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OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry A

General Certificate of Secondary Education

Unit **A171/02**: Modules C1, C2, C3 (Higher Tier)

Mark Scheme for June 2013

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations

Used in the detailed Mark Scheme:

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
(1)	separates marking points
not/reject	answers which are not worthy of credit
ignore	statements which are irrelevant - applies to neutral answers
allow/accept	answers that can be accepted
(words)	words which are not essential to gain credit
words	underlined words must be present in answer to score a mark
ecf	error carried forward
AW/owtte	credit alternative wording / or words to that effect
ORA	or reverse argument

Available in scoris to annotate scripts:

	correct response
	incorrect response
BOD	benefit of doubt
NBOD	no benefit of doubt
ECF	error carried forward
0 , L1 , L2 , L3	indicate level awarded for a question marked by level of response
^	information omitted
CON	contradiction
R	reject

	indicate uncertainty or ambiguity
	draw attention to particular part of candidate's response

ADDITIONAL OBJECTS: You **must** assess and annotate the additional objects for each script you mark. Where credit is awarded, appropriate annotation must be used. If no credit is to be awarded for the additional object, please use annotation as agreed at the SSU.

Subject-specific Marking Instructions

a. Accept any clear, unambiguous response (including mis-spellings of scientific terms if they are *phonetically* correct, but always check the guidance column for exclusions).

b. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

e.g. for a one-mark question where ticks in the third <u>and</u> fourth boxes are required for the mark:

This would be worth 1 mark.

This would be worth 0 marks.

This would be worth 1 mark.

c. The list principle:
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, e.g. one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.

d. Marking method for tick-box questions:

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.
If there is at least one tick, ignore crosses and other markings. If there are no ticks, accept clear, unambiguous indications, e.g. shading or crosses. Credit should be given according to the instructions given in the guidance column for the question. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

e.g. if a question requires candidates to identify cities in England:

Edinburgh	
Manchester	
Paris	
Southampton	

the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third <u>should be blank</u> (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	×	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	×		✓		✓	✓		✓	
Score:	**2**	**2**	**1**	**1**	**1**	**1**	**0**	**0**	**0**	**NR**

e. For answers marked by levels of response:

i. **Read through the whole answer from start to finish**

ii. **Decide the level** that **best fits** the answer – match the quality of the answer to the closest level descriptor

iii. **To determine the mark within the level**, consider the following:

Descriptor	Award mark
A good match to the level descriptor	The higher mark in the level
Just matches the level descriptor	The lower mark in the level

iv. Use the **L1**, **L2**, **L3** annotations in Scoris to show your decision; do not use ticks.

Quality of Written Communication skills assessed in 6-mark extended writing questions include:

- appropriate use of correct scientific terms
- spelling, punctuation and grammar
- developing a structured, persuasive argument
- selecting and using evidence to support an argument
- considering different sides of a debate in a balanced way
- logical sequencing.

Question			Answer	Marks	Guidance
1	(a)		they do not have a reason to discard it / the result may not be faulty / it may not be an outlier / it is a valid sample / there is no evidence of error (1) there may have been a gust of wind at that time (to carry some of the sulfur dioxide away) / there may have been less wind (to bring the sulfur dioxide) at that time / the wind may have changed direction/speed for a short while (1)	2	**do not allow** "to make it more accurate/more reliable/a fair test" / idea that it is an outlier / "it was not different enough" **allow** any other plausible reason for this value being lower than the others eg rained at that time / power station burned less coal/fuel **do not allow** idea of a mistake / vague answers eg environmental conditions/change in weather
	(b)	(i)	both points (4:52 & 5:43) plotted to within +/- ½ small square (1) both range bars (46-55) & 40-45) correctly plotted to within +/- ½ small square (1)	2	**allow** variation of +/- ½ small square is equivalent to +/- 1 unit
		(ii)	smooth curve within 1 small square of all points	1	**do not allow** curve with multiple lines/excessive wobbles/dot to dot/excessive thickness **allow** sensible extrapolation up to 140 **allow** correct curve for given points if no other points plotted
		(iii)	as the distance from the power station increases concentration of sulfur dioxide decreases / ora (1) decrease gets less with increasing distance / concentration falls rapidly at first then more slowly (1)	2	**allow** idea of a negative correlation but not a correlation unqualified **ignore** reference to the ranges **do not allow** description of graph eg line goes down or gets less steep or levels off
		(iv)	range for each value is small / ranges are small / range bars are small (1) **therefore** confidence is high/you can have confidence (1)	2	**do not allow** idea that all values are within the ranges Ignore reference to outliers **do not allow** second mark without some consideration of the data
	(c)		ticks in boxes 2, 4 and 5	2	Three correct boxes for 2 marks Two correct boxes for 1 mark
			Total	**11**	

