Mark Scheme (Results)

Summer 2017

Pearson Edexcel International GCSE
in Chemistry (4CH0) Paper 2CR

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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)	C (proton) The only correct answer is C A is not correct because X is not an electron B is not correct because X is not an ion D is not correct because X is not a neutron		1
(ii)	C (9) The only correct answer is C A is not correct because the sum of the number of protons and neutrons is 9 not 4 B is not correct because the sum of the number of protons and neutrons is 9 not 5 D is not correct because the sum of the number of protons and neutrons is 9 not 5		1
(iii)	beryllium	ACCEPT Be	1

(b)	M1 (same) number of protons M2 (different) number of neutrons	ACCEPT same number of electrons IGNORE same atomic number IGNORE relative atomic mass IGNORE different mass number	2
		Total	5

Question number	Answer	Notes	Marks
2 (a)	M1 bubbles (of gas) / effervescence M2 magnesium disappears / magnesium gets smaller	ACCEPT fizzing ACCEPT magnesium dissolves ALLOW solid for magnesium IGNORE reference to movement IGNORE reference to temperature change	2
(b)	increases	ACCEPT gets hotter	1
(c)	magnesium + (dilute) sulfuric acid → magnesium sulfate + hydrogen	ALLOW chemical equation If both word and chemical equation given mark word equation only	1
		Total	4

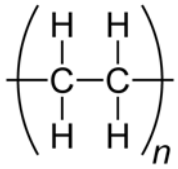
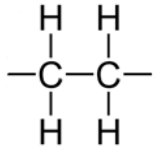
Question number	Answer	Notes	Marks
3 (a)	M1 (A) hydrochloric acid / HCl (aq)	If both name and formula given, both must be correct. State symbol not needed, but penalise if incorrect	2
	M2 (B) calcium carbonate / marble / limestone / chalk / $CaCO_3$	If both name and formula given, both must be correct	
(b)	(gas) syringe / downward delivery (in air)	ACCEPT upward displacement of air	1
(c) (i)	orange / yellow	ACCEPT yellow-orange IGNORE shades or qualifiers, e.g. light	1
(ii)	M1 (name) carbonic acid		2
	M2 (formula) H_2CO_3	ALLOW as the only product of an equation	
	Total		6

Question number	Answer	Notes	Marks
4 (a)	hydrogen AND carbon	ACCEPT in either order ACCEPT C and H if both names and symbols given, mark name only	1
(b) (i)	(a mixture of) compounds/hydrocarbons/substances with similar boiling points	REJECT elements REJECT same boiling points ALLOW references to condense at similar temperatures ALLOW references to similar carbon chain length IGNORE references to other physical properties e.g. viscosity IGNORE references to similar chemical properties	

Question	Answer	Notes	Marks
(b) (ii)	M1 vaporise/heat the crude oil M2 pass vapour/gas into a (fractionating) column/tower M3 vapours/gases/fractions/hydrocarbons/ substances condense at different heights/ levels/points	ALLOW boil IGNORE distil IGNORE references to temperature ALLOW collected for condense ALLOW lower boiling point/more volatile substances condense/collected higher up AND higher boiling point/less volatile substances condense/collected lower down ALLOW shorter chain substances condense/collected higher up AND longer chain substances condense/collected lower down IGNORE reference to melting points If reference to cracking only M1 can be scored	3

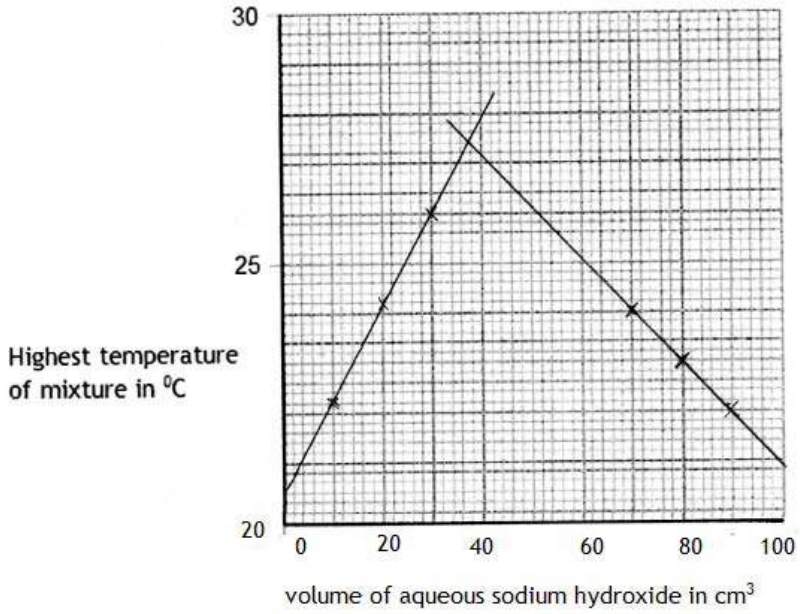
Question	Answer	Notes	marks
4 (c) (i)	bitumen		1
(ii)	gasoline		1
(d) (i)	carbon monoxide	ACCEPT CO If both name and formula given, mark name only	1
(ii)	(it is) poisonous / (it is) toxic / (it) reduces the capacity of the blood to carry oxygen	ACCEPT correct references to haemoglobin / carboxyhaemoglobin IGNORE references to suffocation	1
		Total	9

