



Mark Scheme (Results)

January 2019

Pearson Edexcel International GCSE

In Chemistry (4CH0) Paper 2C

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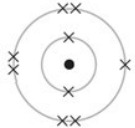
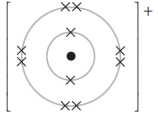
General Marking Guidance

- 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.

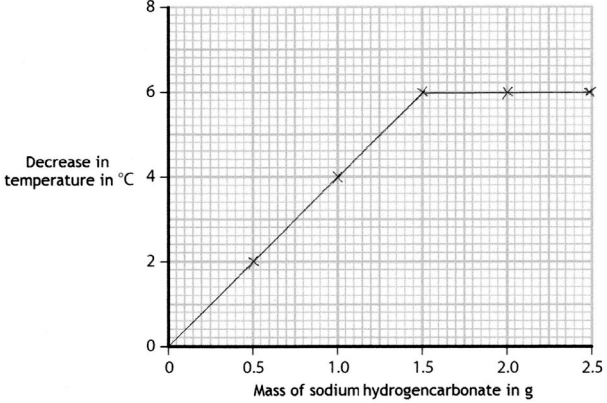
Question number	Answer	Notes	Marks										
1	<table border="1"> <thead> <tr> <th>Name of apparatus</th> <th>Letter</th> </tr> </thead> <tbody> <tr> <td>beaker</td> <td>D</td> </tr> <tr> <td>burette</td> <td>A</td> </tr> <tr> <td>measuring cylinder</td> <td>C</td> </tr> <tr> <td>pipette</td> <td>F</td> </tr> </tbody> </table>	Name of apparatus	Letter	beaker	D	burette	A	measuring cylinder	C	pipette	F		4
Name of apparatus	Letter												
beaker	D												
burette	A												
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pipette	F												

Question number	Answer	Notes	Marks
2 (a) (i)	(contain) same number of protons/37 protons	IGNORE same atomic number REJECT reference to electrons	1
(ii)	(contain) different numbers of neutrons / 87 has two more neutrons / 85 has two fewer neutrons / 85 has 48 neutrons but 87 has 50 neutrons	IGNORE reference to mass number	1
(iii)	A (1)		1
(b)	M1 $(0.722 \times 85) + 0.278 \times 87$ OR $[(72.2 \times 85) + (27.8 \times 87)]/100$ OR 85.556 M2 85.6	85.5 scores 1 Correct answer with no working scores 2	2

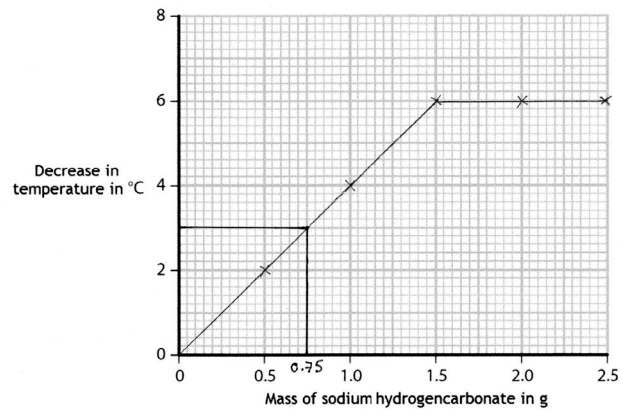
Question number	Answer	Notes	Marks
3 (a)	(i) (thermal) decomposition	IGNORE endothermic	1
	(ii) M1 (bubble through/add to) limewater M2 turns milky	ACCEPT cloudy / turbid / <u>white</u> precipitate M2 DEP M1	2
(b)	(i) gas(es)/CO ₂ /H ₂ O/steam/water given off /formed/evolved		1
	(ii) all of the NaHCO ₃ has decomposed/reacted	ALLOW the reaction has finished ALLOW all the CO ₂ / water/ steam/H ₂ O /gas(es) has been given off	1

Question number	Answer	Notes	Marks
4 (a)	heat (energy) is given out/lost (to the surroundings) /heat is transferred to the surroundings	Not just energy ACCEPT thermal energy is given out ALLOW heat (energy) is produced/released	1
(b)	A 		1
(c)	B 		1
(d)	M1 has giant (ionic structure)/giant (ionic lattice) M2 strong (electrostatic) forces/strong attraction M3 between (oppositely charged) ions M4 large amount of (thermal/heat) <u>energy</u> required to overcome the forces/attraction	ALLOW strong bonds ACCEPT large amount of (thermal/heat) <u>energy</u> required to break the bonds IGNORE more energy	4

