MARKSCHEME

SPECIMEN

MYP CHEMISTRY

ON-SCREEN EXAMINATION

12 pages
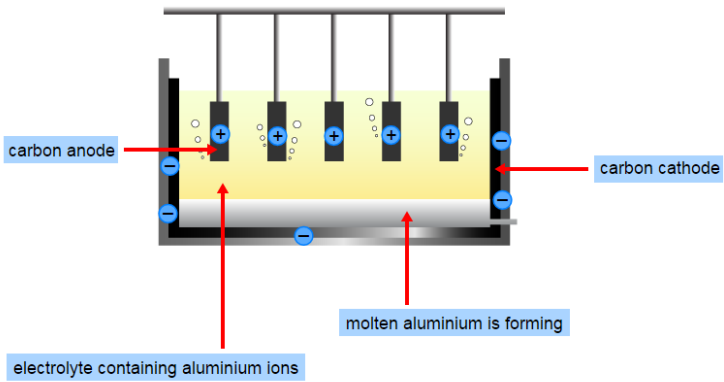
Markscheme instructions

1   Mark positively. Give candidates credit for what they have achieved and what is correct. Do not deduct marks for incorrect responses.

2   Follow the markscheme provided and award only whole marks.

3   Each marking point appears on a separate line.

4   The maximum mark for each subpart is indicated in the "Total" column.

5   Where a mark is awarded a tick should be placed in the text at the precise point where it is clear the candidate deserves the mark.

6   Each marking point in a question part should be awarded separately unless there is an instruction to the contrary in the Notes column.

7   A question subpart may have more marking points than the total allows. This will be indicated by the word "**max**" in the Answer column. Further guidance may be given in the Notes column.

8   Additional instructions on how to interpret the markscheme are in bold italic text in the Answer column.

9   Alternative wording may be indicated in the Answer column by a slash (/). Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.

10   Alternative answers are indicated in the Answer column by "***or***". Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.

11   If two related points are required to award a mark, this is indicated by "***and***" in the answer column.

12   Words in brackets ( ) in the Answer column are not necessary to gain the mark.

13 In some questions a reverse argument is also acceptable. This is indicated by the abbreviation *ORA (or reverse argument)* in the Notes column. Candidates should not be rewarded for reverse arguments unless *ORA* is given in the Notes column.

14

15 Words that are underlined are essential for the mark.

16 If the candidate's response has the same meaning or is clearly equivalent to the expected answer the mark should be awarded. In some questions this is emphasized by the abbreviation *OWTTE (or words to that effect)* in the Notes column.

17 When incorrect answers are used correctly in subsequent question parts the follow through rule applies. Award the mark and add ECF (error carried forward) to the candidate response.

18 The order of marking points does not have to be the same as in the Answer column unless stated otherwise.

19 Marks should not be awarded where there is a contradiction in an answer. Add CON to the candidate response at the point where the contradiction is made.

20 Do not penalize candidates for errors in units or significant figures unless there is specific guidance in the Notes column.

21 Questions with higher mark allocations will generally be assessed using a level response method using task specific clarifications developed with reference to the criteria level descriptors. Candidate's work should be marked using a best fit approach. NB the marks are distributed unevenly across the mark bands as candidates have to include much more detail in their responses to access the highest mark bands.

