the mean rate of reaction from 0 to 60 seconds.

[2 marks]

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0 1 . 3 The rate of reaction decreases as the reaction continues. Explain why. Answer in terms of particles.

[2 marks]

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0 1 . 4 Describe how the student could use a graph of the results to find the rate of reaction at 40 seconds.

[2 marks]

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0 1 . 5 The student repeated the experiment using the same mass of calcium carbonate powder instead of marble chips. All other conditions were kept the same. Explain how the rate of reaction would change.

[2 marks]

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0 2 Sodium thiosulfate solution reacts with dilute hydrochloric acid to form a precipitate of sulfur, so the mixture slowly turns cloudy. A student placed a conical flask on a piece of paper marked with a black cross. The student mixed sodium thiosulfate solution and dilute hydrochloric acid in the flask and timed how long it took until the cross could no longer be seen. The student repeated this with different concentrations of sodium thiosulfate solution. The table shows the results.

Concentration of sodium thiosulfate in g/dm^3	**Time for the cross to disappear in s**
10	124
20	63
30	41
40	32
50	25

0 2 . 1 Give one control variable in this investigation.

[1 mark]

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0 2 . 2 The rate of reaction is proportional to 1/time. Calculate the value of 1/time for the concentration of 40 g/dm^3. Give your answer to 2 significant figures.

[2 marks]

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0 2 . 3 The student then did the experiment at a higher temperature. The reaction was faster. Explain why. Answer in terms of particles and energy.

[3 marks]

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0 2 . 4 Catalysts increase the rate of some reactions. Explain how a catalyst increases the rate of a reaction.

[2 marks]

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0 3 This question is about the Haber process. Ammonia is made by the reaction of nitrogen with hydrogen:
$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$
The forward reaction is exothermic.

0 3 . 1 The reaction can reach dynamic equilibrium. Describe what is meant by dynamic equilibrium.

[2 marks]

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0 3 . 2 In the Haber process the conditions used are a temperature of about 450 °C, a pressure of about 200 atmospheres and an iron catalyst. Explain why these conditions are used. In your answer you should refer to the yield of ammonia, the rate of reaction and cost.

[6 marks]

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0 3 . 3 Ammonia is used to make ammonium nitrate, NH_4NO_3, which is used in fertilisers. Relative atomic masses (Ar): H = 1, N = 14, O = 16. Calculate the percentage by mass of nitrogen in ammonium nitrate.

[2 marks]

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0 4 This question is about crude oil and hydrocarbons. Crude oil is a mixture of a very large number of compounds. Most of the compounds in crude oil are hydrocarbons called alkanes.

0 4 . 1 Which is the general formula for the alkanes? Choose one answer.

A C_nH_{2n} ☐

B C_nH_{2n+2} ☐

C C_nH_{2n-2} ☐

D $C_nH_{2n+1}OH$ ☐

[1 mark]

0 4 . 2 Crude oil is separated into fractions by fractional distillation. Describe how fractional distillation separates crude oil into fractions.

[3 marks]

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0 4 . 3 Heptane, C_7H_{16}, is an alkane used in petrol. Write a balanced symbol equation for the complete combustion of heptane.

[2 marks]

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0 4 . 4 Decane can be cracked to produce hexane and compound X:
$C_{10}H_{22} \rightarrow C_6H_{14} + 2X$
Give the formula of X.

[1 mark]

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0 4 . 5 Compound X is an alkene. Describe a test to show that X is an alkene. Give the result of the test.

[2 marks]

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0 5 This question is about organic compounds. The table shows the formulae of four organic compounds, A, B, C and D.

Compound	**Formula**
A	$CH_3CH=CH_2$
B	C_2H_5OH
C	CH_3COOH
D	$CH_3COOC_2H_5$

0 5 . 1 Name compound A.

[1 mark]

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0 5 . 2 Compound A reacts with hydrogen. Name the product of this reaction and give the condition needed for the reaction to happen.

[2 marks]

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0 5 . 3 Compound B can be made by fermenting sugar using yeast. Give two conditions needed for fermentation.

[2 marks]

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0 5 . 4 Compound B reacts with compound C to form compound D and water. Name compound D, and name the type of substance used as a catalyst for this reaction.

[2 marks]

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0 5 . 5 A solution of compound C has a higher pH than a solution of hydrochloric acid with the same concentration. Explain why.

[2 marks]

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0 6 This question is about polymers.

0 6 . 1 Poly(ethene) is made by addition polymerisation. Polyesters are made by condensation polymerisation. Give two differences between addition polymerisation and condensation polymerisation.

[2 marks]

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0 6 . 2 A polyester is made from a diol and a dicarboxylic acid. Name the small molecule produced in this reaction.

[1 mark]

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0 6 . 3 Proteins are polymers made from amino acids. Name the two functional groups in an amino acid molecule.

[2 marks]

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0 6 . 4 DNA is a natural polymer. Name the monomers that DNA is made from.

[1 mark]

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0 6 . 5 One molecule of a sample of poly(ethene) has a relative formula mass (Mr) of 42 000. The monomer is ethene, C_2H_4. Relative atomic masses (Ar): H = 1, C = 12. Calculate the number of ethene molecules that joined together to make this poly(ethene) molecule.

