OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry A

General Certificate of Secondary Education

Unit **A323/02:** Ideas in Context plus C7 (Higher Tier)

Mark Scheme for June 2012

Oxford Cambridge and RSA Examinations

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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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:

	indicate uncertainty or ambiguity
BOD	benefit of doubt
CON	contradiction
	incorrect response
ECF	error carried forward
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
	draw attention to particular part of candidate's response
NBOD	no benefit of doubt
R	reject
	correct response
	draw attention to particular part of candidate's response
^	information omitted

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 and 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, eg 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, eg 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.

eg 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 should be blank (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	Mark	Guidance
1	(a)		leach/migrate/diffuse **out** of products (1) get into food/air/soil / people eat contaminated food/breathe contaminated air/touch contaminated soil (1)	2	**allow** leak out of products **allow** transfer by direct contact with product/plasticized PVC eg sucking toys/medical equipment
	(b)		*any two from:* relies on opinion rather than data / interview data/observations of mothers is unreliable ; (1) only a small sample / only a small age range ; (1) patterns of play are not reliable indicators of femininity / what is a boy's toy? ; (1) other environmental factors not considered ; (1)	2	**ignore** there is no data/there is not enough evidence **allow** examples of other environmental factors eg in family with sisters/parents choose toys
	(c)		*any two from:* they already have ideas that they do not change easily / they had already formed opinions before looking at the evidence ; (1) they may be involved in phthalate industry / they may be biased / they may think the study is biased ; (1) data can be interpreted in different ways ; (1)	2	**allow** their expertise/experience/training of the two scientists may be in different areas (of science) **ignore** reference to precautionary principle / not enough evidence
	(d)		they are not sure whether phthalates pose a health risk (1) so they have banned them in case they are/until further information is available / better to be safe than sorry (1)	2	there must be an element of uncertainty in the idea of whether phthalates pose a risk for the first mark **do not credit** idea that phthalates cause harm/pose a risk **ignore** reference to ALARA
	(e)		plasticizer molecules get between polymer chains / push chains further apart (1) plasticizers reduce the forces (of attraction)/strength of bonds **between** polymer chains (1) with plasticizers **less energy** is needed to separate/slide the polymer chains (1)	3	**ignore** references to effect of plasticizers eg make polymers more flexible **do not credit** ideas of monomers instead of polymer chain / idea of weakening bonds unqualified
	(f)		plasticizers migrate/diffuse/move nearer to surface of polymer / plasticizers escape from the polymer (1) so there is **less plasticizer** (between the polymer chains) to modify the properties (1)	2	**allow** description of a property change eg there is **less plasticizer** so plastic becomes brittle/less flexible/less durable ignore reference to chains/bonds/links breaking
			Total	**13**	

Question			Answer	Mark	Guidance
2	(a)	(i)	by cooling (1) ethanol and water condense / only ethene remains a gas (after cooling) / ethene has a lower boiling point than ethanol and water/the others / ora (1)	2	**do not allow** ethene can be evaporated from the mixture **do not allow** ethene has a lower boiling point than only one ie ethanol or water (must be ethanol **and** water or the others)
		(ii)	there are no other products/ there are no waste products / there is only one product / all of the (atoms in the) reactants/ethene and steam go into the product (1)	1	**do not credit** vague answers such as 'all atoms stay present' or 'there is no waste' or 'all the ethene and steam are used in the reaction' **allow** there are no by-products
		(iii)	*any one from:* other reactions take place ; (1) not all of the ethene/steam reacts ; (1) some material is lost / some atoms are lost ; (1)	1	**do not credit** idea that atom economy decreases **allow** other products are made (from other reactions) **allow** the reaction does not go to completion/is reversible
	(b)		*any two from:* forward and backward reactions go on at same time ; (1) rate of forward reaction and backward reaction is the same ; (1) the **concentrations** of products and reactants remain constant ; (1)	2	**do not give credit** for 'the reactions go on at same time' without qualification that these are forward and backward **do not credit** 'it is a reversible reaction' / 'reaction goes in both directions' **do not allow** amount for concentration **do not allow** idea that concentrations of reactants and products are the same
	(c)		ethene and steam/water on left and ethanol on right (1) left (reactants) line higher / right (products) line lower (1) arrow or line between labelled 'energy released/lost/given out (1)	3	for ethene and steam & ethanol **allow** reactants & product if water listed as a product first mark is lost for energy released **allow** negative ΔH for third mark arrow/line must stretch from upper to lower line with no gap/additional length, and if only one arrow present it must point down **ignore** activation energy if included in diagram
	(d)		*any two from:* reactants need a minimum amount of energy to react ; (1) more energy at high temperature ; (1) this provides/overcomes the activation energy / at high temperature more molecules have activation energy ; (1) (activation) energy is needed to break bonds ; (1)	2	**allow** 'activation energy is the energy needed for a reaction to start/take place' **do not credit** 'they need energy to start the reaction'

