



AQA Chemistry Paper 1 - Topics 1-5

Higher

Combined Science - Trilogy

Predicted Paper A

Name.....

Date.....

1 hour 15 minutes allowed

Similar to your real exam each question in this gets harder towards the end of each question, so if you find you can do the last part of a certain question, try the next question, they all start off easier then get harder.

You will need a chemistry data sheet (periodic table)

Grade boundaries

These are VERY rough guesses! Getting an 8 or 9 on here does not guarantee you the same mark in the exam

- 9 55
- 8 45
- 7 35
- 6 25
- 5 15



Exam Analysis

Question	Marks available	Marks gained	Topic	What do you need to do to improve ...	Bits to help if you don't understand ...
1	9		Atomic Structure		Topic summary; https://youtu.be/sYlmoNKypoY
2	10		Quantitative chemistry and experiments		Explanation; https://youtu.be/yzTJybCnrzo
3	10		Required practical 1		Experiment; https://youtu.be/ttsAmaNu4ao Exam questions' https://youtu.be/BmaXoGTameA
4	16		Structure and bonding		Topic summary flashcards; https://youtu.be/LwZD3-5rLV8
5	4		pH		Explanation; https://youtu.be/CvmhbNYroeo
6	8		Electrolysis		Experiment and explanation; https://youtu.be/r0kbEj2PDEg
7	13		Energy Changes		Calculations; https://youtu.be/B3hs4GEgJQc
Total	70				



Question 1

a) What are the two sub-atomic particles that are in the nucleus of an atom? [2 marks]

.....
.....
.....

b) Draw the arrangement of electrons in an atom of carbon. [2 marks]

c) What is the difference between an atom and an ion? [1 mark]

.....
.....
.....

d) What is the difference between an atom of oxygen and an atom of sulfur? [4 marks]

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....



Question 2

New fertiliser technology is being developed that would help oil producing plants grow faster; these are being trialled all over the country. A scientist collected the results and looked at the amount of oil produced after these plants have been growing.

- a) Ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$, is commonly used in fertilizers to aid the growth of plants. What is the relative formula mass of ammonium sulfate (M_r)?

.....
.....
.....
.....

[2 marks]