Question			Answer	Marks	Guidance
2	(a)	(i)	one additional oxygen molecule on left / 2 in front of the one oxygen molecule on left (1) one carbon dioxide molecule on right (1)	2	**do not allow** if there is a visible gap between the oxygens **allow** slightly overlapping circles Any shape but no gaps between carbon and oxygens and the two oxygens must not touch **allow** circle with C for carbon/O for oxygen **do not allow** oxygen circles same size as hydrogen unless labelled with O
		(ii)	**(Level 3)** Answer describes what happens in incomplete combustion and explains the health problems it causes. Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **(Level 2)** Answer **partially includes both** a description of what happens in incomplete combustion **and** an explanation of the health problems it causes, OR **completely includes only one** of the two. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **(Level 1)** Answer includes some of the relevant points but there is not enough detail to give a complete answer. Quality of written communication impedes communication of the science at this level. **(1–2 marks)** **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. **(0 marks)**	6	**This question is targeted at grades up to A** **Indicative scientific points may include:** explanation of what happens during incomplete combustion: • not enough oxygen for (all) carbon to form carbon dioxide • some carbon forms carbon monoxide • some carbon does not react • carbon particulates are formed • unburned hydrocarbons/named hydrocarbon released health problems it causes • carbon monoxide is poisonous • carbon monoxide combines with haemoglobin • carbon monoxide reduces amount of oxygen blood can carry • carbon particulates/hydrocarbons cause breathing problems/affect those with asthma/cause cancer • carbon particulates help to cause smog. **do not credit** references to nitrogen monoxide etc **Use the L1, L2, L3 annotations in Scoris; do not use ticks**
	(b)		carbon dioxide is removed from the air by: photosynthesis (1) dissolving in water (1)	2	**ignore** reference to people using less petrol/fossil fuels / "increase in use of alternative energy sources" **do not allow** "absorbed by plants" unqualified **do not allow** "by sea" unqualified **allow** "formation of acid rain/absorbed by oceans/sea"
			Total	**10**	

Question			Answer	Marks	Guidance
3	(a)	(i)	**any two from:** (speed of) rotation/movement ; roughness of surface / material on surface ; pressure/weight applied / mass of roller	2	**do not allow** "time tested/size of rubber sample/amount of rubber tested"
		(ii)	tick in box 4	1	
	(b)	(i)	mean of original rubber is outside range of vulcanised rubber/ora (1) ranges for original and vulcanised rubber do not overlap (1)	2	**do not allow** idea that one range is higher than the other / "ranges are different" / "means are different" **do not allow** quoted range numbers unqualified
		(ii)	tick in box 1 (1) tick in box 4 (1)	2	
		(iii)	**any two from:** chain length ; plasticiser ; crystallinity	2	**do not allow** "adding chains/adding covalent bonds" **do not allow** "length" unqualified **allow** "branching"
			Total	**9**	

Question			Answer	Marks	Guidance
4	(a)		pentane	1	**allow** C_5H_{12} **do not allow** -130 or 36
	(b)	(i)	as (molecule) size increases the boiling point increases / owtte	1	**allow** "positive correlation between bp and size/length/ number of carbons/number of atoms etc" **do not allow** "positive correlation" unqualified **do not allow** "more molecules higher bp" **do not allow** "bp increases down table"
		(ii)	butane is a liquid (below 0°C) (1) it has to be a gas (1)	2	**do not allow** "its bp is -0.5 °C/just below 0°C" **do not allow** "will not work" unqualified
			Total	**4**	