Question			Answer	Mark	Guidance
	(e)		lowers activation energy (1) provides an alternative route (1)	2	**ignore** vague references to breaking bonds / holds reactants close to each other
			Total	**13**	

Question			Answer	Mark	Guidance
3	(a)	(i)	to allow identification of methyl esters/components (1)	1	**allow** to use as a reference material / for comparison with substances on the chromatogram **ignore** references to purity/concentration
		(ii)	as number of (carbon) atoms/size of molecules increases retention time increases (1)	1	**allow** alternative wording eg goes up, higher, longer **allow** decreases … decreases etc **do not credit** 'positive correlation' without qualification
	(b)	(i)	lauric myristic heptadecanoic (2)	2	any order, all three for 2 marks, two for 1 mark **do not allow** retention times instead of names
		(ii)	other compounds/chemicals/products/esters are present (1)	1	**allow** impurities present / it is contaminated
		(iii)	myristic (1)	1	**do not allow** retention time instead of name
	(c)		as mobile phase moves (through stationary phase) it carries components/mixture with it (1) (in dynamic equilibrium) there is an uneven distribution between the phases / different amount of each component is in each phase / some components are attracted more to/more soluble in one phase than the other (1) component more in/more attracted to/more soluble in mobile phase moves faster/further / component more in/more attracted to/more soluble in stationary phase moves slower/less far (1) QWC - correct use of terms mobile phase and stationary phase (1)	4	**allow** use of names for mobile phase and stationary phase eg carrier gas and liquid, but this will not give QWC mark
			Total	**10**	

Question			Answer	Mark	Guidance
4	(a)	(i)	0.1 dm^3/100 cm^3 of stock solution (1) add 0.9 dm^3/900 cm^3 of water / make up to 1 dm^3/1000 cm^3 with water (1)	2	**allow** 1/10 stock solution and 9/10 water for one mark only **allow** correct proportions with incorrect final volume for one mark only eg 25 cm^3 made up to 250 cm^3
		(ii)	*any two from:* it changes colour (from acid to alkaline/neutral) (1) to see when the aspirin/solution has been neutralised / to see the end point / when end point is reached (1) to show when addition of sodium hydroxide solution should stop (1)	2	
	(b)	(i)	23 + 16 + 1 = 40 (2)	2	all three RAMs correct = 1 mark added together to total 40 = 1 mark (second mark cannot be given without first mark) **no mark for 40 without working**
		(ii)	40 g sodium hydroxide reacts with 180 g aspirin / 10 000 cm^3 NaOH soln reacts with 180 g aspirin (1) 27.4 cm^3 reacts with (27.4 x 180)/10 000 (1) = 0.493 g aspirin (1)	3	**allow** other valid methods give all three marks for correct answer without working **allow** 0.4932 / 0.49 **do not allow** 0.5 for the third mark
		(iii)	look at the range / see how close results are to each other (1) if results are close together/have small range **then degree of uncertainty is low** (1)	2	**ignore** reference to outliers **allow** reverse argument **do not credit** 'use range and mean' **do not credit** idea of looking at range of masses of aspirin / make sure results are close the second marking point subsumes the first ie they can get the first mark without the second, but the second marking point will include both the first and second marks **allow** uncertainty is low if the results are within 0.2 = 2 marks
			Total	**11**	

Question			Answer	Mark	Guidance
5	(a)		34 (1)	1	
	(b)		$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ formulae (1) balance (1)	2	for C_2H_5OH allow CH_3CH_2OH or C_2H_6O C_2H_5OH and CO_2 can be in either order **allow** multiples eg $2C_6H_{12}O_6 \rightarrow 4C_2H_5OH + 4CO_2$ **ignore** state symbols formula numbers must be clearly smaller than letters and letters upper case for the formula mark but can still get balance mark if this is only error
	(c)	(i)	RFM $C_6H_{12}O_6$ = 180 **and** RFM C_2H_5OH = 46 (1) 180g glucose makes 92g ethanol (1) 60g glucose makes (60 x 92)/180 = 30.7g (1)	3	no ecf **allow** rfm marks if correct values used in calculation the third marking point subsumes the other two ie they can get all three marks for the third marking point **no mark for 30.7 without working**
		(ii)	reaction is not complete / not all glucose reacts (to make ethanol) (1) other reactions take place / other products are formed (1)	2	**allow** yeast killed/enzymes denatured at high concentration of ethanol = 2 **allow** high concentration of ethanol killed enzyme/denatured yeast = 1 mark only **ignore** idea that some of mass is lost **do not credit** idea of reactants being impure **do not credit** idea that some of glucose is used to make carbon dioxide
			Total	**8**	

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