OCR GCSE GATEWAY CHEMISTRY A · J248

CHEMISTRY



MARK SCHEME

M2 HANDLING DATA

SCORE	PERCENTAGE
/46	%

STEMUP

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Question			Answer/Indicative content	Marks	Guidance
1			Level 3 **Gives three reasons why washing powder C is the best** **AND** **gives at least two advantages of washing clothes at low temperatures** Quality of written communication does not impede communication of the science at this level. (5–6 marks) Level 2 **Gives two reasons why washing powder C is the best** **AND** **gives one advantage of washing clothes at low temperatures** Quality of written communication partly impedes communication of the science at this level. (3–4 marks) Level 1 **Gives one reason why washing powder C is the best** **OR** **gives one advantage of washing clothes at low temperatures** Quality of written communication impedes communication of the science at this level. (1–2 marks) Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	This question is targeted at grades up to C Indicative scientific points may include: Explanations for C Pete is correct because • best or excellent stain removal • best or excellent whiteness • best or good for preventing fading **ignore** just quoting data Advantages of washing clothes at low temperatures: • idea that energy is saved • idea that less greenhouse gases are produced • idea that (delicate) fabrics aren't damaged • idea that colours won't run • idea of preventing enzymes (in detergents) denaturing **ignore** costs less **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
			Total	**6**	

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Question			Answer/Indicative content	Marks	Guidance
2			FIRST CHECK ANSWER ON ANSWER LINE If answer = 0.62 award 3 marks 3.7/6 ✓ = 0.61666…… ✓ = 0.62 (2 sig. figs) ✓	3 (AO2 × 2.2 1.2)	ALLOW 3.7 ± 0.1
			Total	3	
3			D ✓	1 (AO1.1)	
			Total	1	

Question			Answer/Indicative content	Marks	Guidance
4	a	i	FIRST CHECK ANSWER ON ANSWER LINE If answer = 0.62 award 3 marks R_f = distance travelled by substance / distance travelled by solvent = 37/60 ✓ = 0.61666…. ✓ = 0.62 (2 significant figures) ✓	3 (AO1.1) (AO2.2) (AO1.2)	**ALLOW** ECF for use of correct calculation from incorrect measurements **ALLOW** 0.59 – 0.67 **ALLOW** ECF for sig fig mark
		ii	A and B	1 (AO3.2a)	Both needed for the mark
		iii	Idea that D forms weak(er) bonds with the mobile phase than C / Idea that D forms strong(er) bonds with stationary phase than C / D is less polar than C / ORA ✓	1 (AO2.1)	**ALLOW** C is more soluble (in the solvent) than D / ORA
	b	i	Similarity: Both have stationary and mobile phases / both use silica in the stationary phase ✓ Difference: Thin-layer uses liquid for mobile phase / gas chromatography use gas for mobile phase ✓	2 (AO2 × 1.1)	**ALLOW** the mobile phases are different states
		ii	Thin-layer chromatography is used to separate solids / gas chromatography is used to separate gases (in a gas mixture) ✓	1 (AO2.1)	**ALLOW** idea that the tomato sauce is a liquid or not a gas
			Total	**8**	

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Question			Answer/Indicative content	Marks	Guidance
5		i	Na_2O (s) + H_2O (l) → **2**NaOH (aq) Formulae ✓ Balancing ✓ State symbols ✓	3 (AO2.1) (AO1.2) (AO2.1)	**ALLOW** any correct multiple, including fractions **ALLOW** = **OR** ⇌ instead of → **DO NOT ALLOW** and / & instead of '+' balancing mark is dependent on the correct formulae but **ALLOW** 1 mark for a balanced equation with a minor error in subscripts / formulae e.g. NAO + H_2O →**2**NaOH State symbols mark is independent of formulae & balancing marks
		ii	Hydroxide / OH– ions ☐	1 (AO1.1)	
		iii	Sodium sulfate✓	1 (AO2.1)	**ALLOW** Na_2SO_4 **IGNORE** incorrect formulae if correct name is given
		iv	**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 100 award 2 marks** pH increased by 2 concentration decreases by a factor of 10 × 10 ✓ 100 ✓	2 (AO2.2)	**ALLOW** for 1 mark pH increase by 1, so concentration decreased by a factor of 10
			Total	**7**	
6			**FIRST CHECK ANSWER ON ANSWER LINE** **If answer = 373 (tonnes) award 4 marks** M_r $CaCO_3$ = 100.1 **and** M_r CaO = 56.1 ✓ 209 g of calcium oxide = $\frac{100.1}{56.1} \times 209$ = 372.9215686 (g) ✓ = 373 (g) (**3 significant figures**) ✓	4 (AO3 × 2.2) (AO1.2)	Need both relative formula masses for 1 mark **DO NOT ALLOW** 100 or 56 **ALLOW** ECF from incorrect RFMs **ALLOW** ECF **ALLOW** ECF for sig fig mark
			Total	**4**	