Question		Answers	Notes	Total	Criterion
1	a	oxygen **and** O **or** silicon and Si	*Name and symbol both needed for mark, accept either O or* O_2	1	A
	b	group 3 period 3		2	A
	c	2, 8 ,3 **or** $1s^2\,2s^2\,2p^6\,3s^2\,3p^1$		1	A
	d	Al is very reactive/strong reducer reacts with O_2 (in the atmosphere)/other elements to form compounds		2	A
	e	**Any two from** light, corrosion resistance, malleability (accept flexibility), hardness		2	A
	f	blue / purple		1	A
	g	(strong) alkali high pH **or** pH > 8	**NOT** *concentrated*	2	C
	h	acid correct name/formula of any acid		2	A
	i	water correctly named sodium salt	*Salt should agree with acid given in part 1h*	2	A
2	a	$2Al_2O_3 + 3C \rightarrow 4Al + 3CO_2$	*1 **mark** for correct chemical formula of reactants* *1 **mark** for correct formulae of products* *1 **mark** for correct balancing ecf from first mark* *1 **mark** max for a word equation* *Ignore incorrect state symbols*	3	A
	b	aluminium is reduced carbon is oxidised oxidation involves loss of electrons/gain of oxygen reduction involves gain of electrons/loss of oxygen	*Check for con* *Could give ionic equation as answer*	4	A C

	c	electrolysis is decomposition of a compound using electricity **and any two from** molten alumina is an electrolyte alumina is molten so the ions are free to move O^{2-} ions will release electrons **and** Al^{3+} ions will receive electrons total charge / number of ions is conserved	**NOT** aqueous for this mark	3	A
	d	all labels correct 2 correct only Draggable labels 		3	A
	e	Aluminium ions are attracted to the -electrode/cathode because they are positive ions aluminium ions gain electrons so are reduced to aluminium	Accept a correct balanced equation	2	A
3	a	correct molar mass of Al_2O_3 (102 g mol^{-1}) correct ratio of moles **or** masses correct mass (22.67g) Units (g) required for final answer		4	D
	b	1.28×10^8 cans to 2 or 3 sig figs expressed any way $mass\ of\ Al\ recycled = 9000 \times 10^6\ g \times 0.17 = 1.53 \times 10^8\ g$	**2 marks** for correct answer (**1 mark** for any one correct version of following steps) Conversion of tonne to g (seen or implied)	2	C

		$number \ of \ cans = \dfrac{1.53 \times 10^9}{12.0} = 1.28 \times 10^8$	*Convert % to multiplier* *Conversion to can*		
4	a	toxic flammable		2	B
	b	***Any two from*** Wear gloves or wash hands immediately if in contact with skin Wear eye protection Carry out experiment in the fume cupboard or well ventilated area Keep bottles away from flames safe disposal of waste fuels		2	B
	c	releases most heat/energy per unit mass / unit volume / numbers of moles combusted		2	B

	d	Design a method with limited success	• one variable is identified • attempt at a table	1–2			

		Design a safe method in which he or she selects materials and equipment	• two correct variables are identified taken from following list, or any other reasonable alternative(s)
			   o temperature
			   o volume/mass of water used
			   o level of insulation
			   o use of same balance, thermometer etc
			• equipment linked to at least one control variable is specified
			• attempt at a method but detail is insufficient for another student to follow
			• a table with labels or units
			• a safely concern is mentioned
				3–7			

		Design a complete and safe method in which he or she selects appropriate materials and equipment	• three correct variables from the list above are identified • equipment correctly linked to the three control variables is specified where relevant • method is described and could easily be followed by another student • method is likely to give appropriate, quantitative data • appropriate number or range of data is stated • a table with labels and units • a safely concern is mentioned	8–13		**19**	B
		Design a logical, complete and safe method in which he or she selects appropriate materials and equipment	• four correct variables are identified and explained • equipment linked to all control variables is specified and justified • complete method is described, fully explained and could easily be followed by another student • method is likely to give appropriate, quantitative data • appropriate number and range of data is explained • a table with labels and units • a relevant safely concern is explained	14–19			

	e	**Any five arranged correctly** Fuels Water Balance Spirit burner Measuring cylinder Tripod Beaker Thermometer Insulation material Heat proof mat		**5**	B
5	a	the value at 50.7/nonane/Mr=128.3 is an outlier		**1**	C
	b	C_7H_{16}	*Subscripts must be used appropriately*	**1**	C
	c	Any value between 4900 and 5000 kJ mol^{-1} *or* 46.3±0.05 kJ g^{-1}		**3**	C D