		Any reference to covalent bonds / metallic bonding / intermolecular forces max 1 mark	
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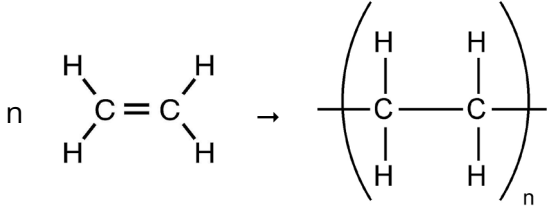
Question number	Answer	Notes	Marks																				
5 (a)	<table border="1"> <thead> <tr> <th>Mass of sodium hydrogencarbonate in g</th> <th>Initial temperature in °C</th> <th>Lowest temperature reached in °C</th> <th>Decrease in temperature in °C</th> </tr> </thead> <tbody> <tr> <td>0.5</td> <td>25</td> <td>22</td> <td>3</td> </tr> <tr> <td>1.0</td> <td>24</td> <td>20</td> <td>4</td> </tr> <tr> <td>1.5</td> <td>23</td> <td>18</td> <td>5</td> </tr> <tr> <td>2.0</td> <td>23</td> <td>18</td> <td>5</td> </tr> </tbody> </table> <p>M1 all four temperature readings correct</p> <p>M2 all four calculations of decrease in temperature correct</p>	Mass of sodium hydrogencarbonate in g	Initial temperature in °C	Lowest temperature reached in °C	Decrease in temperature in °C	0.5	25	22	3	1.0	24	20	4	1.5	23	18	5	2.0	23	18	5	<p>Calculations in M2 CSQ on values given in M1</p>	2
Mass of sodium hydrogencarbonate in g	Initial temperature in °C	Lowest temperature reached in °C	Decrease in temperature in °C																				
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1.5	23	18	5																				
2.0	23	18	5																				
(b) (i)		<p>M1 & M2 All five points plotted correctly = 2 Deduct one mark for each incorrectly plotted point</p> <p>M3 both lines drawn correctly with the aid of a ruler</p> <p>First line does not need to pass through origin and IGNORE extrapolation</p>	3																				

(b) (ii)



correct value given from candidate's plotted graph

1

Question number	Answer	Notes	Marks
6 (a)	<div style="text-align: center;">  </div> <p>M1 correct repeat unit with single bond between carbon atoms</p> <p>M2 extension bonds, brackets and n included</p>	<p>Accept n anywhere after brackets but not before</p> <p>Extension bonds do not need to go out of brackets</p> <p>M2 DEP on M1</p>	2
(b)	the polymer is the only product (of the reaction) / no small molecule is produced (as well as the polymer)	ALLOW only one type of monomer	1

<p>(c) (i)</p>	<p>Any two from:</p> <p>M1 strong so does not break/so can be reused</p> <p>M2 low density so not heavy (when it contains the shopping)</p> <p>M3 non-toxic so does not poison food/safe to use with food</p> <p>M4 waterproof so contents do not get wet/bag does not tear when wet</p> <p>M5 flexible so fits around the shopping</p> <p>M6 can be recycled so saves resources</p> <p>M7 transparent so can see contents of bag</p>	<p>IGNORE light</p> <p>ALLOW odourless so does not taint food</p> <p>IGNORE references to cost</p> <p>IGNORE non-biodegradable</p> <p>If two correct properties with no links allow 1 mark</p>	<p>2</p>
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(c) (ii)	landfill: sites get filled up/takes up (more) land burning: produces toxic /poisonous / greenhouse gas	<p>ALLOW accumulates (in landfill as non-biodegradable/does not breakdown/decompose)</p> <p>IGNORE can produce methane which is a greenhouse gas</p> <p>IGNORE reference to harm to wildlife /habitats/ environment/visual pollution/unpleasant smell / noise pollution/ toxic leaching</p> <p>ACCEPT produces CO₂ which is a greenhouse gas</p> <p>ACCEPT could produce CO which is poisonous/reduces blood capacity to carry oxygen</p> <p>IGNORE produces harmful gas(es) /air pollution</p>	2

Question number	Answer	Notes	Marks
7	<p>M1 ions cannot flow/move when solid</p> <p>M2 ions can flow/move when liquid/molten</p> <p>$\text{Mg}^{2+} + 2\text{e}^{-} \rightarrow \text{Mg}$</p> <p>(it/steel) reacts with chlorine</p>	<p>ACCEPT ions are in fixed positions</p> <p>If reference to electrons cannot/can move then 0</p> <p>IGNORE not inert</p>	<p>2</p> <p>1</p> <p>1</p>

