Mark Scheme (Results)

November 2024

Pearson Edexcel International GCSE In Chemistry (4CH1) Paper 2C

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Notes	Marks
1 (a) (i)	D		1
(ii)	D		1
(iii)	A		1
(b)	M1 (they are both atoms of the same element because they both have the) same number of protons M2 (they have the same chemical properties because they both have the) same electron configuration	ALLOW same atomic number ALLOW same number of electrons IGNORE same number of electrons in the **outer shell** IGNORE any mention of neutrons	2
(c)	M1 $(3\times1.6726\times10^{-24})+(4\times1.6740\times10^{-24})$ M2 1.1714×10^{-23}	1.17138×10^{-23} without working scores 2 answer must be in correct standard form ALLOW any number of significant figures from 2 and correctly rounded ALLOW ecf for M2 as long as the numbers are added possible answers 1 mark for 3.3466×10^{-24} 1.00398×10^{-23}	2
		Total = 7	

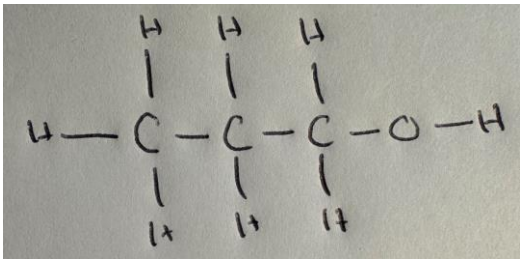
Question number	Answer	Notes	Marks
2 (a) (i)	M1 layers (of atoms or ions or particles) M2 (atoms /ions) can slide over one another	ALLOW rows or sheets no marks if mention of intermolecular forces or electrons sliding	2
(ii)	M1 electrons are delocalised M2 and (electrons) can move / flow (throughout the structure)	any reference to ions moving scores 0 must mention electrons in the answer in M1	2
(b)	M1 carbon extraction / extraction using carbon M2 iron is less reactive (than carbon) OR carbon is more reactive (than iron)	no marks if electrolysis in M1	2
(c)	M1 add sodium hydroxide (to both solutions) M2 iron(II) sulfate forms a green precipitate /ppt	IGNORE OH^-/ hydroxide ions for M1 but allow M2 IGNORE sluggish green or green sludge IGNORE iron(III) sulfate even if incorrect unless it is a green precipitate M2 dep on M1 or any soluble hydroxides	2
		Total = 8	

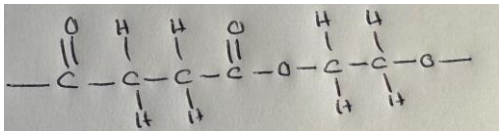
Question number	Answer	Notes	Marks
3 (a)	**D (fractional distillation)** A is not the answer as this technique is not chromatography B is not the answer as this technique is not crystallisation C is not the answer is this technique is not filtration		1
(b)	X = thermometer Y = (Liebig) condenser Z = beaker		3
(c)	M1 measure / test the boiling point M2 a pure substance has a fixed boiling point / boiling point of 78°C	ALLOW boil the ethanol IGNORE a pure substance has a fixed melting point IGNORE any incorrect temperature ALLOW a pure substance will not boil over a range of temperatures ALLOW if it boils over a range of temperatures it is impure	2
		Total = 6	

Question number	Answer	Notes	Marks
4 (a) (i)	any two from: M1 effervescence / bubbles / fizzing (of hydrogen) M2 (the piece of lithium) gets smaller / disappears M3 (the piece of lithium) moves on the surface M4 white trail	 ALLOW dissolves ALLOW (the piece of lithium) floats (on the surface) any mention of a flame MAX = 1	2
(ii)	M1 blue/purple M2 hydroxide ions / lithium hydroxide / an alkaline solution / an alkali / OH^- (ions) is produced / formed		2
(b)	M1 (moles of H_2) = 550÷24000 OR 0.0229 M2 (moles of Li) = 0.0229×2 OR 0.0458 M3 (mass of Li) 0.321 (g)	0.321g scores 3 ALLOW M1×2 ALLOW M2×7 ALLOW 0.32 / 0.3206 /0.32088 /0.32083 /0.322 minimum 2 sig. figs.	3
(c) (i)	any one from: M1 (lilac) flame M2 melts / turns into a ball	 REJECT an incorrect colour of the flame ALLOW faster effervescence / moves faster / can explode	1
(ii)	M1 (atoms of potassium) are bigger / have more shells (of electrons) / larger atomic radius / the outer shell electron is further from the nucleus M2 (therefore) the outer shell electron is less attracted to the nucleus M3 (and therefore the outer shell) electron is more easily lost	ALLOW / more shielding from the nucleus / Li 2,1 K 2,8,8,1 lose 1 mark if outer shell electron is not mentioned lose 1 mark in M2 or M3 if electron**s** are mentioned	3
		Total = 11	

