OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry B

General Certificate of Secondary Education

Unit **B741/01:** Modules C1, C2, C3 (Foundation Tier)

Mark Scheme for January 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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For answers marked by levels of response:

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

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

c. **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

d. 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.

Annotations used in scoris

Annotation	Meaning
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt **not** given
	error carried forward
	information omitted

Annotation	Meaning
	ignore
	reject
	contradiction

Abbreviations, annotations and conventions used in the detailed Mark Scheme.

/ = alternative and acceptable answers for the same marking point
(1) = separates marking points
allow = answers that can be accepted
not = answers which are not worthy of credit
reject = answers which are not worthy of credit
ignore = statements which are irrelevant
( ) = words which are not essential to gain credit
__ = underlined words must be present in answer to score a mark (although not correctly spelt unless otherwise stated)
ecf = error carried forward
AW = alternative wording
ora = or reverse argument

Question			Answer	Marks	Guidance
1	(a)		because a new substance is formed (1) and the process cannot be reversed / AW (1)	2	answers can be in either order **allow** correct references to changes to molecules **ignore** 'because there is a colour change'
	(b)	(i)	carbon dioxide given off (1)	1	**allow** gas given off (1) **allow** CO_2 given off (1)
		(ii)	$2NaHCO_3 \rightarrow Na_2CO_3 + CO_2 + H_2O$ formulae correct (1) balancing (1)	2	balancing mark is conditional on correct formulae **allow** $2NaHCO_3$ + heat $\rightarrow Na_2CO_3 + CO_2 + H_2O$ (1) **allow** = or ⇌ instead of → **not** 'and' or '&' instead of + **allow** correct multiples **allow** one mark for correct balanced equation with minor errors of case and subscript e.g. 2NaHCO3 → $Na_2CO3 + CO_2 + H2O$
			Total	**5**	

Question			Answer	Marks	Guidance
2	(a)		**C** (1)	1	**allow C** ticked, underlined or circled if answer line blank (1)
	(b)		C_4H_{10} (1)	1	**allow** $H_{10}C_4$ (1) **not** C4H10 / C^4H^{10}
	(c)		because they contain carbon and hydrogen (atoms) (1) only (1)	2	**allow** are compounds containing carbon and hydrogen (1) only (1) second mark is dependent on the first **allow** contains carbon and hydrogen molecules **only** (1) **but** contains carbon and hydrogen molecules (0) **allow** contains C and H **only** (1) **allow** contains a mixture of carbon and hydrogen **only** (1) **but** contains a mixture of carbon and hydrogen (0)
			Total	**4**	

Question			Answer	Marks	Guidance
3			**[Level 3]** **Applies a knowledge of polymerisation to name poly(propene) <u>and</u> names one or both conditions <u>and</u> gives a complete description of polymerisation.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Applies knowledge of polymers to name poly(propene) <u>and</u> either names a condition <u>or</u> gives a limited description of polymerisation.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Applies knowledge of polymers to name poly(propene) <u>or</u> name a condition <u>or</u> gives a rudimentary description of polymerisation.** 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:** **Name of polymer** • the polymer made is poly(propene) or polypropene or polypropylene **Conditions** • a catalyst is needed • a high pressure is needed **ignore** references to temperature **Description of polymerisation** • many (small) molecules join together • to make a large molecule or polymer • small molecules or propene (molecules) are called the monomer • monomers are alkenes **allow** higher level answers e.g. • double bond in monomer breaks and molecules join together • unsaturated monomer molecules join to give saturated polymer (could be shown by an equation) • the displayed formula of poly(propene)
			Total	**6**	

Question			Answer	Marks	Guidance
4	(a)		petrol (1)	1	**allow** $C_5 – C_{10}$ (1)
	(b)		**any two from** oil slicks (1) idea of damage to wildlife (1) damage to beaches (1)	2	 **allow** oil leaks/oil spills (1) **allow** named wildlife eg kills sea birds / fish (1) **allow** destroys habitats (1) **allow** harms tourist trade (1) **allow** damage to the local economy or fishing industry (1) **ignore** risk of explosion
	(c)	(i)	percentage made is less than the percentage needed ora (1)	1	**allow** only 5% is produced when 22% is needed (1)
		(ii)	idea that cracking converts large (hydrocarbon) molecules into smaller (more useful) ones or petrol (1) **and** **any one condition from** catalyst / high temperature (1)	2	**allow** correct references to just hydrocarbons or (hydrocarbon) chains **allow** hydrocarbon molecules are split or hydrocarbon molecules are broken down **allow** breaks named large fractions into named smaller fractions eg breaks bitumen down into petrol (1) **ignore** references to pressure **allow** heat it (1)
			Total	**6**	