[2 marks]

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0 7 This question is about pure substances, formulations and chromatography.

0 7 . 1 A carton of orange juice is labelled 'pure'. What does 'pure' mean in chemistry?

[1 mark]

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0 7 . 2 A student measured the melting points of two samples of aspirin, P and Q. Pure aspirin melts at 136 °C. Which sample is pure? Give a reason for your answer.

Sample	Melting point
P	136 °C
Q	121 °C to 129 °C

[2 marks]

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0 7 . 3 Paint is a formulation. What is meant by a formulation?

[2 marks]

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0 7 . 4 A student used paper chromatography to find which dyes are in a food colouring, E. The student put spots of E and of three known dyes, F, G and H, on a pencil line near the bottom of a sheet of chromatography paper. The student placed the paper in a beaker of water, with the water level below the pencil line. Explain why the water level must be below the pencil line.

[1 mark]

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0 7 . 5 When the student removed the paper, the solvent front was 8.0 cm above the pencil line. One of the spots from E was 5.2 cm above the pencil line. Calculate the Rf value of this spot.

[2 marks]

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0 7 . 6 The table shows the Rf values of the spots on the chromatogram. What can the student conclude about food colouring E? Use the information in the table.

Substance	Rf values of the spots
E	0.20, 0.45, 0.65
F	0.45
G	0.72
H	0.65

[3 marks]

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0 8 This question is about identifying substances.

0 8 . 1 Give the test for chlorine gas and the result of the test.

[2 marks]

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0 8 . 2 A solution gives a crimson flame in a flame test. Name the metal ion in the solution.

[1 mark]

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0 8 . 3 Sodium hydroxide solution is added to a solution containing iron(III) ions, Fe^{3+}. A brown precipitate forms. Write a balanced ionic equation for this reaction.

[2 marks]

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0 8 . 4 A technician has three unlabelled solutions. One is aluminium chloride, one is calcium bromide and one is iron(II) sulfate. Describe tests the technician could use to identify the positive ion and the negative ion in each solution. Give the result of each test.

[6 marks]

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0 8 . 5 Flame emission spectroscopy is an instrumental method of analysis. Give one advantage of using an instrumental method instead of a chemical test.

[1 mark]

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0 9 This question is about the Earth's atmosphere.

0 9 . 1 One theory suggests that, during the first billion years of the Earth's existence, volcanoes released gases that formed the early atmosphere. Which gas do scientists think made up most of the Earth's early atmosphere? Choose one answer.

A nitrogen ☐

B oxygen ☐

C carbon dioxide ☐

D argon ☐

[1 mark]

0 9 . 2 The percentage of carbon dioxide in the atmosphere has decreased since the early atmosphere formed. Describe two ways that carbon dioxide was removed from the atmosphere.

[2 marks]

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0 9 . 3 Carbon dioxide and methane are greenhouse gases. Describe how greenhouse gases keep the Earth warm.

[3 marks]

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0 9 . 4 The table shows the concentration of carbon dioxide in the atmosphere in three different years. Calculate the percentage increase in the concentration of carbon dioxide from 1960 to 2020. Give your answer to 2 significant figures.

Year	Concentration of carbon dioxide in parts per million (ppm)
1960	317
1990	354
2020	414

[2 marks]

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0 9 . 5 Oxides of nitrogen are atmospheric pollutants produced by car engines. Explain how oxides of nitrogen are produced in car engines.

[2 marks]

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10 This question is about water and life cycle assessments.

1 0 . 1 What is meant by potable water?

[1 mark]

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1 0 . 2 A student distilled a sample of sea water. Describe two ways the student could show that the water collected (the distillate) is pure water. Give the result for each.

[2 marks]

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1 0 . 3 The table shows some life cycle assessment data for two types of shopping bag. Evaluate the two types of shopping bag. Use the data in the table and your own knowledge.

	Paper bag	**Poly(ethene) bag**
Raw material	wood (from trees)	crude oil
Energy used to make one bag in MJ	1.8	2.4
Mass of carbon dioxide produced making one bag in kg	0.09	0.15
Typical number of times used	2	15
Disposal	biodegradable; can be recycled	not biodegradable; can be recycled

[4 marks]

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11 This question is about metals and how they are obtained and protected.

1 1 . 1 Copper can be obtained from low-grade ores by phytomining. Describe how phytomining produces a copper compound.

[2 marks]

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1 1 . 2 A student set up three test tubes, each with an iron nail inside.
Tube 1: the nail is in tap water, open to the air.
Tube 2: the nail is in water that has been boiled, with a layer of oil on top of the water.
Tube 3: the nail is in air with anhydrous calcium chloride, which absorbs water, and the tube is sealed with a stopper.
After one week, only the nail in tube 1 had rusted. What do the results show about the conditions needed for iron to rust? Explain your answer.

[2 marks]

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1 1 . 3 Iron can be protected from rusting by coating it with zinc. Explain why the iron does not rust even if the zinc coating is scratched.

[2 marks]

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1 1 . 4 Gold used for jewellery is usually an alloy. Pure gold is 24 carat. Calculate the percentage of gold in 18 carat gold.

[1 mark]

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END OF QUESTIONS