Markscheme

November 2018

Chemistry

On-screen examination

12 pages

The following are the annotations available to use when marking responses.

Annotation	Explanation
	Correct point, place at the point in the response where it is clear that the candidate deserves the mark. For use in analytically marked questions only.
	Omission, incomplete
CON	Contradiction
	Valid part (to be used when more than one element is required to gain the mark)
	Error carried forward
	Dynamic annotation, it can be expanded to surround work
	Horizontal wavy line that can be expanded
	Highlight tool that can be expanded to mark an area of a response

Annotation	Explanation
	Not good enough
	The candidate has given a response but it is not worthy of any marks
	Text box used for additional marking comments
	Seen; must be stamped on all blank response areas and on duplicate pages of concatenated responses
	Vertical wavy line that can be expanded
	Words to that effect
	Award 1, 2, 3, 4 marks. For use in holistically marked questions only

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 Words that are <u>underlined</u> are essential for the mark.

14 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.

15 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 *WTTE* (words to that effect) in the Notes column.

16 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.

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

18 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.

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

20 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. A candidate's work should be reviewed to determine holistically the mark for each row of the holistic grid and a mark awarded for each row.

Question		Answers	Notes	Total	Criterion
1	a	Period 4		**1**	A
	b	transition metals		**1**	A
	c	***Accept any reasonable response (max 2), for example:*** • variable oxidation state/number • form coloured compounds • any named metallic property	*Accept: "they have colour"* *Do not accept "hard"*	**2**	A
	d	***Protons:*** 27 ***Neutrons:*** 32 ***Electrons****:* 25		**3**	A
	e	$CoCl_2$ Ionic (bonding)		**2**	A
	f	cobalt oxide ***or*** cobalt (II) oxide cobalt carbonate ***or*** cobalt (II) carbonate	*Roman numeral must be correct if present* *ECF from part e "cobalt monoxide"*	**2**	A

2	a	plastic – dissolves in organic solvent steel – magnetic glass – sinks in water		**3**	A
	b	Fe_2O_3		**1**	C
	c	mass Fe = 56 ***and*** O = 16 seen or implied 160 g ***or*** $gmol^{-1}$	*ECF from part b for all marking points*	**3**	A D
	d	n=m/M ***or*** 0.5/160 seen or implied 3.125×10^{-3} (moles) seen or implied 3.13×10^{-3} ***or*** 0.00313	*Award 1 mark only for an answer of 320* *no ECF from 2nd marking point*	**3**	A Di
	e	Covalent electrons shared between silicon and oxygen atoms		**2**	C
	f	(silicon oxide is) insoluble in water <u>giant</u> covalent structure will not dissolve in water	*Accept reference to glass or sand not being soluble for the second marking point*	**2**	A
	g	***Accept any three reasonable points (max 3), for example*** • save beaches • preserve biodiversity • conserve raw materials • improves sustainability		**3**	D

3	a	***Independent variable:*** type of fruit ***Dependent variable:*** pH ***Control variables:*** mass of fruit, time of mixing fruit same volume of water added, same volume of mixture tested, same equipment used	accept "acidity" Do not accept "amount"	**4**	B
	b	a research question linking pH with type of fruit	*Accept "acidic"*	**1**	B
	c	cranberry ***and*** (pH =) 2.4 this has the lowest pH ***or*** this has the highest acidity the higher the acidity in the stomach, the more severe the heartburn	*This mark is awarding for linking stomach acidity with heartburn so it can be awarded for an incorrect juice*	**3**	C
	d	bar chart data for all juices presented correctly title linking DV with IV *x* axis: type of fruit juice *y* axis: pH		**5**	C
	e	***Any reasonable extension, for example*** • different (varieties of) fruits • length of time the fruit is blended • different ripeness of fruit		**1**	C
	f	(with more than one trial you are able to) calculate the mean reduces experimental errors ***or*** increases accuracy		**2**	C

	g	red green purple red		**4**	C
	h	the indicator gives a range of pH ***or*** the colour change would not be visible		**1**	C