- b) Complete the mean averages in the table below

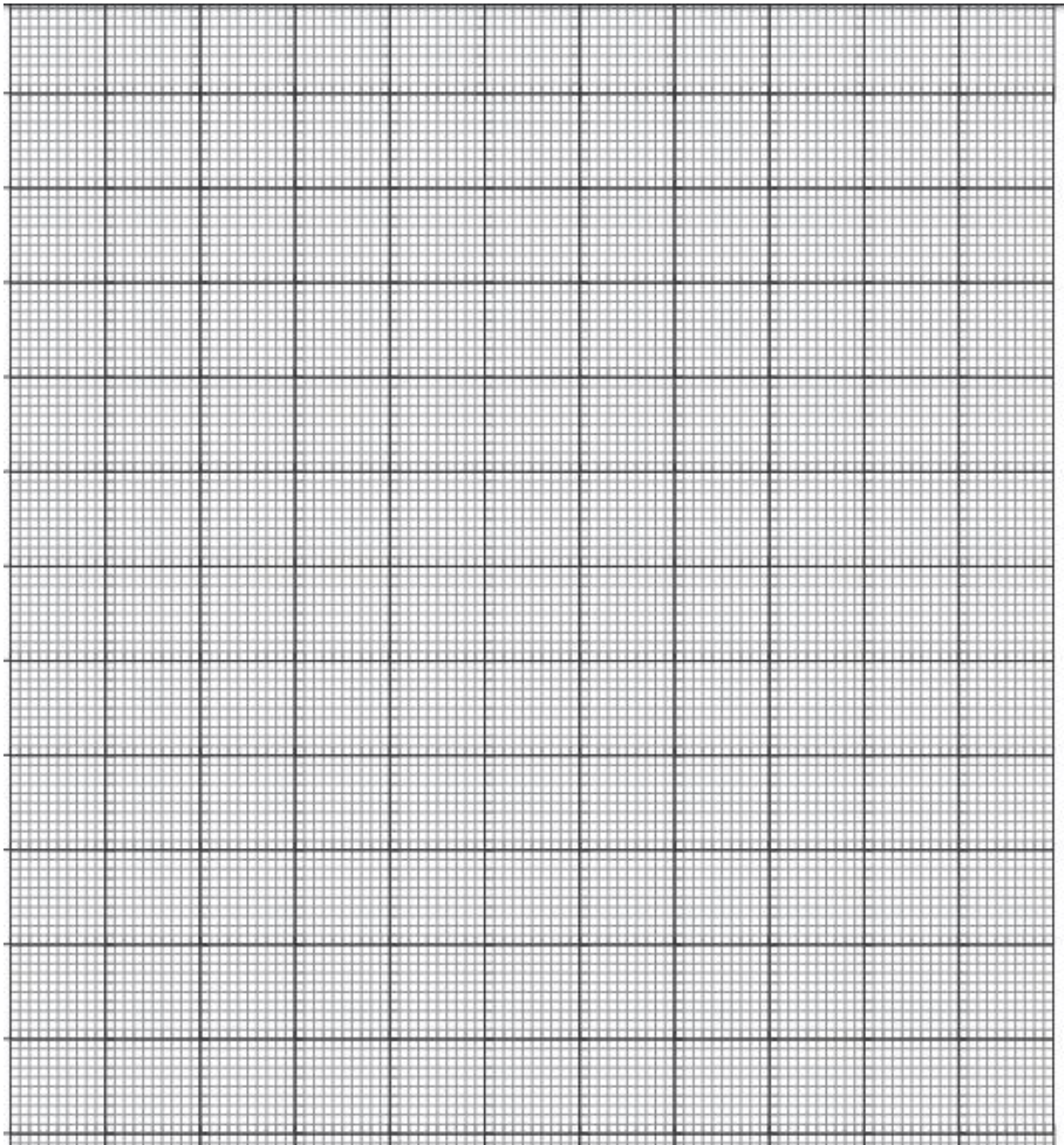
[3 marks]

Months of growth	Volume of oil per 10kg of plant (cm^3)			
	Test 1	Test 2	Test 3	Average
2	25	28	24	
4	39	42	37	
6	32	35	31	
8	51	21	49	
10	57	61	62	



c) Plot the results on the graph

[4 marks]



d) Give one independent variable from the experiment

[1 mark]

.....
.....
.....



Question 3

a) How many atoms are there in sulfuric acid?

[1 mark]

.....

b) Which of the following represents the accurate electronic configurations for sulfur and oxygen?

[1 mark]

Circle **one** answer only

	Sulfur	Oxygen
A		
B		
C		
D		



c) Describe the process of making dry copper sulfate crystals from sulfuric acid and copper oxide, name the equipment used and the separation processes involved. [6 marks]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

d) Write the balanced symbol equation for the reaction between copper oxide and sulfuric acid [2 marks]

.....



Question 4

a) Which of the following are the correct set of properties?

[1 mark]

Circle **one** answer only.

	Solid	Liquid	Gas
A	Can't flow	Can't flow	Can flow
B	Fixed volume	Fixed volume	Not fixed volume
C	Can't be compressed	Can be compressed	Can be compressed
D	Particles in a fixed position	Particles in a fixed position	Particles free to move

b) Describe the bonding between magnesium and oxygen. Give the formula in your answer, you may use a diagram to help.

[6 marks]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



c) Diamond and graphite are both made from the same element.

i. Which element is this? [1 mark]

.....
.....

ii. How many bonds does each element make in diamond? [1 mark]

.....
.....

iii. Which one can conduct electricity? [1 mark]

.....
.....

iv. Which gas will be produced when they are burnt in an excess of oxygen? [1 mark]

.....
.....

d) A student had two unknown compounds A and B both were white solids at room temperature and both dissolved in water. Compound A was able to conduct electricity when dissolved but compound B was not.

