

GCSE

Chemistry B

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

General Certificate of Secondary Education

Mark Scheme for June 2014

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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 scoris

Annotation	Meaning
	Blank Page – this annotation must be used on all blank pages within an answer booklet (structured or unstructured) and on each page of an additional object where there is no candidate response.
	correct response
	incorrect response
	benefit of the doubt
	benefit of the doubt not given
	error carried forward
	information omitted
	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	<p>any two from:</p> <p>to see if the perfume is toxic / poisonous (1)</p> <p>to see if the perfume irritates the skin (1)</p> <p>so the perfume can be approved by government (1)</p>	2	<p>to check for side effects is not sufficient</p> <p>allow whether the person is allergic (to perfume) allow harmful to the skin / gives a reaction with the skin allow to see if it is corrosive / too acidic</p> <p>allow is it harmful, is it dangerous or is it safe if no other mark has been awarded</p> <p>ignore references to the perfume having a pleasant smell</p> <p>ignore references to whether they wash away or dissolve in water</p>
b i	<p>J because</p> <p>it is insoluble in water / will not wash off (1)</p> <p>it has a low boiling point / it will evaporate easily / it is volatile (1)</p>	2	<p>no mark for the choice of perfume on its own.</p> <p>allow I because it is insoluble in water / will not wash off</p> <p>allow K because it has a low boiling point / it will evaporate easily / it is volatile</p> <p>ignore references to other properties</p>

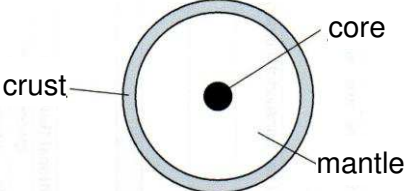
Question	Answer	Marks	Guidance
1 b ii	<p>any one from:</p> <p>does it have a nice smell / what is its smell / the smell / how long the smell lasts (1)</p> <p>does it react with water (1)</p> <p>does it irritate the skin (1)</p> <p>is the perfume toxic / poisonous / harmful / health and safety (1)</p>	1	<p>ignore is it volatile / does it evaporate easily / boiling point / does it dissolve in water</p> <p>allow does it react with other cosmetics</p> <p>allow what is the melting point</p> <p>allow are the raw materials available to make it</p> <p>allow consider the ethical nature of the process</p> <p>allow the constituents</p> <p>allow the energy needed in manufacture</p> <p>allow how long it takes to make</p> <p>allow the pH of the perfume</p> <p>allow is it flammable</p>
Total		5	

Question	Answer	Marks	Guidance
2 a	used up faster than they are made (1)	1	<p>allow takes a long time to be made / takes millions of years to make allow it is a finite resource / will eventually run out</p> <p>cannot be produced again is not sufficient not cannot be reused / can be reused</p>
b	sulfur + oxygen → sulfur dioxide (1)	1	<p>allow $S + O_2 \rightarrow SO_2$ allow mix of formulae and names allow = in the equation not & or and instead of + not sulfur oxide but allow sulfur(IV) oxide</p>
c	<p>any two from:</p> <p>corrodes metals / rusts iron / rusts (ferrous) metals (1)</p> <p>reacts with marble or limestone (statues) (1)</p> <p>damages statues / damages buildings / erodes stonework / AW (1)</p> <p>kills plants / damages trees / can damage crops (1)</p> <p>kills (aquatic) animals / destroys animal habitats (1)</p> <p>increases amount of heavy metal ions in water / increases concentration of aluminium in water (1)</p>	2	<p>not rusts aluminium or other non-ferrous metals</p> <p>allow erodes or dissolves rocks such as limestone and chalk allow dissolves buildings allow corrodes buildings</p> <p>allow deforestation allow harms plants</p> <p>allow harms animals pollutes the environment or habitats is not sufficient</p> <p>allow causes or triggers asthma</p> <p>not damages the ozone layer</p> <p>not greenhouse gas / global warming</p>


Question	Answer	Marks	Guidance
2 d	$2\text{NO}_2 + \text{H}_2\text{O} \rightarrow \text{HNO}_2 + \text{HNO}_3$	1	allow in the question if answer line is blank ignore errors in case, subscript and superscript
e	lime water / calcium hydroxide (solution) / $\text{Ca}(\text{OH})_2$ (1) goes milky / cloudy / white / white precipitate / white solid (1) This mark is dependent on the correct test chemical	2	allow white suspension not white solution
Total		7	