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Question			Answer/Indicative content	Marks	Guidance
7	a		**Any one from:** Use a single indicator / named single indicator eg methyl orange / phenolphthalein (instead of universal indicator)✓ Idea that universal does not give a sudden colour change / universal indicator gives a continuous colour change / ORA ✓ OR Fill the burette exactly to the 0.0 cm^3 line ✓ Idea that this will give accurate volume of acid ✓ OR Idea of adding acid to the alkali **slowly or dropwise** near the end point ✓ As indicator should change colour on addition of one drop (of acid) ✓ OR Idea of swirling the alkali while adding the acid ✓ To ensure mixing of acid and alkali ✓ OR Use a white tile under the conical flask ✓ To see the colour change easily / clearly ✓	2 (AO3.3b)	**Explanation must be linked to reason** **ALLOW** idea of using a pH probe or pH meter
	b		**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 23.65 (cm^3) award 2 marks** Use of volume of acid from only titrations 2 & 3 / Use of only 23.60 & 23.70 ✓ Accurate volume of acid = 23.65 (cm^3) ✓	2 (AO2.2)	**ALLOW** 1 mark for average calculated using all results, ie 24.35 (cm^3)
			Total	**4**	

Question			Answer/Indicative content	Marks	Guidance
8	a	i	Waxes and tar ✓	1 (AO2.1)	
		ii	Waxes and tar ✓	1 (AO2.1)	
	b		FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 124.49(%) award 3 marks 11,000,000 – 4,900,000 = 6.1×10^6 ✓ 6,100,000 ÷ 4,900,000 = 1.244897959 ✓ 1.244897959 × 100 = 124.49(%) ✓	3 (AO2×2.2) (AO1.2)	ALLOW ECF from calculation
			Total	5	

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Question			Answer/Indicative content	Marks	Guidance
9	a		**Any one from:** Use a single indicator / named single indicator eg methyl orange / phenolphthalein (instead of universal indicator)✓ Idea that universal indicator does not give a sudden colour change / universal indicator gives a continuous colour change / ORA ✓ **OR** Fill the burette exactly to the 0.00 cm^3 line ✓ Idea that this will give accurate volume of acid ✓ **OR** Idea of adding acid to the alkali <u>slowly</u> **or** <u>dropwise</u> (near the end point) ✓ Idea that indicator should change colour on addition of one drop (of acid) ✓ **OR** Idea of swirling the alkali while adding the acid ✓ To ensure mixing of acid and alkali / AW ✓ **OR** Use a white tile under the conical flask ✓ To see the colour change easily / clearly ✓ **OR** Repeat the experiment <u>until concordant or consistent results are obtained</u> ✓ To obtain a more accurate titre / AW ✓ **OR** Idea of doing a rough titration ✓ As this will give you an idea of the endpoint ✓	2 (AO3.3b)	**Explanation must be linked to improvement** **ALLOW** idea of using a pH probe or pH meter to give a more accurate indication of when neutralisation occurs **ALLOW** idea of missing the end point **ALLOW** two improvements, with no explanation, for 1 mark if no explanations given

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Question			Answer/Indicative content	Marks	Guidance
	b	i	FIRST CHECK THE ANSWER ON ANSWER LINE **If answer = 23.65 (cm^3) award 2 marks** Use of volume of acid from titrations 2, 3 & 4 / Use of 23.60, 23.70 & 23.65 ✓ Accurate volume of acid = 23.65 (cm^3) ✓	2 (AO2.2)	**DO NOT ALLOW** 23.7 (cm^3) **ALLOW** 1 mark for average calculated using all results, ie 24.18 / 24.175 (cm^3) but **DO NOT ALLOW** 24.2 (cm^3)
		ii	FIRST CHECK THE ANSWER ON ANSWER LINE **If answer = 0.106 (mol / dm^3) award 4 marks** moles of alkali $= \frac{0.200 \times 25.0}{1000}$ / 0.200 x 0.0250 / moles of acid = $\frac{0.005}{2}$ = 0.0025 / 2.5×10^{-3} ✓ $= \frac{0.0025}{0.02365}$ / $\frac{0.0025 \times 1000}{23.65}$ / $\frac{2.5 \times 10^{-3}}{0.02365}$ / $\frac{2.5 \times 10^{-3} \times 1000}{23.65}$ / 0.1057 (mol/dm^3) ✓ concentration = 0.106 (mol / dm^3) (3 sig. figs) ✓	4 (AO3 × 2.2) (AO1.2)	**ALLOW** ECF from moles of alkali **ALLOW** ECF from average titre in **(i)** **ALLOW** ECF from moles of acid i.e. conc = $\frac{\text{moles}}{0.02365}$ or $\frac{\text{moles} \times 1000}{23.65}$
			Total	8	

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