Question number	Answer	Notes	Marks
8 (a) (i)	<p>M1 (total) $\text{vol}(\text{CO}_2) = 480 \times 140$ OR $67\,200 \text{ dm}^3$</p> <p>M2 $n[\text{CO}_2] = (67\,200 \div 24) = 2800 \text{ (mol)}$</p> <p>OR</p> <p>M1 (per person) $n[\text{CO}_2] = 480 \div 24$ OR 20 (mol)</p> <p>M2 (total) $n[\text{CO}_2] = (20 \times 140) = 2800 \text{ (mol)}$</p>	<p>Mark CQ on M1</p> <p>Mark CQ on M1</p>	2
(ii)	<p>M1 mass of $\text{Na}_2\text{O}_2 = 2800 \times 78(.0)$ OR $218\,400 \text{ (g)}$</p> <p>OR M2 from part (i) $\times 78(.0)$</p> <p>M2 $218(.4) \text{ (kg)}$</p>	<p>Mark CQ on M1</p> <p>ACCEPT any number of sig figs except 1</p>	2

(b)

M1 (it/Li₂O₂) absorbs/reacts with more CO₂ (per mole/per gram)

M2 (it/Li₂O₂) produces oxygen

ORA

ACCEPT only 1 mol Li₂O₂ needed per mol of CO₂, but 2 mol of LiOH needed per mol of CO₂

Answers in either order

2

Question number	Answer	Notes	Marks
9 (a) (i)	M1 (\rightleftharpoons) (reaction is) reversible M2 (ΔH) enthalpy change (of reaction)	IGNORE references to equilibrium ACCEPT heat (energy) change NOT just energy change	2
(ii)	phosphoric acid	ALLOW H_3PO_4	1
(b) (i)	M1 (yield/it/amount of ethanol) increases M2 because (forward) reaction is exothermic	IGNORE equilibrium shifts to the right ACCEPT backward reaction is endothermic IGNORE because reaction moves in exothermic direction IGNORE references to rate IGNORE references to Le Chatelier's principle, eg lower temperature favours the exothermic reaction / equilibrium position shifts to raise the temperature M2 DEP M1	2

(ii) M1 (yield/it/amount of ethanol) decreases

M2 because there are more moles/molecules (of gas) on the left / ORA

IGNORE equilibrium shifts to the left

ALLOW particles

REJECT atoms

ACCEPT there are more moles/molecules of reactants

IGNORE reaction moves to the side with the larger number of moles/molecules

IGNORE references to rate

IGNORE references to Le Chatelier's principle, eg lower pressure favours the reaction that produces the larger number of moles (of gas) / equilibrium position shifts to increase the pressure

M2 DEP M1

2

(c)	(i)	dehydration	ALLOW (thermal) decomposition	1
	(ii)	crude oil is a finite resource / crude oil will eventually run out	ALLOW crude oil non-renewable IGNORE reference to cost	1

Question number	Answer	Notes	Marks
10 (a) (i)	<p>M1 lanthanum</p> <p>M2 melting point is below 1030 (°C)</p>	<p>ALLOW melting point/920 (°C) is lower than operating temperature</p> <p>IGNORE (lanthanum) has lowest melting point</p> <p>M2 DEP M1</p>	2
(ii)	$\text{Sm}_2\text{O}_3 + 6\text{HCl} \rightarrow 2\text{SmCl}_3 + 3\text{H}_2\text{O}$		1

(b)	<p>M1 (samarium) ions in layers/rows/planes/sheets</p> <p>M2 slide/slip (over each other)</p> <p>M3 delocalised electrons OR sea of electrons</p> <p>M4 (can) flow/travel/move (through structure) / are mobile (when voltage/pd is applied)</p>	<p>ACCEPT atoms/cations/particles for ions Reject molecules</p> <p>Allow OWTTE, eg flow/shift/roll/move</p> <p>M2 DEP on mention of EITHER layers or equivalent OR mention of ions or equivalent</p> <p>Do not award M2 if molecules/protons/electrons/nuclei in place of ions etc</p> <p>If reference to ionic bonding / covalent bonding / molecules / intermolecular forces, no M1 or M2</p> <p>Not just electrons IGNORE free electrons</p> <p>IGNORE carry charge/current M4 DEP on M3 or mention of electrons If reference to ions moving no M3 or M4</p>	4

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