For each compound give the type of structure and explain why you have come to this conclusion.

[5 marks]

.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....



Question 5

a) A drink (sample A) is tested and found to be pH 9, what does this tell us about the solution?

.....
.....
.....

[1 mark]

b) Which ion is responsible for the solution being pH 11??

.....
.....
.....

[1 mark]

c) An acidic and an alkaline solution can be mixed together and a neutral solution produced, what is the ionic equation for this?

.....
.....
.....
.....

[2 marks]



Question 6

a) The electrolysis of sodium chloride solution (brine) produces a number of useful products; give the formula for these products and a possible use for each of them.

.....
.....
.....
.....
.....
.....

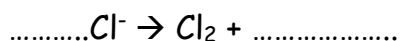
[3 marks]

b) Which electrode does hydrogen go to and why?

.....
.....

[2 marks]

c) Complete the equation for the reaction of chloride ions.



[2 marks]

d) What type of reaction is happening to chlorine?

.....
.....

[1 mark]



Question 7

Methanol (CH_4O) burns in oxygen to produce carbon dioxide and water

a) Draw the dot and cross diagram for the bonding in oxygen gas

[3 marks]

b) Write the balanced equation for the burning of methanol (CH_4O) in oxygen.

.....
.....

[4 marks]

c) Draw an energy level diagram for this reaction

[2 marks]



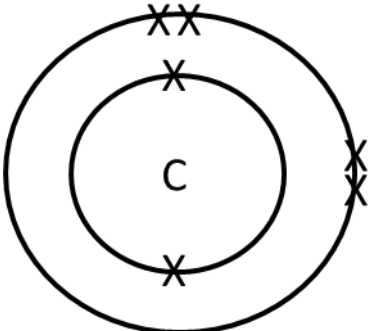
d) Calculate the energy change when the reaction happens.

Bond	Bond energy in kJ per mole
O = O	495
O - H	467
C - H	413
C - O	358
C = O	745
C - C	347

[4 marks]



