

Chemistry B

General Certificate of Secondary Education

Unit **B642/01**: Modules C4, C5, C6 (Foundation Tier)

Mark Scheme for January 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

Annotation	Meaning
	correct response
	incorrect response
	benefit of doubt
	benefit of doubt not given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

Subject-specific Marking Instructions

Abbreviations, annotations and conventions used in the detailed mark scheme

/	=	alternative and acceptable conventions used in the detailed mark scheme
(1)	=	separates marking points
allow	=	answers that cannot 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 earn 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)	(i)	optical brightener (1)	1	allow other ways of indicating correct response e.g. ringing or ticking the correct answer
		(ii)	remove stains / remove colour (1)	1	ignore kills bacteria ignore removes dirt
	(b)		optimal temperature is 35 °C / best temperature is 35 °C (1) more washing powder the faster the cleaning / washing power increases with amount of powder (1)	2	allow as temperature increases washing ability goes up and then goes down / ora / aw allow around 35 °C it takes less time for the stain to be removed
	(c)		saves energy / can wash delicate clothes / colour does not become paler (1)	1	allow reduces the carbon footprint / less greenhouse gases / less global warming / aw allow clothes will not lose colour / clothes will not shrink / clothes will not be damaged allow enzymes are not denatured ignore reference to cost ignore reference to environmentally friendly allow less carbon dioxide made (during energy production)
			Total	5	

Question		Answer	Marks	Guidance
2	(a)	2 (1)	1	
	(b)	through the roots (1)	1	allow dissolved in water / by osmosis ignore leaves
	(c) (i)	ammonium sulfate (1)	1	allow other ways of indicating correct response e.g. ringing or ticking the correct answer but answer line takes precedence
	(ii)	acidic (1)	1	allow contains hydrogen ions / weakly acidic ignore weak or strong
	(d)	80 (1)	1	
		Total	5	

Question		Answer	Marks	Guidance
3	(a)	carbon dioxide + hydrogen \rightarrow methanol (1)	1	<p>allow $\text{CO}_2 + \text{H}_2 \rightarrow \text{CH}_3\text{OH}$ allow mix of formulae and names allow equilibrium sign / = instead of the arrow</p> <p>not and / & instead of +</p> <p>ignore state symbols</p>
	(b)	<p>any two from:</p> <p>energy / heating / lighting / electricity / power / maintaining temperature / maintaining pressure / AW (1); raw materials / starting materials / hydrogen / carbon dioxide (1); catalyst (1) workers / labour / salary / wages (1); plant costs / equipment / maintenance / health and safety (1); research / development (1); pollution controls (1); rates / taxes / rent (1)</p>	2	<p>ignore transport / packaging / advertising / storage / insurance ignore cost of selling</p> <p>allow ingredients</p> <p>allow cost of the factory itself</p> <p>allow a correct cost (1) plus explanation (1)</p>
	(c)	<p>any one from:</p> <p>higher temperature (1)</p> <p>higher pressure (1)</p> <p>uses more energy / needs more power / needs more heat (1)</p>	2	<p>allow uses more temperature /</p> <p>allow uses more pressure / needs stronger containers for the reaction vessel</p> <p>ignore method 1 uses only 1 substance as a catalyst but method 2 uses a mixture of 2 substances</p>
Total			4	

Question		Answer	Marks	Guidance
4	(a)	black solid (1)	1	if two or more answers given then do not award a mark
	(b)	any two from: semiconductors (1) reinforce graphite / tennis rackets / fishing rods (1) microchips (1) supply drugs / deliver medicines (1) allows chemical reactions to take place inside the cage (1)	2	ignore reference to catalysts ignore used in electrical wiring / to conduct electricity
Total			3	

Question		Answer	Marks	Guidance
5	(a)	nitrate ions (1)	1	
	(b)	chlorination (1)	1	allow other ways of indicating answers e.g. tick or circle but answer line takes precedence
	(c)	cheap / readily available / idea that it is used as a raw material for contact process / raw material for making ethanol / hydro-electric power / coolant / AW (1)	1	allow used on a large scale allow solvent
Total			3	

Question		Answer	Marks	Guidance
6	(a)	$C_2H_2O_4$ (1)	1	allow any order of atomic symbols not C2H2O4 / C ² H ² O ⁴
	(b)	H^+ (1)	1	allow other ways of indicating correct response e.g. ringing or ticking the correct answer but answer line takes precedence
	(c) (i)	carbon dioxide (1)	1	allow CO ₂
	(ii)	will react with metal / will react with the element / corrodes the kettle (1)	1	allow strong(er) acid / it is strong(er) / it has too low a pH the kettle, metal or element is damaged is not sufficient ignore it is toxic / erode
Total			4	

