AQA Style

GCSE
COMBINED SCIENCE: TRILOGY

Higher Tier   Chemistry Paper 2

H

Mark Scheme

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Question 1

Question	Answers	Extra information	Mark
01.1	a mixture designed as a useful product	Accept a description of a mixture.	**1**
01.2	X	If more than one box is ticked, award no marks.	**1**
01.3	sample/batch C is correct/ contains the right ingredients	Sample/batch C is the <u>only</u> one that is correct/contains the correct ingredients receives marking points 1 and 3.	**1**
	(because) it matches the correct medicine/ has the same dots/pattern/ the substances travelled the same distances	Sample/batch C is the <u>only</u> one that matches the correct medicine, has the same dots/ pattern, they travelled the same distances receives marking points 2 and 4.	**1**
	samples/batches A, B and D are not correct/do not contain the right ingredients		**1**
	(because) they do not match the correct medicine/they have different dots/patterns/ the substances travelled different distances		**1**
01.4	it stayed on the start line/ didn't move		**1**
	(because) it was not soluble (in the solvent used)		**1**
01.5	$\dfrac{8}{40}$	Accept $R_f = \dfrac{\text{distance moved by substance}}{\text{distance moved by solvent}}$	**1**
	0.2		**1**
Total			**10**

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Question 2

Question	Answers	Extra information	Mark
02.1	Any **two** from: • extracting and/or processing of raw materials • manufacturing/making the product and/or packaging • using the product during its lifetime • disposal (at the end of its useful life) • transport/distribution at each stage	For each step, allow a clear description of the process or a specific example related to a named product.	2
02.2	**Level 2:** The ways in which relevant features are similar/different is made clear. The magnitude of the difference is described.		3-4
	Level 1: There is a simple comparison of the indicators for each type of bag.		1-2
	No relevant content.		0
	Indicative content: • Comparison: Producing paper bags uses more water than producing plastic bags. • Magnitude: Producing paper bags uses 700/3.5× more litres of water than producing plastic bags. • Comparison: Producing paper bags releases more CO_2 than producing plastic bags. • Magnitude: Producing paper bags releases 3kg/3× more CO_2 than producing plastic bags. • Comparison: Plastic bags are more likely to end up as litter than paper bags. • Magnitude: There is a 5× higher risk of plastic bags becoming litter compared to paper bags/the risk of a plastic bag becoming litter is 1 but the risk of a paper bag becoming litter is only 0.2.		

02.3	Any **one** from: • not all impacts are easy to calculate/ some impacts require human judgements/ it is not a purely objective process • different people may come up with different judgements • judgements may be biased/ misused	Accept a specific example, e.g. to support advertising claims.	1
Total			**7**

Question 3

Question	Answers	Extra information	Mark
03.1	methane	Accept CH_4. Accept water vapour. Accept nitrous oxide. Accept ozone.	**1**
03.2	Any **two** from: • burning fossil fuels/ combustion (to generate electricity, heat homes or run vehicles) • deforestation • grazing cattle • rice fields • disposing of waste in landfill sites	If no mark has been awarded for grazing cattle or rice fields allow **1** mark for farming/ agriculture.	**2**
03.3	the results are peer-reviewed	Accept checked by other scientists.	**1**
	to prevent false claims	Accept to check that the data/ results are reproducible. Accept to check the results are valid.	**1**

03.4	**Level 3:** A judgement is supported by a range of logically linked reasons. There is at least one statement from each section of the indicative content.	**5-6**
	Level 2: Some logically linked reasons are given. There may also be a simple judgement. There is at least one statement from each section of the indicative content.	**3-4**
	Level 1: Relevant points are made that do not need to be linked. Two marks can be awarded for two valid statements.	**1-2**
	No relevant content.	**0**
	Indicative content: **Points in support of the statement:** • The trend in Figure 3 shows a decrease in temperature. • Figure 2 shows that the global temperature regularly decreases for a few years. • The trend in Figure 3 fits the pattern of fluctuations/increases and decreases shown in Figure 2. **Points against the statement:** • Figure 2 shows an upward trend in temperature since 1964. • Figure 3 shows an increase in temperature between 2018 and 2019. • The decrease in 2018 in Figure 3 is unlikely to be anomalous as it fits the pattern of results in Figure 2. • Figure 3 only includes four years of data (while Figure 2 includes 140). • Figure 3 includes data only from March each year. • Figure 3 includes data from one location while Figure 2 includes data from across the world. • So the calculation of the mean temperature in Figure 2 is more accurate. • The data and methods in Figure 2 have been peer reviewed/ verified but the data in Figure 3 has not. • Therefore, the data in Figure 2 is more likely to be valid.	
Total		**11**