Question			Answer	Marks	Guidance
5	(a)		perfume **C** (1) **any one factor from** the perfume does not dissolve in water/ perfume does not irritate the skin/ perfume evaporates easily (1) **and linked explanation of property i.e.** so perfume will not be washed off or removed by sweat / so it will not cause harm/ so she will be able to smell it easier (1)	3	**allow** does not react with water (1)
	(b)		nail varnish is insoluble / does not dissolve in water (1)	1	**need to be sure that answer refers to nail varnish** **allow** nail varnish does not form a solution in water (1) **allow** water is not a solvent for nail varnish (1)
			Total	**4**	

Question			Answer	Marks	Guidance
6	(a)		copper or lead (1)	1	**allow** Cu or Pb (1)
	(b)		lead (1)	1	**allow** Pb (1)
	(c)		granite (1) because it is the hardest (1)	2	**allow** granite because its hardness is 7 (1)
	(d)		steel (1) because it is the strongest (1)	2	**allow** steel (1) because it is (very) strong (1) **allow** steel (1) because its relative strength is 400 (1)
			Total	**6**	

Question			Answer	Marks	Guidance
7	(a)		nitrogen + hydrogen → ammonia (1)	1	**allow** N_2 + (3)H_2 → (2)NH_3 (1) balancing not required **allow** = or ⇌ instead of → **not** 'and' or '&' instead of '+' **not** '+ heat' or + catalyst' on LHS of equation
	(b)		⇌ (1)	1	**allow** ⇋ or ⇄ or ⇆ (1)
	(c)		30(%) (1)	1	**allow** any value between 29 and 30 (1)
	(d)	(i)	pressure = 600 (atmospheres) **and** temperature = 350(^{o}C) (1)	1	**both** required
		(ii)	idea that there is a need for high pressure or high temperature (1) idea of higher energy costs or equipment costs (1)	2	**allow** idea that reaction is too slow (1) so have to pay labour costs or energy costs for a longer time (1)
	(e)		3 / three (1)	1	
			Total	**7**	

Question			Answer	Marks	Guidance
8	(a)		nitrogen and phosphorus (1)	1	both required **allow** N and P (1) **allow** nitrogen and phosphate (1)
	(b)	(i)	(fertilisers absorbed) through roots (1)	1	**allow** osmosis (1)
		(ii)	increased plant growth / faster plant growth / increase crop yield / idea that fertilisers increase the food supply / idea that fertilisers provide essential elements (1) idea of death of water organisms / eutrophication (1)	2	**allow** to feed more people (1) **allow** increase profit (1) **ignore** better plant growth / helps plants grow / makes plants healthier **not** 'poisons' fish or other water organisms **allows** kills (named) wildlife (1)
			Total	**4**	

Question			Answer	Marks	Guidance
9	(a)		**[Level 3]** **All main parts of the structure of the Earth are correctly identified. Examples of what can happen at plate boundaries are described.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **At least two parts of the structure of the Earth are correctly identified <u>and</u> one example of what happens at a plate boundary is described.** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **One part of the structure of the Earth is correctly identified <u>or</u> one example of what happens at plate boundaries is mentioned.** 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 E.** **Marks can be awarded from a labelled diagram** **Indicative scientific points may include:** **Structure of the Earth** • Earth consists of (iron) core. • Earth consists of mantle • Earth consists of (thin rocky) crust • mantle is molten can flow/move slightly **allow** correct reference to lithosphere **When tectonic plates meet** • earthquakes can occur • tsunamis can occur • volcanoes can occur **allow** high level answers such as mountain building or subduction

Question			Answer	Marks	Guidance
	(b)		**any two from:** because idea that crust is too thick (to drill through) / AW (1) references to increased temperature (as mantle or core or centre of Earth is approached) / AW (1) scientists need to use seismic waves / shock waves produced by earthquakes or man made explosions (1)	2	**allow** idea that no-one has dug all the way to the mantle (1) e.g. can't get deep enough **allow** it is too hot (inside the Earth) (1)
			Total	**8**	