Question			Answer	Marks	Guidance
5	(a)		tick in box 3	1	
	(b)		**(Level 3)** Indicates Ann is correct and both of the others incorrect. Answer includes both an explanation **and** a justification of their choices with reference to the table. Answer uses ideas of the forces between molecules. Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **(Level 2)** Indicates Ann is correct **and** either Sue or John is incorrect. Answer includes both an explanation **and** a justification of their choices with reference to the table. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **(Level 1)** Answer indicates Ann is correct or Sue is incorrect or John is incorrect and attempts a relevant explanation/justification. Justification may be based on diagram rather than table. Answer may have three correct choices without any explanation or justification. Quality of written communication impedes communication of the science at this level. **(1–2 marks)** **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit. **(0 marks)**	**6**	**This question is targeted at grades up to A*** **Indicative scientific points may include:** • Ann is correct • Sue and John are incorrect • data quoted from table to show that there is more stretch across than down with the same load **Ann is correct because** • the bag stretches more across than down • molecules slide over each other easier in the same direction as the chain alignment • for polymer to stretch horizontally molecules are pulled away from each other **Sue is incorrect because** • there is not more stretch down the bag than across **John is incorrect because** • stretch is not the same across and down **Ideas about forces** • there are forces of attraction between adjacent parts of molecules/chains • more forces need to be overcome to pull molecules away from each other than to slide molecules over each other • the more force needed the less the polymer stretches for the same load **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
			Total	**7**	

Question			Answer	Marks	Guidance
6	(a)		during making and using shirts energy is taken in/used (1) during disposal/burning (useful) energy/heat is given out (1)	2	credit 2 marks for "positive is energy used and negative is energy released"
	(b)		energy totals are polyester (97+33+340-33 =) 437 (MJ) cotton (60+40+340-7 =) 433 (MJ) (1) water use totals are polyester (17+1260+4900 =) 6207 (dm^3) cotton (22200+3900+4900 =) 31000 (dm^3) (1) cotton is more sustainable because it uses less energy / polyester is more sustainable because it uses less water (1)	3	give mark for both correct values without working or units values must be linked to correct materials **do not credit** polyester 470 MJ cotton 440 MJ mark third marking point independently of the first two **allow** ecf from calculations **ignore** reference to other data
			Total	**5**	

Question			Answer	Marks	Guidance
7	(a)		**(Level 3)** Answer indicates that Mary and Joe are both correct/partially correct but Sally incorrect. Opinions are well supported by evidence for each. Quality of written communication does not impede communication of the science at this level. **(5–6 marks)** **(Level 2)** Answer only includes acceptable opinions for two of Mary, Joe and Sally with good evidence OR includes acceptable opinions for all three with weak evidence. Quality of written communication partly impedes communication of the science at this level. **(3–4 marks)** **(Level 1)** Answer only includes an acceptable opinion for one of Mary, Joe and Sally with some evidence OR two/three acceptable opinions with no evidence. Quality of written communication impedes communication of the science at this level. **(1–2 marks)** **(Level 0)** Insufficient or irrelevant science. Answer not worthy of credit **(0 marks)**	6	**This question is targeted at grades up to C** **Indicative scientific points may include:** Acceptable opinions • Mary correct or partially correct • Joe correct or partially correct • Sally incorrect Mary correct/Joe partially correct because • you can choose a balance of red, yellow and green • helps you make healthier choices • give an idea of how much salt you are eating. Joe correct/Mary partially correct because • traffic light code only gives rough idea of salt content • you do not know which items you will eat on any day • you may still go over sensible salt intake. Sally incorrect because • too much salt is harmful • (salt causes) high blood pressure/heart disease/stroke. **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**

Question			Answer	Marks	Guidance
7	(b)		**any two from** not aware of health implications / not aware that they should limit the amount of salt intake (1); not aware of which foods contain high salt content/how much salt they are taking in/many food items contain 'hidden' salt (1); do not care how much salt they eat / do not believe salt is harmful / think risk is small / only a recommendation / do not have time to monitor (1); think salt improves flavour of food (1) think benefit is worth the risk (1)	2	
	(c)		preservative / keep food fresh (1); flavouring / improve taste (1)	2	**allow** "to kill bacteria"
			Total	**10**	

Question			Answer	Marks	Guidance
8			evaporated (1) tectonic (1) solution (1) electrolysis (1)	4	one mark for each correct word **do not allow** "brine" **allow** "brine solution/salt solution/saltwater" **allow** oxidation
			Total	**4**	

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