Question 4

Question	Answers	Extra information	Mark
04.1	a glowing splint		**1**
	relights	Accepts bursts into flame.	**1**
		Do not accept a lit splint burns brighter or faster.	
04.2	$C_3H_8 + \mathbf{5}O2 \longrightarrow 3CO_2 + \mathbf{4}H_2O$	Allow multiples.	**1**
04.3	$\dfrac{(12 \times 3)}{44} \times 100$	Accept $\dfrac{36}{44} \times 100$	**1**
	81.8181....		**1**
	81.8	An answer of 81.8 with no working shown scores **3** marks.	**1**
		$\dfrac{12}{44} \times 100 = 27.2727...$ scores **1** mark.	
		An answer of 27.3 scores **2** marks.	
04.4	incomplete combustion will occur	Allow reference to less oxygen available for combustion.	**1**
	Any **three** from:	Effects of the pollutants must be linked to the correct pollutant.	**3**
	• (therefore) carbon monoxide will be produced	Allow description of effects of inhaling carbon monoxide.	
	• which is a toxic gas		
	• that is colourless/odourless/ not easily detected		
	• (therefore) particulate carbon/particulates/soot will be produced		
	• which can irritate the lung linings/make asthma worse/ cause cancer		
Total			**10**

Question 5

Question	Answers	Extra information	Mark
05.1	Any **two** from: • size/surface area of marble chips • volume of acid • temperature of the acid • atmospheric pressure • whether or not the reaction is stirred • mass of marble chips • type of acid • angle of the gas syringe		**2**
05.2	Any **one** from: • some gas may be lost before the bung is inserted • timer not started at the start of the reaction • gas cylinder does not allow precise measurements/error reading volume of gas	Allow a description of adding the marble chips, the bung and starting the timer at the same time.	**1**
05.3	all points correctly plotted	Allow a tolerance of ± ½ a small square. Allow **1** mark for 5 or 6 points plotted correctly.	**2**
	curve of best fit ignoring the anomalous point at (60, 35)	Allow correct line of best fit for incorrectly plotted points.	**1**

05.4	(rate of reaction) decreases	Allow the rate is fastest at the beginning.	1
	(rate decreases) more slowly as time increases	Accept a reference to a time period where the rate is slower than at the start.	1
	(rate) becomes zero at 68 seconds	Allow reaction stops at 68 seconds.	1
		Accept time in the range 64 to 76 seconds.	
05.5	tangent drawn at 40s		1
	attempt at $\dfrac{\text{change in y}}{\text{change in x}}$ for their tangent	At least one of Δx or Δy must be correct for their tangent.	1
	an answer in the range of 0.62 to 0.68		1
	cm³/s		1
Total			**13**

Question 6

Question	Answers	Extra information	Mark
06.1	Any **two** from: • copper can be extracted from low grade ores • mining is not required • no need to move/transport/ dispose of large amounts of rock	Allow copper can be extracted from contaminated land. Allow consequences of less mining. Allow less energy required. Allow fewer emissions of greenhouse gases/carbon dioxide.	**2**
06.2	iron is more reactive than copper (so) iron displaces copper (from copper sulfate)	 Allow iron reduces copper ions.	**1** **1**
06.3	M_r $CuSO_4$ = 159.5 $\dfrac{0.957}{159.5}$ = 0.006 (mol)	 Allow correct use of incorrectly calculated value for M_r. Allow 6×10^{-3} (mol). An answer of 0.006 or 6×10^{-3} (mol) with no working shown scores **3** marks.	**1** **1** **1**
06.4	(amount of hydrated copper sulfate) decreases (because) the equilibrium/ system shifts to the left/in the endothermic direction	 Allow the equilibrium/ system shifts to reduce the temperature/to counteract the change. Allow favours the reverse/ endothermic reaction.	**1** **1**
Total			**9**

Question 7

Question	Answers	Extra information	Mark
07.1	(banded iron formations) require oxygen		1
	which was first produced 2.7 billion years ago (by algae)	Allow there was no oxygen produced before 2.7 billion years ago for **2** marks.	1
07.2	(limestone is) formed from the carbonate compounds/ calcium carbonate (shells/ skeletons) of sea organisms/ animals/plankton		1
07.3	C_nH_{2n+2}		1
07.4	petrol has shorter/smaller molecules/chains		1
	(so) it has a lower boiling point		1
	(therefore) it condenses higher up the (fractional distillation) column		1
	because the column is cooler at the top	Allow because there is a temperature gradient.	1
07.5	cracking		1
	breaks larger molecules/ kerosene into smaller molecules		1
Total			**10**