

Chemistry B

General Certificate of Secondary Education

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

Mark Scheme for January 2012

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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 the doubt
	benefit of the doubt not given
	error carried forward
	information omitted
	ignore
	reject
	contradiction

Subject-specific Marking Instructions

- / = 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)	sulfuric acid / H_2SO_4 (1)	1	allow incorrect use of superscripts, subscripts or case
	(b)	ammonium nitrate / NH_4NO_3 (1)	1	allow ammonia / NH_3 allow incorrect use of superscripts, subscripts or case ignore sodium chloride
	(c)	sulfuric acid / H_2SO_4 (1)	1	allow incorrect use of superscripts, subscripts or case
	(d)	hydrochloric (acid) / HCl / sulfuric (acid) / H_2SO_4 (1)	1	allow incorrect use of superscripts, subscripts or case allow ammonium nitrate / NH_4NO_3
	(e)	sodium hydroxide and hydrochloric (acid) / NaOH and HCl (1)	1	allow mix of names and formulae allow incorrect use of superscripts, subscripts or case
		Total	5	

Question		Answer	Marks	Guidance
2	(a)	air / atmosphere (1)	1	allow from water
	(b)	any three from: energy / electricity / maintaining temperature catalyst (1) labour / salaries / workers (1) pollution control (1) rates / taxes (1) health and safety / maintenance of equipment (1) equipment (1) transport costs (1)	3	ignore cost of raw materials / starting materials allow maintaining pressure / flow of gas allow heat for energy allow fuel costs
		Total	4	

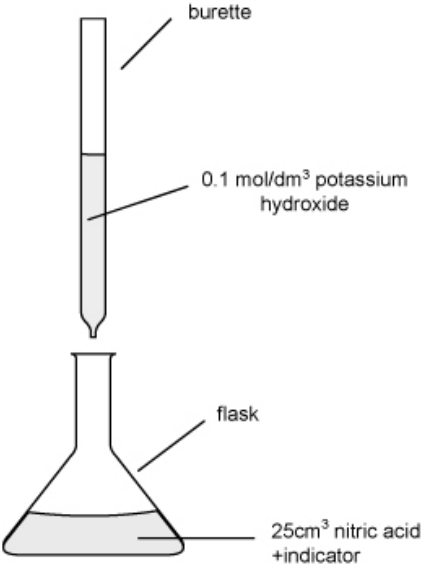
Question		Answer	Marks	Guidance
3	(a)	nitrogen and phosphorus (1)	1	allow N and P
	(b)	to make plants grow bigger / make plants grow faster / grow more / increase crop yield (1)	1	allow to replace essential element / to provide nitrogen for protein synthesis / to provide phosphorus to make DNA allow to make more money to make plants grow is not sufficient
	(c)	root (hair) (1)	1	
	(d)	149 (1)	1	
	(e)	$\frac{17.5}{25} \times 100$ (1) but 70 (2)	2	allow $\frac{am}{pm} \times 100$ for one mark if answer incorrect allow full marks for 70(%) with no working out
		Total	6	

Question		Answer	Marks	Guidance
4	(a)	1996 / 1997 (1)	1	
	(b)	increases / gets bigger (1)	1	
	(c)	decreases / becomes less alkaline / becomes more acidic (1)	1	allow becomes weaker alkali
	(d)	$\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$ (1)	1	allow any correct multiple allow = instead of \rightarrow not and or & instead of +
	(e)	sea water is alkaline / sea water will neutralise acids (1)	1	
		Total	5	

Question		Answer	Marks	Guidance
5	(a)	hydrogencarbonate / HCO_3^- (1)	1	allow incorrect use of superscripts, subscripts or case
	(b)	1.20 (g) (1)	1	unit not needed allow 1.2 (g)
	(c)	take water out of solution / boil / evaporate (1)	1	allow heat the solution allow add more ions to the water allow add salt / add chloride
	(d)	sulfate / SO_4^{2-} (1)	1	allow incorrect use of superscripts, subscripts or case
	(e)	white (1)	1	
	(f) (i)	cathode (1)	1	
	(ii)	ions (1) can move / react at electrodes – dependant on marking point 1 being correct (1)	2	allow has charged particles (1) that can move (1) allow has free ions (2) allow has ions attracted to electrode (2) allow one mark for has particles that can move / electrons that can move
		Total	8	