Question		Answer	Marks	Guidance
7	(a)	NaO (1)	1	allow other ways of indicating correct response e.g. ringing or ticking the correct answer but answer line takes precedence
	(b)	Na ₂ O ₂ – solid H ₂ O – liquid NaOH – aqueous all three correct (2) BUT one or two correct (1)	2	
	(c)	evidence that 3.90 is one half of 7.8 (1) 0.8 (g) (1)	2	allow full marks for correct answer on the answer line whether or not there is any working out allow (moles of) Na ₂ O ₂ = 0.05
Total			5	

Question		Answer	Marks	Guidance
8	(a)	10.0 cm ³ pipette (1)	1	allow tick or circled 10.0 cm ³ pipette but answer line takes precedence
	(b)	acid – colourless and alkali – pink (1)	1	both answers needed for 1 mark
	(c)	litmus / methyl orange / universal indicator / screened methyl orange (1)	1	allow pH paper / any other acid-base indicator
	(d) (i)	24.5 (1)	1	unit not needed
	(ii)	24.0 / 24	1	unit not needed
Total			5	

Question		Answer	Marks	Guidance
9		idea that mass of LHS – mass of K ₂ CO ₃ is the mass of oxygen / 186–138 (1) 48 (g) (1)	2	award full marks for correct answer with no working out or incorrect working out mark the answer line first of all
Total			2	

Question		Answer	Marks	Guidance
10	(a)	reversible reaction / aw (1)	1	allow equilibrium
	(b) (i)	50 atmospheres and 180 °C (1)	1	allow other ways of indicating the answer in the table e.g. ringing, ticks or underlining but answer on the answer line takes precedence
	(ii)	decreases (1)	1	
	(iii)	increases (1)	1	
		Total	4	

Question		Answer	Marks	Guidance
11	(a)	fats are solids and oils are liquids (1)	1	allow one is a solid one is a liquid
	(b)	(i)	(A) has a (carbon-carbon) double bond (1)	1
		(ii)	bromine (water) (1) goes red-brown to colourless / yellow to colourless / decolourised (1)	2 allow 2 marks for bromine water is decolourised this mark is dependent on correct reagent or near miss e.g. bromide allow any shade of brown / orange allow goes colourless ignore goes clear not goes discoloured
	(c)	emulsion (1)	1	allow other ways of indicating correct response e.g. ringing or ticking the correct answer but the answer on the answer line takes precedence.
		Total	5	

Question		Answer	Marks	Guidance
12	(a)	gas A is hydrogen (1) (litmus paper) is bleached / loses colour / turns white (1)	2	allow H or H ₂ for hydrogen allow goes paler
	(b)	make household bleach / make soap (1)	1	
		Total	3	

Question		Answer	Marks	Guidance
13	(a)	electrical (1)	1	allow correct answer ticked, circled or underlined in list if answer line is blank but answer line takes precedence
	(b)	$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$ correct reagents and products (1) correct balancing dependent on correct formulae (1)	2	allow any correct multiple including fractions allow = instead of \rightarrow not and instead of + / + heat allow correct balanced equation with minor errors of subscripts, superscripts and case for one mark e.g. $2\text{H}_2\text{O} + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
	(c)	any one from: fossil fuel running out / diesel or petrol is non-renewable / hydrogen and oxygen are renewable (1) less or no greenhouse gases / water is only waste product (1) fuel cell more efficient / fuel cell has direct energy transfer / or a for fossil fuel (1)	1	ignore more economic (cost in stem) allow fuel cell is a renewable energy source ignore so we stop burning fossil fuels / reduces amount of fossil fuel burnt allow less polluting / less carbon dioxide made ignore environmentally friendly / less damaging to environment / greener allow reduces carbon footprint / reduces carbon emissions allow waste less energy
		Total	4	

Question		Answer	Marks	Guidance
14	(a)	tap water (1)	1	
	(b)	water becomes softer / temporary hardness removed (1) permanent hardness remains (1)	2	allow decreases / gets less
	(c)	calcium (1) magnesium (1)	2	allow correct answers ticked, circled or underlined in list if answer line is blank but answer line takes precedence
		Total	5	

Question		Answer	Marks	Guidance
15	(a)	carbon, hydrogen and oxygen (1)	1	ignore use of symbols
	(b)	any two from: methanol has fewer atoms (1) methanol has fewer hydrogen atoms (1) methanol has fewer carbon atoms (1) methanol has fewer carbon hydrogen bonds (1) methanol has no carbon-carbon bonds (1) methanol has a smaller relative formula mass (1)	2	allow ora by referring to ethanol if actual numbers of atoms or bonds are used then this must be correct allow methanol is a smaller molecule
		Total	3	

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