Question	Answer	Marks	Guidance
3 a	D and E (1)	1	both needed
b	A and F (1)	1	both needed
c	B contains carbon and hydrogen (1) only / AW (1) C contains oxygen / has oxygen in the formula / does not contain only carbon and hydrogen (1)	3	allow (formula) has only (1) H and C (1) the only is not an independent mark and must be linked to the carbon and hydrogen not contains carbon and hydrogen molecules / contains a mixture of carbon and hydrogen not hydro atoms but ignore for the third marking point allow C has three elements / C has three different atoms (1) not C contains oxygen molecules
	Total	5	

Question	Answer	Marks	Guidance
<p>4 a</p> 	<p>Level 3 Answer applies knowledge and understanding of the properties of a plastic and its use. Explanation as to why the plastic used to make the sandwich box needs to be non-biodegradable and insoluble in water. One other property needed by the plastic explained. Quality of communication does not impede communication of science at this level. (5-6 marks)</p> <p>Level 2 Answer applies knowledge and understanding of the properties of a plastic and its use. Two properties of the plastic needed are explained. OR One property of the plastic needed is explained and one extra property is given. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>Level 1 Answer applies knowledge and understanding of the properties of a plastic and its use. One property of the plastic needed is explained. OR One extra property is given. Quality of communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>Level 0 Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <p>Explanations</p> <ul style="list-style-type: none"> • Non-biodegradable so the plastic does not rot, decay, decompose or breakdown • Insoluble in water so it will not dissolve / so moist foods can be stored / idea that water cannot enter <p>Extra properties</p> <ul style="list-style-type: none"> • Non-toxic material (so it will not contaminate the food or make the food dangerous to eat) • Non-reactive (so will not react with chemicals in the food) • Ability to shape the plastic • Plastic must be air-tight to prevent entry by bacteria • Transparent / colourless / clear • Waterproof • Does not react with water • Cannot be crushed easily • Low density <p>ignore references to can be coloured / is strong / is hard / tough / durable / melting point / boiling point / recycling</p> <p>ignore disadvantages</p> <p>Use the L1, L2, L3 annotations in Scoris, do not use ticks</p>
b	<p>any two from:</p> <p>land-fill site (1) idea of recycling (1) incinerated / combusted / burned (1) cracked / broken down to form monomers (1)</p>	2	<p>ignore heated to make fossil fuels</p>
Total		8	

Question	Answer	Marks	Guidance
5 a	 <p>all three labels correct (2)</p> <p>but</p> <p>one or two labels correct (1)</p>	2	allow inner or outer core for core
b	<p>rock B</p> <p>because</p> <p>(rock B) contains large crystals (1)</p>	1	<p>candidates must identify rock B and give explanation for the mark</p> <p>allow larger grains / bigger pieces / bigger blocks</p> <p>ignore rock is bigger / larger structure</p>
c	3 / three (1)	1	ignore Cu, Fe, S
	Total	4	

Question	Answer	Marks	Guidance
6 a	nitrogen (1)	1	<p>allow N</p> <p>ignore nitrate</p>
b	sulfuric (acid) (1)	1	<p>allow H₂SO₄</p>
c	<p>any one benefit from: idea of increasing food supply / bigger crop yield / produce bigger plants / plants grow faster (1)</p> <p>and</p> <p>any one problem from: harms or death of aquatic organisms / eutrophication / pollution of water supplies / produces an algal bloom (in rivers) (1)</p>	2	<p>allow replace essential elements / replace nitrogen / replace potassium / replace phosphorus / replace nutrients / replace minerals</p> <p>allow fertilisers contain nutrients / contain vital minerals</p> <p>allow to make more money</p> <p>ignore to make plants grow / to help plants grow / to produce better crops</p> <p>ignore makes plants healthier</p> <p>not kills weeds / kills pests</p> <p>allow contamination of water supplies effect organisms in river is not sufficient washed into rivers is not sufficient</p>