d		**State** the validity of a hypothesis based on the outcome of a scientific investigation	• the hypothesis is valid	1	*Mark holistically using a best fit approach*		
		Outline the validity of a hypothesis based on the outcome of a scientific investigation	• the hypothesis is valid • because the same mass (1g) of each fuel was combusted giving a fair comparison	2–3			
		Discuss the validity of a hypothesis based on the outcome of a scientific investigation	• the hypothesis is valid • because the same mass (1g) of each fuel was combusted giving a fair comparison • and from C_5H_{12} to $C_{10}H_{22}$ the energy released per g combusted decreases	4–5		**8**	C
		Evaluate the validity of a hypothesis based on the outcome of a scientific investigation	• the hypothesis is valid • because the same mass (1g) of each fuel was combusted giving a fair comparison • and from C_5H_{12} to $C_{10}H_{22}$ the energy released per g combusted decreases • and the molar mass increases from C_5H_{12} to $C_{10}H_{22}$ so fewer moles are combusted	6–8			
e		Loss of heat to the surroundings			*Other reasonable alternative systematic error*	**1**	C
f		Better insulation around the beaker Lid to cover the beaker			*Other alternatives clearly linked to answer in e*	**2**	C

6	a	667 g or 0.67 kg	*Units required*	**1**	C
	b	5.1 maize cobs (or 6 maize cobs)	*Do **not** accept 5 as it is inappropriate to round down in this context*	**1**	C
	c	303 dm^3		**1**	C
	d	lack of protein *or* minerals *or* vitamins *or* fat	***Not** Mg, K, Zn as these are mentioned in the video*	**1**	D
	e	any food which is high in nutrient specified in answer to 1d		**1**	D
7	a	correctly linked effect and explanation for two conditions from the list		**4**	D
	b	any correct example of a fermentation reaction correct explanation of how fermentation works in this situation (two points needed)	*eg breadmaking* *The CO$_2$ produced* *Causes the bread to rise*	**3**	D
8	a	correct structural formula with **all** bonds displayed		**1**	C
	b	$CH_3CH_2OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$ (+ energy)	***1 mark** for correct chemical formula of reactants* ***1 mark** for correct formulae of products* ***1 mark** for any correctly balanced equation ecf from first mark* *Word equation scores max **1 mark*** *Ignore incorrect state symbols*	**3**	D
	c	1 mole of ethanol produces 2 moles CO$_2$ molar mass of CO$_2$ = 44 g mol^{-1} mass of CO$_2$ produced = 88g	*ecf from an incorrectly balanced equation in b* *No ecf for a word equation* *Units needed for this mark*	**3**	A
	d	1 mole of octane produces 8 moles CO$_2$ molar mass of CO$_2$ = 44 g mol^{-1} mass of CO$_2$ produced = 352g	*Units needed for this mark*	**3**	A

9		Outline the implications of using science	• definition of environment • an advantage **or** a disadvantage	1–2		**14**	D
		describe the implications of using science	• correct definition of environment • identification of CO_2 as a greenhouse gas • an advantage **and** a disadvantage	3–5			
		discuss the implications of using science	• correct definition of environment • identification of CO_2 as a greenhouse gas • definition of global warming • an advantage **and** supporting scientific evidence • a disadvantage **and** supporting scientific evidence • an impact on society	6–9			
		discuss and evaluate	• correct definition of environment • identification of CO_2 as a greenhouse gas • definition of global warming • more than one advantage **and** supporting scientific evidence • more than one disadvantage **and** supporting scientific evidence • link made between increased CO_2 and increased global warming • more than one clearly reasoned impact on society • a concluding appraisal linking all the issues discussed previously	10–14			
10		correctly linked reason with clearly reasoned argument			*Two points needed – do not award **1 mark***	**2**	D
						120	