Question		Answer	Marks	Guidance												
6	(a)	gas (1)	1													
	(b)	120 (tonnes) (1)	1	unit not needed												
	(c)	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th style="text-align: center;">sentence</th> <th></th> </tr> </thead> <tbody> <tr> <td>At equilibrium the forward and backward reactions have stopped.</td> <td></td> </tr> <tr> <td>At equilibrium the rate of the forward reaction is greater than the backward reaction.</td> <td></td> </tr> <tr> <td>At equilibrium the rate of the forward reaction is the same as the backward reaction.</td> <td style="text-align: center;">✓</td> </tr> <tr> <td>At equilibrium the concentrations of the reactants are the same as the concentrations of the products.</td> <td></td> </tr> <tr> <td>At equilibrium the concentrations of the reactants and of the products do not change</td> <td style="text-align: center;">✓</td> </tr> </tbody> </table> <p>one correct (1) but two correct (2)</p>	sentence		At equilibrium the forward and backward reactions have stopped.		At equilibrium the rate of the forward reaction is greater than the backward reaction.		At equilibrium the rate of the forward reaction is the same as the backward reaction.	✓	At equilibrium the concentrations of the reactants are the same as the concentrations of the products.		At equilibrium the concentrations of the reactants and of the products do not change	✓	2	if more than two ticks mark the incorrect answers first. <ul style="list-style-type: none"> • one incorrect answer max 1 mark • two or more incorrect will be 0
sentence																
At equilibrium the forward and backward reactions have stopped.																
At equilibrium the rate of the forward reaction is greater than the backward reaction.																
At equilibrium the rate of the forward reaction is the same as the backward reaction.	✓															
At equilibrium the concentrations of the reactants are the same as the concentrations of the products.																
At equilibrium the concentrations of the reactants and of the products do not change	✓															
	(d)	greater concentration of products / smaller concentration of reactants (1)	1	allow more products / more hydrogen / more carbon monoxide / less methane / less water / less reactants ignore rate for forward faster than rate of backward reaction												
Total			5													

Question			Answer	Marks	Guidance
7	(a)	(i)	gas produced / carbon dioxide made (1)	1	not incorrect gas made not water or acid spits or spills out
		(ii)	0.05 (g) (1)	1	unit not needed
	(b)	(i)	11 (minutes)	1	unit not needed allow any time between 10 to 11 minutes not 10 minutes
		(ii)	acid runs out / reactants run out (1)	1	allow calcium carbonate runs out allow the limiting reactant has fully reacted allow all the powder has reacted
			Total	4	

Question	Answer	Marks	Guidance
8	acid (measured) in pipette and alkali (measured) in burette (1) alkali added to the acid in the flask (1) stop when indicator changes colour (1)	3	marks can be awarded either from a labelled diagram or a written description e.g. 
	Total	3	

Question		Answer	Marks	Guidance
9	(a)	carbon, chlorine, fluorine (1)	1	all three required order unimportant not C, Cl, F
	(b)	<p>any two from</p> <p>idea of depletion of ozone layer (1)</p> <p>allows more UV to reach Earth's surface (1)</p> <p>increases the risk of skin cancer, cataracts or crop damage (1)</p> <p>CFCs make chlorine atoms / CFCs make (free) radicals (1)</p> <p>CFCs only slowly removed from atmosphere (1)</p> <p>they are greenhouse gases (1)</p> <p>global warming (1)</p>	2	<p>allow makes holes in the ozone layer</p> <p>allow lets more UV through</p> <p> </p> <p>allow slow to degrade / inert</p>
		Total	3	

Question			Answer	Marks	Guidance
10	(a)	(i)	5.2 (1)	1	
		(ii)	tap water (1)	1	
		(iii)	idea of a control (1)	1	e.g. so can compare other samples to it allow to give a baseline ignore distilled water contains very little hardness
	(b)		add washing soda / sodium carbonate (1) ion exchange (resin) (1)	2	
			Total	5	

Question			Answer	Marks	Guidance
11	(a)	(i)	25 (cm ³) (1)	1	allow 24.5 to 25.5 (cm ³)
		(ii)	answer in the range 42 to 44°C (1)	1	
		(b)	yeast contains an enzyme (1)	1	allow speeds up reaction / acts as a catalyst
	(c)		hydration (1)	1	allow correct answer ticked, underlined or circled if answer line is blank
			Total	4	

Question			Answer	Marks	Guidance
12			<p style="text-align: center;"> chemical use </p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 5px; width: 80px; text-align: center;">chlorine</div> <div style="border: 1px solid black; padding: 5px; width: 80px; text-align: center;">making bio-diesel</div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 80px; text-align: center;">ethanol</div> <div style="border: 1px solid black; padding: 5px; width: 80px; text-align: center;">making plastics</div> </div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="border: 1px solid black; padding: 5px; width: 80px; text-align: center;">vegetable oils</div> <div style="border: 1px solid black; padding: 5px; width: 80px; text-align: center;">as a solvent</div> </div> <p style="margin-top: 20px;"> all correct (2) but one or two correct (1) </p>	2	
			Total	2	

Question			Answer	Marks	Guidance
13	(a)	(i)	painkiller /AW (1)	1	
		(ii)	ibuprofen (1)	1	allow morphine / co-codamol / codeine / nurofen
	(b)		$C_9H_8O_4$ (1)	1	allow any order not $C^9H^8O^4$
			Total	3	

Question		Answer	Marks	Guidance
14	(a)	idea of barrier / stop water, oxygen or air reaching iron (1)	1	protects the iron is not sufficient
	(b)	any two from galvanising / coating with zinc (1) sacrificial protection / correctly named metal (1) alloying (1) tin plating (1) painting (1)	2	allow coating with plastic/enamelling
		Total	3	

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