Question			Answer	Marks	Guidance
10	(a)		batch when products made when required and continuous all the time (1)	1	**allow** batch made in small amounts but continuous in large amounts (1) **allow** batch is made when required and continuous 24-7 (1) **allow** in a batch process the reactants can be changed but in a continuous process the reactants can not be changed (1)
	(b)		**any three from** labour / salaries / wages / cost of workers (1) energy / electricity / gas / power (1) raw materials / starting materials (1) marketing (1) time taken to complete the process (1) rent / rates / water rates (1) health and safety / pollution controls (1) equipment costs (1)	3	**ignore** transport / packaging **allow** ingredients (1) **allow** advertising (1) **allow** legal costs (1) **ignore** manufacturing costs
	(c)		**any two from** tests on animals may give different results than with humans (1) tests on humans risk harming humans (1) tests on humans have more benefits than risks (1) there are alternative testing regimes than to use animals (1) not testing animals avoids protests from the public (1) not enough human volunteers / more than enough animals available (1) rights of humans more important than rights of animals (1) people volunteer but animals do not (1) idea of cruelty / unnecessary suffering to animals (1)	2	**allow** testing on humans is useful to see if the drug has any side effects (1) **allow** testing on defenceless animals is not fair (1) **allow** references to (abuse) of animal rights (1)
			Total	**6**	

Question			Answer	Marks	Guidance
11	(a)		nonane (1) largest temperature change / greatest temperature rise – dependent on correct choice of hydrocarbon (1)	2	**second mark is dependent on first mark** **allow** nonane (1) because the temperature rise is 27 (1) but only if all of the temperature changes are calculated **not** highest temperature obtained **allow** nonane (1) because it is the largest molecule (1)
	(b)		29 (1)	1	
			Total	**3**	

Question			Answer	Marks	Guidance
12	(a)		98 (1)	1	
	(b)		$\frac{34}{267}$ x 100 (1)	1	**allow** $\frac{34}{(233+34)}$ x100 **/** $\frac{34}{(98+169)}$ x 100 (1) the mark is for the working out and not the answer
	(c)		atom economy is very low (1) lots of waste is made (1)	2	 **allow** lots of atoms are wasted (1) or **allow** 87.3% is wasted (1)
			Total	**4**	

Question			Answer	Marks	Guidance
13	(a)		**one** correct property (1) **but** **two** correct properties (2)	2	If three answers then if 2 correct award 1 mark if only 1 is correct award 0 marks. If four or five answers given award 0 marks graphite has a low melting point [ ] graphite conducts electricity when solid [✓] graphite is colourless [ ] graphite is insoluble in water [✓] graphite is extremely hard [ ]
	(b)		diamond (1)	1	
			Total	**3**	

Question			Answer	Marks	Guidance
14	(a)		magnesium + (dilute) hydrochloric acid → magnesium chloride + hydrogen (1)	1	**allow** unbalanced symbol equation or mix of words and correct formulae (1) e.g. Mg + HCl → $MgCl_2$ + H_2 scores one mark
	(b)	(i)	for temperature – from experiment **A** to **B** the reaction time gets shorter or increases rate of reaction (1) for concentration – from experiment **A** to **C** the reaction time gets shorter or increases rate of reaction (1)	2	**allow** one mark for appreciation that they need to use results from experiments **A** and **B** for temperature **and A** and **C** for concentration, if no other mark awarded **allow** one mark for the idea that a higher temperature results in a shorter reaction time or faster rate **and** a higher concentration results in a shorter reaction time or faster rate, if no other mark awarded

Question			Answer	Marks	Guidance
	(b)	(ii)	**[Level 3]** **Applies knowledge and understanding of collision theory to explain <u>both</u> factors in detail although the reference to more collisions may only be made for one of the factors.** Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** **Applies knowledge and understanding of collision theory to explain one of the factors in detail <u>or</u> partially explain both factors** Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** **Appreciation that the rate of any reaction depends on the number of collisions in whatever context it is used** 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** At all levels **ignore** reference to faster collisions and to more particles and **ignore** particles vibrate more **allow** answers that give ora but it must be very clear that this is what they have done **Indicative scientific points at levels 2 and 3 may include:** <u>rate increases with **temperature** because</u> • acid particles move faster / acid particles have more energy • more collisions between particles of acid and magnesium – this does not have to be qualified eg more (successful) collisions or more collisions (per second) **allow** – higher level answers for temperature that refer to more acid particles having sufficient energy to react or more acid particles having energy above that of the activation energy <u>rate increases with **powder** because</u> • magnesium has greater surface area / powder has more magnesium particles exposed • more collisions between particles of acid and magnesium – this does not have to be qualified eg more (successful) collisions or more collisions (per second) **Indicative scientific points at level 1 may include:** • more collisions gives a faster reaction even if referring to concentration or pressure • link between number of collisions and rate of reaction
			Total	**9**	

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