Question number	Answer	Notes	Marks
5 (a) (i)	46.6 (g)	Ignore trailing zeros e.g. accept 46.60	1
(ii)	as temperature increases, solubility decreases	ACCEPT reverse argument IGNORE any reference to inverse proportionality REJECT reference to (direct) proportionality ALLOW references to negative correlation	1
(b)	M1 use a fume cupboard M2 (because) ammonia is toxic/poisonous	ALLOW carry out in a well-ventilated area IGNORE reference to lab coats/goggles/(gas) masks/gloves IGNORE do not inhale fumes IGNORE dangerous/harmful/irritant	2
(c)	water evaporates (more quickly) / ammonia escapes (as it is less soluble in hot water)	ALLOW (ammonia) solution evaporates IGNORE ammonia evaporates	1
(d)	measure the pH (of the solution using universal indicator or pH meter) OR titrate with acid		1
		Total	6

Question number	Answer	Notes	Marks
6 (a)	M1 (method 1) zymase M2 (method 2) phosphoric acid / H_3PO_4	ACCEPT yeast If both name and formula given, mark name only	2
(b)	M1 company A chooses method 1/fermentation AND company B chooses method 2/ethene with steam/hydration M2 company A has (access to) a supply of sugar (cane)/glucose M3 company B can obtain ethene from crude oil/an oil refinery M4 company A does not need pure ethanol / company B does need pure ethanol	 IGNORE company A only needs a dilute solution of ethanol IGNORE references to batch/continuous processes	4
(c) (i)		M1 one correct repeat unit drawn with continuation bonds e.g.  or $-CH_2-CH_2-$ M2 rest of diagram correct ie brackets and balanced using n	2

(ii)	$C_{12}H_{26}$	ALLOW n in any position after bracket but not before M2 DEP M1	
(iii)	crude oil is a finite/limited resource OR ethanol can be made from sugar (cane)/glucose which is a renewable resource	ALLOW crude oil is non-renewable IGNORE reference to high/increasing demand for ethene	
		Total	10

Question number	Answer	Notes	Marks
7 (a)	M1 polystyrene is a better insulator M2 so less heat (energy)/thermal energy is transferred/lost to the surroundings/atmosphere/air	ALLOW polystyrene is an insulator REJECT no heat loss to the surroundings	2
(b)	M1 (before) 18.6 (ºC) M2 (after) 22.8 (ºC)	one mark for correct answers in the wrong order Ignore trailing zeros e.g. accept 18.60	2

Question	Answer	Notes	Marks
(c) (i)			4
	M1 and M2 all points plotted correctly to the nearest gridline	deduct one mark for each incorrectly plotted point	
	M3 best fit straight line through first 3 points drawn with the aid of a ruler M4 best fit straight line through last 3 points drawn with the aid of a ruler	ALLOW M3 and M4 even if lines do not intersect Penalise lack of use of a ruler once only	

Question	Answer	Notes	Marks
(c) (ii)	M1 (sodium hydroxide) expected value 37-38 cm^3 M2 (hydrochloric acid) (100 – M1) expected value 63-62 cm^3	mark CSQ on candidates graph read to nearest gridline	2
(iii)	sodium hydroxide (has the greater concentration because) M1 sodium hydroxide and hydrochloric acid react in a 1:1 (molar) ratio M2 the volume of sodium hydroxide required is less (than the volume of hydrochloric acid required)	ALLOW hydrochloric acid has the lower concentration because the volume of hydrochloric acid required is more (than the volume of sodium hydroxide)	2
		Total	12

Question number	Answer	Notes	Marks
8 (a) (i)	M1 0.02350 x 0.0200 M2 0.000470 / 4.70 x 10^{-4} (mol)	do not penalise missing trailing zeros 0.0005 scores 1/2 ACCEPT 0.47 for 1 mark Correct answer without working scores 2	2
(ii)	M1 M2 from (i) ÷ 0.0250 / (0.000470) ÷ 0.0250 M2 0.0188 (mol/dm^3) OR M1 $\frac{\text{M2 from (i) x 1000}}{25}$ M2 0.0188 (mol/dm^3) OR M1 (23.5 ÷ 25.0) x 0.0200 M2 0.0188 (mol/dm^3)	do not penalise missing trailing zeros ACCEPT any number of sig fig except one Correct answer without working scores 2	2

8 (b)	M1 <u>heat/boil</u> until crystals form in a sample of solution that has been removed and cooled	ACCEPT heat/boil to produce a (hot) saturated/concentrated solution ACCEPT heat/boil until crystals start/begin to form ALLOW (heat/boil to) evaporate some of the water ALLOW heat/boil to crystallisation point IGNORE references to filtering before heating	4
	M2 cool/leave (the solution) until crystals have formed	M2 DEP on M1	
	M3 filter (to remove the crystals) AND wash with (a little deionised/distilled) water	ACCEPT decant/pour off the liquid/(excess solution) M3 dep on crystals having been formed	
	M4 suitable method of drying the crystals	e.g. place in (warm) oven / leave to dry (in warm place) / use filter paper / use kitchen towel REJECT any reference to heating directly with a flame, e.g. with a Bunsen If M1 not scored then award 1 mark out of 4 for leaving the solution until the water evaporates fully OR for evaporating solution to dryness	
		Total	8

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