Answers

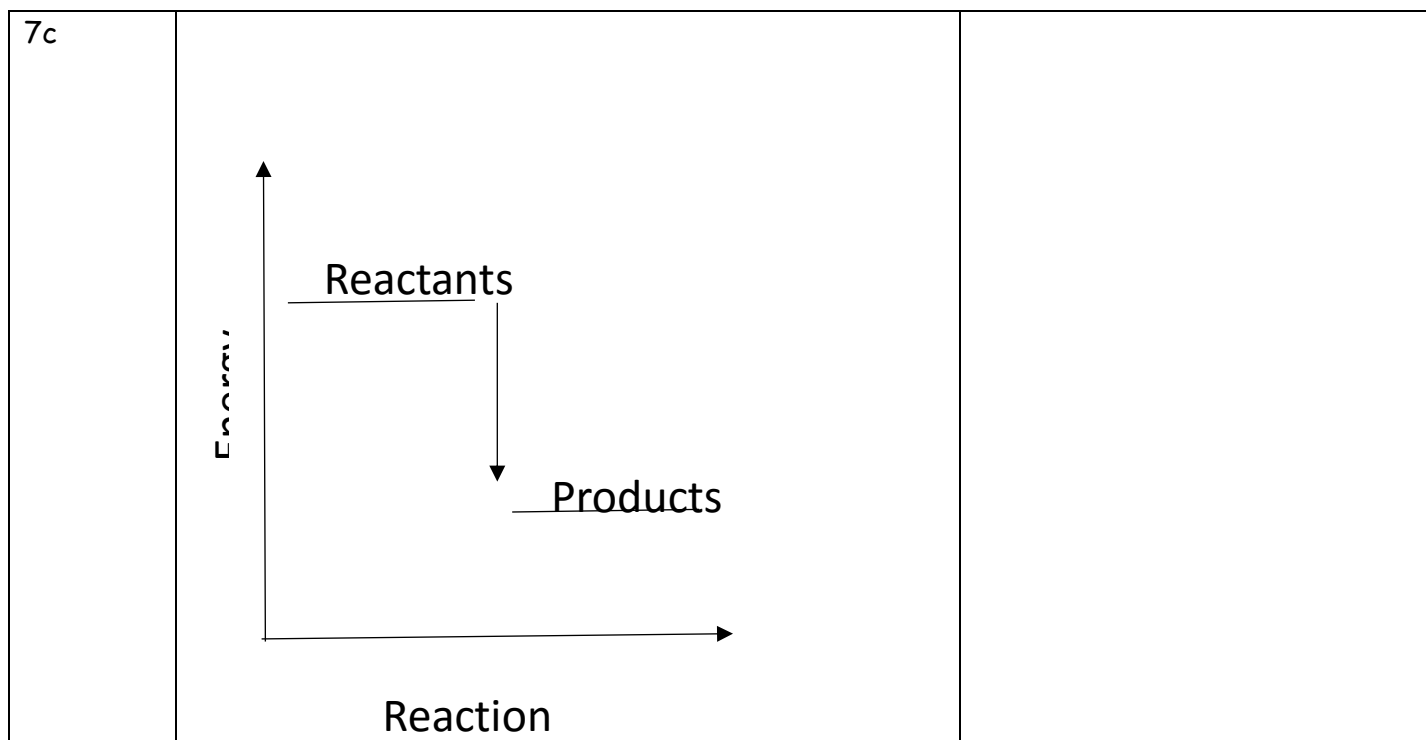
Question	Answer	Guidance																													
1a	Proton Neutron	1 mark for each																													
1b		1 mark for inner shell 1 mark for outer shell																													
1c	An ion is an atom that has lost or gained electrons	1 mark																													
1d	<p>-oxygen has 8 protons OR -sulfur has 16 protons AND -this is more/less than oxygen/sulfur</p> <p>-oxygen has 8 neutrons OR -sulfur has 16 neutrons AND -this is more/less than oxygen/sulfur</p> <p>-oxygen has 8 electrons -sulfur has 16 electrons -oxygen has 2 electron shells -sulfur has 3 electron shells</p> <p>Not mark for mentioning the number of electrons in the outer shell as this is the same for both</p>	<p>1 mark for each bullet point</p> <p>If only electrons mentioned then max 2 marks</p> <p>To gain full marks each of the subatomic particles must be mentioned</p>																													
2a	132	2 marks																													
2b	<table border="1"> <thead> <tr> <th rowspan="2">Months of growth</th> <th colspan="4">Volume of oil per 10kg of plant (cm³)</th> </tr> <tr> <th>Test 1</th> <th>Test 2</th> <th>Test 3</th> <th>Average</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>25</td> <td>28</td> <td>24</td> <td>25.7</td> </tr> <tr> <td>4</td> <td>39</td> <td>42</td> <td>37</td> <td>39.3</td> </tr> <tr> <td>6</td> <td>32</td> <td>35</td> <td>31</td> <td>32.7</td> </tr> <tr> <td>8</td> <td>51</td> <td>21</td> <td>49</td> <td>50</td> </tr> </tbody> </table>	Months of growth	Volume of oil per 10kg of plant (cm ³)				Test 1	Test 2	Test 3	Average	2	25	28	24	25.7	4	39	42	37	39.3	6	32	35	31	32.7	8	51	21	49	50	<p>-3 marks if all correct -2 if 3 answers correct -1 if 1 answer correct</p> <p>-25.6 or 32.7 do not gain a mark as student have not rounded correctly, penalise this only once.</p>
Months of growth	Volume of oil per 10kg of plant (cm ³)																														
	Test 1	Test 2	Test 3	Average																											
2	25	28	24	25.7																											
4	39	42	37	39.3																											
6	32	35	31	32.7																											
8	51	21	49	50																											