4	a	***Cayenne – jalapeño – red chilli – habanero*** any two in the correct location all correct		**2**	C
	b	the data show that habanero peppers contain the most capsaicin (so) the prediction is not valid	*Only award 2nd mark if the 1st mark is awarded*	**2**	C
	c	compound 1 contains a (C=C) double bond ***or*** alkene (group) compound 1 has a longer (carbon) chain ***or*** it has an extra carbon	*ORA*	**2**	C
	d	if the temperature of the method is low ***or*** the pepper is raw then the spiciness will increase ***or*** the spiciness will be the highest because the capsaicin will not melt ***or*** boil ***or*** evaporate ***or*** be destroyed		**3**	B

5

	1	2	3	4
Variables	A variable is identified	Independent variable ***and*** dependent variable identified	Independent variable ***and*** dependent variable identified ***and*** one control variable is stated	Independent variable ***and*** dependent variable identified ***and*** more than one control variable is stated
Additional equipment	One piece of additional equipment is listed	Stopwatch ***and*** one piece of additional equipment	Stopwatch ***and*** mortar and pestle ***or*** balance ***and*** one piece of additional equipment	Complete equipment is listed: balance, measuring cylinder ***or*** 25 cm^3 pipette/burette, stopwatch, mortar and pestle
Method	Attempt at a method	Time for neutralization is measured	Time for neutralization is measured ***and*** mass is measured ***or*** powder is used	Time for neutralization is measured ***and*** mass is measured ***and*** powder is used
Data	One treatment is investigated	All treatments are investigated	All treatments are investigated with repeats	All treatments are investigated with repeats ***and*** plans to calculate means
Assumptions	All of the acid has reacted			
Safety	A safety precaution is stated	A safety precaution is stated ***and*** linked to hazard		

19 B

<table>
<tr><td>6</td><td>a</td><td>value of 2.9 ± 0.2 from graph

value for carbon footprint for the potato in the range 0.65 – 0.74

value 11.32 ± 0.04 for total carbon footprint (accept any sig figs)

final value given to two sig figs</td><td>

ECF from first marking point

ECF from second marking point</td><td>4</td><td>C

D</td></tr>
<tr><td></td><td>b</td><td>energy values are similar for both

(but) environmental impact is higher for meat-based than for vegetable

correct use of 11.32 (kgCO_2e) for meat-based or 1.91 (kgCO_2e) for vegetable-based</td><td>

Do not award this mark if no data is given, ECF from part a for meat-based meal</td><td>3</td><td>D</td></tr>
<tr><td>7</td><td>a</td><td>$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$
reactants correct

products correct</td><td></td><td>2</td><td>A</td></tr>
<tr><td></td><td>b</td><td colspan="3"><table>
<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>Advantages and disadvantages of cattle farming</td><td>An attempt at an advantage or disadvantage</td><td>An advantage or disadvantage</td><td>An advantage and disadvantage</td><td>An advantage and disadvantage with at least one justified</td></tr>
<tr><td>Economic impacts of cattle farming</td><td>An attempt at an economic impact</td><td>An economic impact</td><td>More than one economic impact</td><td></td></tr>
<tr><td>Environmental impact of CH_4 capture</td><td>An attempt at an environmental impact</td><td>An environmental impact</td><td>More than one environmental impact</td><td></td></tr>
<tr><td>Ethical aspects of CH_4 capture</td><td>A statement about the impact on a cow or a statement about the methane hazard</td><td>A statement about the impact on a cow with justification or a statement about the methane hazard with justification</td><td>A statement about the impact on a cow with justification and linked to a statement about the methane hazard</td><td></td></tr>
<tr><td>Concluding appraisal</td><td>A conclusion is given</td><td></td><td></td><td></td></tr>
</table></td><td>14</td><td>D</td></tr>
</table>