Question	Answer	Marks	Guidance
6 d 	<p>[Level 3] Answer describes costs of making nitric acid AND includes the word equation for the reaction. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Answer describes costs of making nitric acid OR includes the word equation for the reaction and a cost of making nitric acid. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Answer describes a cost of making nitric acid OR includes the word equation for the reaction. Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to E</p> <p>Indicative scientific points may include:</p> <p>Word equation ammonia + oxygen → nitric acid + water allow correct formulae but equation does not need to balance e.g. $\text{NH}_3 + \text{O}_2 \rightarrow \text{HNO}_3 + \text{H}_2\text{O}$ allow mix of correct formulae and words</p> <p>Costs</p> <ul style="list-style-type: none"> • energy / gas / electricity / heating / lighting / temperature / pressure • raw materials / starting materials / ammonia / oxygen / catalyst • labour / wages / salaries / staff / workers • equipment / plant / maintenance • marketing • taxes / rates / rent • safety / H&S • pollution control <p>ignore R&D, distribution, transport, packaging, advertising , storage</p> <p>Use the L1, L2, L3 annotations in Scoris; do not use ticks.</p>
Total		10	

Question	Answer	Marks	Guidance
7 a i	transparent (1)	1	<p>allow insoluble (in water) / waterproof / does not react with water (1)</p> <p>allow clear / see through / colourless (1)</p> <p>allow does not biodegrade / does not decompose / does not decay (1)</p> <p>allow does not photodegrade (1)</p> <p>ignore shatterproof / strong</p>
a ii	(aluminium car body) will corrode less / does not corrode (1)	1	<p>assume unqualified answer refers to aluminium</p> <p>allow (aluminium car body) will have a longer lifetime (1)</p> <p>allow aluminium does not rust (1) but not aluminium does not rust as easily (0)</p> <p>allow aluminium does not oxidise (in air) (1)</p> <p>ignore aluminium is less corrosive</p> <p>allow car will have better fuel economy (1)</p> <p>allow ora for steel</p> <p>ignore aluminium is easier to mould / is more flexible</p> <p>not stronger</p>
b	(PVC) has high flexibility / is flexible / aw (1) (PVC) has low (electrical) conductivity / is a poor (electrical) conductor / does not conduct (electricity) / aw (1)	2	<p>ignore references to density</p> <p>allow is an (electrical) insulator (1)</p>
Total		4	

Question	Answer	Marks	Guidance
8 a	$2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$ correct reactants and products (1) correct balancing (1)	2	<p>allow any correct multiple, including fractions allow = instead of \rightarrow not and / & instead of '+'</p> <p>balancing mark is dependent on the correct formulae but allow 1 mark for a balanced equation with a minor error in subscripts / formulae e.g. $2\text{NA} + \text{Cl}_2 \rightarrow 2\text{NACL}$</p>
b i	to sterilise (water) / to make solvents / (to make household) bleach / to make plastics (1)	1	<p>allow swimming pools</p> <p>cleans water or cleaning pools is not sufficient</p>
ii	(moist) litmus paper (1) bleaches (1) This mark is dependent on the correct reagent	2	<p>allow (damp) litmus paper allow (moist Universal) indicator paper / (damp Universal) indicator paper</p> <p>allow removes colour / turns white</p>

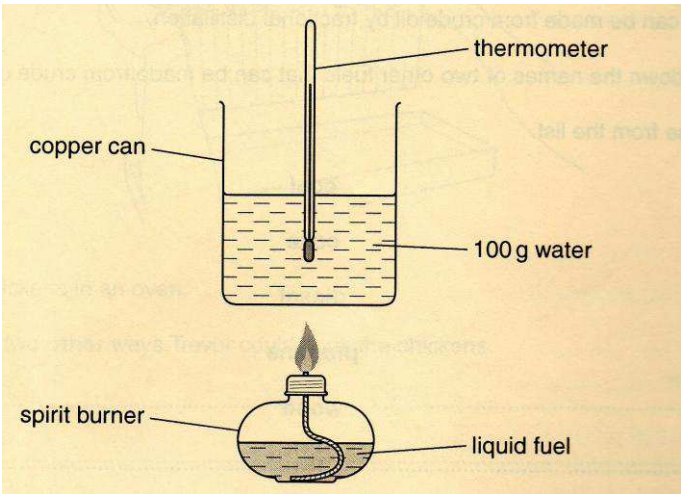
Question	Answer	Marks	Guidance
8 c	Yes (no mark) because no metal has four 1's (1) idea that if a metal corrodes fast it is not suitable to store the chemical / to be used the container should corrode very slowly (1)	2	No mark for yes if answer is no 0 marks for question allow each metal has at least one 3 (1) allow can only use a metal if it is 1 allow each metal will corrode fast with at least one chemical / there is no metal that corrodes slowly with every chemical (2)
	Total	7	