Question number	Answer	Notes	Marks
5 (a) (i)	(volumetric) pipette	REJECT dropping pipette	1
(ii)	yellow to red	ALLOW yellow to orange / yellow to pink must be in the correct order	1
(iii)	any one from: M1 (universal indicator) does not give a sharp colour change M2 (universal indicator) changes colour over a range of pH values	 ALLOW has no clear end point ALLOW there are a wide range of colours / colour change is too gradual	1
(b) (i)	M1 volume at end 23.80(cm^3) **and** volume at start 2.15(cm^3) M2 volume added 21.65(cm^3)	no M1 for 23.8 ALLOW ecf if M1 values are incorrect but correct subtraction to 2 decimal places	2
(ii)	M1 volumes from titrations 1 and 3 used M2 (21.30+21.50)÷2 M3 21.40(cm^3)	 ALLOW ECF from M1 ALLOW ECF from M2 common answers are 21.48/22.38/21.83/22.23 21.50/22.40/21.85/22.25	3
(c)	M1 repeat using the same volumes of NaOH and HNO_3 **OR** repeat without indicator M2 heat until crystals first start to form /heat to crystallisation point / heat until crystals form on the end of a glass rod M3 leave to cool (and crystallise) M4 pour off excess liquid OR filter (to remove crystals) M5 leave (in a warm place) to dry	M1 only if heated to dryness ALLOW heat to evaporate some/most of the water /to form a saturated solution lose 1 mark if no mention of crystals for M3, M4, M5 IGNORE wash crystals ALLOW dry in a (warm) oven/in a dessicator /dry with filter paper /towel/cloth	5
		Total = 13	

Question number	Answer	Notes	Marks
6 (a)	M1 crude oil / it is heated M2 the vapours / gases rise up the column M3 the column is hotter at the bottom than the top OWTTE M4 the vapours condense at their boiling points	ALLOW boiled/vaporised ALLOW the vapours cool as they rise up the column/temperature gradient	4
(b) (i)	M1 600-700°C M2 catalyst of silica/alumina	ALLOW any number or range between 600-700 ALLOW aluminosilicates/ zeolites / SiO_2 / Al_2O_3	2
(ii)	M1 (shorter chain alkanes) are more flammable / are easier to burn M2 therefore are more useful as fuels /petrol /gasoline	 ALLOW used as fuels /petrol/gasoline	2
(iii)	M1 (bonds broken) = 612+193 OR 805 (kJ/mol) M2 (bonds formed) = 348+(2×276) OR 900 (kJ/mol) M3 -95 (kJ/mol) OR M1 (bonds broken) = (4×414)+612+193 OR 2461 (kJ/mol) M2 (bonds formed) = (4×414)+348+(2×276) OR 2556 (kJ/mol) M3 -95 (kJ/mol)	working must be shown for a show that question ALLOW M1-M2 as long as answer is between -80 and -120 (kJ/mol) ALLOW M1-M2 as long as answer is between -80 and -120 (kJ/mol)	3
(iv)	M1 more energy / heat was given out /released when the bonds (in the products) were formed M2 than was taken in / needed to break the bonds (in the reactants)	ALLOW sum of bond energies to break the bonds (in the reactants) ALLOW is less than the sum of the bond energies for making the bonds (in the products) no marks for energy taken in /needed to make the bonds OR for energy given out /released to break the bonds	2
		Total = 13	

Question number	Answer	Notes	Marks
7 (a) (i)	propan-1-ol	ALLOW propanol REJECT propan-2-ol	1
(ii)		REJECT -OH must be -O-H	1
(iii)	M1 242-(15+45) = 182 M2 182÷14 M3 13	13 without working scores 3 ALLOW M1÷14 M3 must be an integer 17 scores 2	3
(iv)	H_2O / water		1

(b) (i)	M1 (moles of NaOH) 0.150×0.025 **OR** 0.00375(mol) M2 (moles of C) 0.00375÷2 **OR** 0.001875(mol) M3 0.001875÷0.0175 **OR** 0.10714(mol/dm^3) M4 0.107(mol/dm^3)	correct answer without working scores all 4 marks ALLOW M1÷2 ALLOW M2÷0.0175 ALLOW M3 to 3 sig figs M4 must be to 3 sig figs 0.214 scores 3 marks	4
(ii)	 M1 for the ester linkage M2 rest of the molecule correct	ALLOW without the extension bonds M2 dep on M1	2
		Total = 12	

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