	10	57	61	62	60	
2c	-x axis correct (label, units, scale) -y axis correct (label, units, scale) -point plotted correctly -line of best fit drawn					1 mark for each point
2d	Months of growth Location around the country					
3a	7					1 mark
3b	C					1 mark
3c	Simple statements might include: -crystallisation -filtering -evaporation Simple Explanations (clear explanations in brackets) might include: -Heating sulfuric acid and mixing the copper oxide in (until the black copper oxide cannot dissolve in the sulfuric acid any more) -filtering the solution (to remove the left over solid) -heating the blue solution (to evaporate off the water leaving about half the solution) -leaving the solution to crystallise (copper sulfate crystal made)					Level 1 (1-2 marks) -simple statements made Level 2 (3-4 marks) -statement with simple explanations Level 3 (5-6 marks) -statements with clear explanations
3d	$\text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$					1 mark for each side of the equation
4a	B					1 mark
4b	-magnesium loses 2 of electrons ... -...and becomes a 2+ positive ion -oxygen gains 2 of electronsbecoming a -2 negative ion -They now both have full outer shells -MgO					1 mark for each bullet point, marks may be gain from a diagram
4ci	carbon					
4cii	4					
4ciii	graphite					
4civ	Carbon dioxide					
4d	Points for compound A					The first point for each



	<ul style="list-style-type: none"> -is ionic -solid at room temperature so has a high melting point -conducts when dissolve -ions free to move <p>Points for compound B</p> <ul style="list-style-type: none"> -giant covalent -does not conduct when dissolved 	<p>compound is needed to gain the rest of the marks. Correct identification of A as ionic and B as giant covalent (simple covalent is incorrect and gains no marks, covalent alone is insufficient information and gains no marks)</p> <p>After that 1 mark for each bullet point up to 5</p>
5a	Alkali	1 mark
5b	Hydroxide or OH ⁻	1 mark Allow error carried forward if 1a is answered acid and 1b is answered H ⁺
5c	H ⁺ + OH ⁻ → H ₂ O	1 mark for left hand side 1 mark for right hand side Reversible reaction sign preferred
6a	<ul style="list-style-type: none"> -Cl₂ (disinfectant, production of HCl) -H₂ (fuel, production of HCl) -NaOH (bleach, paper making) 	Product and use must be given to gain mark 1 mark for each bullet point
6b	<ul style="list-style-type: none"> -negative -because its positive and opposites attract 	1 mark for each bullet point
6c	2Cl ⁻ → Cl ₂ + 2e ⁻	1 mark for LHS 1 mark for RHS
6d	Reduction	1 mark
7a		1 mark for correct placement of electrons 1 mark for correct number of electrons 1 mark for double bond
7b	2CH ₄ O + 3O ₂ → 2CO ₂ + 4H ₂ O	1 mark for all formula correct 1 mark for LHS 1 mark for RHS



7d

Reactants				Products			
Methanol				Carbon Dioxide			
Bond	Energy	Number of bonds	Total energy	Bond	Energy	Number of bonds	Total energy
C-H	413	3	1239	C = O	745	2	1490
C-C	347	0	0	Total for each carbon dioxide			1490
C-O	358	1	358				
O-H	467	1	467	Number of carbon dioxides			2
Total for each methanol			2064				
Number of methanols			2	Overall for carbon dioxide			2980
Overall for methanol			4128				
Oxygen				Water			



O=O	495	1	495	O - H	467	2	934
Total for each oxygen			495	Total for each water			934
Number of oxygens			3	Number of waters			4
Overall for oxygen			1485	Overall for water			3736
Overall for reactants			5613	Overall for products			6716

Total for REACTANTS - Total for PRODUCTS = $5613 - 6716 = -1103 \text{kJ/Mol}$

EXOTHERMIC (-ve)

1 mark for LHS, 1 mark for RHS, one mark for correct answer, 1 mark for correct sign