Question	Answer	Marks	Guidance
9 a	diamond (1)	1	
b	any two from: high melting point (1) high boiling point (1) grey / black (1) conducts electricity (1) insoluble in water (1) lustrous / shiny (1) opaque (1)	2	ignore dark not dull not flexible ignore strong / hard
c	idea that can cage medicine, drug or chemical inside the fullerene (1)	1	ignore spherical in shape
	Total	4	

Question	Answer	Marks	Guidance
10 a 	<p>[Level 3] Explanation that the results do not support the prediction with reference to experimental data AND an explanation using reacting particle model that reaction in experiment 4 is faster or the reaction time is shorter than experiment 3. Quality of communication does not impede communication of science at this level. (5-6 marks)</p> <p>[Level 2] Explanation that the results do not support the prediction with reference to experimental data AND an explanation that the reaction in experiment 4 is faster or the reaction time is shorter than experiment 3 because acid is more concentrated OR an explanation using reacting particle model that reaction in experiment 4 is faster or the reaction time is shorter than experiment 3. Quality of written communication partly impedes communication of the science at this level. (3-4 marks)</p> <p>[Level 1] Explanation that the results do not support the prediction with reference to experimental data OR An explanation that the reaction in experiment 4 is faster or reaction time is shorter than experiment 3 because the acid is more concentrated. Quality of communication impedes communication of the science at this level (1-2 marks)</p> <p>[Level O] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points for evaluation could include:</p> <ul style="list-style-type: none"> • identification that experiments 1 and 3 must be compared • results show as volume increases reaction time does not change <p>Indicative scientific points for experiments 3 and 4 could include:</p> <ul style="list-style-type: none"> • concentration is higher in experiment 4 • acid particles are more crowded in experiment 4 / acid particles are closer together / more acid particles per unit volume / more acid particles per cm³ / more acid particles in the same space • more (successful) collisions (per second) <p>Use the L1, L2, L3 annotations in Scoris, do not use ticks</p>

Question	Answer	Marks	Guidance
b	any time less than 30 seconds (1) the reaction will be faster (1)	2	allow higher level answers such as particles have more energy / particles move faster / there are more collisions between particles
	Total	8	

Question	Answer	Marks	Guidance
11 a i	no undesired products made / all the atoms that react end up in the product / only one product made (1)	1	ignore no waste is produced but allow no waste products allow no atoms have been wasted ignore all the atoms are used up
ii	14 (1)	1	unit not needed
b	6 (1)	1	unit not needed
c	a continuous process makes large amounts / a continuous process works 24/7 (1) in a batch process chemicals are made for a set time and then process is stopped and repeated at a later date / a batch process makes small amounts / made on demand (1)	2	two marks can only be awarded if a reference is made to both batch and continuous processes allow batch takes place when the product is required
d	46 % (2) but 46.2 / 46.15 / 46.154 (1)	2	answer must have two sig figs for two marks allow one mark for $\frac{2.4}{5.2} \times 100$
	Total	7	

Question	Answer	Marks	Guidance
12 a	exothermic (1)	1	allow any other indication of the correct answer e.g. tick, or circle providing answer line is blank
b i	suitable container of water (1) but container of water above spirit burner (2) thermometer in water (1)	3	allow any suitable container e.g. beaker / can / metal can 
ii	points plotted correctly to within a half a square (1) mass of paraffin is 2.5 g (1)	2	ignore any line drawn unit not needed allow any value between 2.4 to 2.6 allow 2 marks for correct answer allow ecf from any incorrect line drawn
Total		6	

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