OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry B

General Certificate of Secondary Education

Unit **B642/02:** Modules C4, C5, C6 (Higher Tier)

Mark Scheme for January 2011

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

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

Question			Expected Answers	Marks	Additional Guidance
1	(a)		carbon monoxide + methanol → ethanoic acid (1)	1	**allow** mixture of correct formulae and names **allow** $CO + CH_3OH \rightarrow CH_3COOH$ **allow** = in equation **not** & or and or + energy
	(b)		**any two from:** (use of a) catalyst increases the rate of reaction (1) reactants are recycled (1) catalyst is not used up / catalyst is recycled (1) (continuous process) so can be automated (1)	2	**allow** use a lower temperature / use a lower pressure / use less heat energy
	(c)	(i)	increases / goes up (1)	1	
		(ii)	decreases / goes down (1)	1	
			Total	5	

Question			Expected Answers	Marks	Additional Guidance
2	(a)		9 (1)	1	
	(b)	(i)	149 (1)	1	
		(ii)	20.8 (%) (1)	1	**allow** ecf from wrong M_r in (i) **allow** 21%
	(c)		$AgNO_3$ + KI → KNO_3 + AgI (1)	1	**allow** $Ag^+ + I^- \rightarrow AgI$ **allow** correct multiples **allow** = **not** and or & in equation **ignore** state symbols
	(d)		$\frac{1.68}{2.24} \times 100$ (1) **but** 75 (2)	2	**allow** $\frac{am}{pm} \times 100$ for one mark if answer incorrect **allow** full marks for 75% with no working out
			Total	6	

<table>
<tr><th colspan="3">Question</th><th>Expected Answers</th><th>Marks</th><th>Additional Guidance</th></tr>
<tr><td>3</td><td>(a)</td><td></td><td>ammonium phosphate and sodium nitrate (1)</td><td>1</td><td>allow $(NH_4)_3PO_4$ and $NaNO_3$</td></tr>
<tr><td></td><td>(b)</td><td></td><td><table><tr><th>statement</th><th>number</th></tr><tr><td>aquatic animals in the river die</td><td>6</td></tr><tr><td>algal bloom blocks sunlight</td><td>3</td></tr><tr><td>other green plants in the river die and aerobic bacteria feed off dead plants</td><td>4</td></tr><tr><td>concentration of nitrate ions in river water increases so algae grow rapidly</td><td>2</td></tr><tr><td>rain washes away fertiliser from fields</td><td>1</td></tr><tr><td>concentration of oxygen in the river water decreases</td><td>5</td></tr></table>correct order (2)</td><td>2</td><td>allow one mark for correct order with two in the wrong place</td></tr>
<tr><td></td><td>(c)</td><td></td><td>ammonia and phosphoric acid (1)

titration / description of titration (1)

use a pH meter to show when pH is 7 / add until a named indicator changes colour (1)</td><td>3</td><td>allow H_3PO_4 and NH_3 / NH_4OH
not ammonium
allow ammonium hydroxide

allow adding ammonia or phosphoric acid in a controlled way eg dropping from a teat pipette

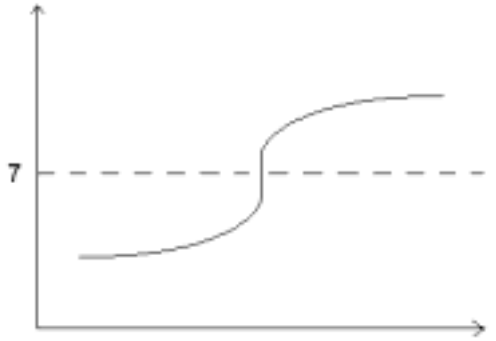
ignore wrong colour change of indicator
ignore universal indicator
ignore evaporation if included after neutralisation</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>6</td><td></td></tr>
</table>

Question			Expected Answers	Marks	Additional Guidance
4	(a)		idea that the structure has many bonds that can be broken / lots of strong bonds / is a giant structure / needs lots of energy to break the bonds (1) **but** idea that there are **many, strong** bonds to be broken which needs **lots** of **energy** / has a **giant** structure with **strong** bonds that need **lots** of **heat** to break (2)	**2**	This is a level of response mark scheme **allow** reference to covalent bonds instead of strong bonds but **not** ionic bonds **ignore** high temperature
	(b)		(very) hard (1)	**1**	**allow** is a good conductor of heat **ignore** rigid / strong
			Total	**3**	

Question			Expected Answers	Marks	Additional Guidance
5	(a)		NaO (1)	**1**	**allow** correct answer ticked, circled or underlined in list if answer line blank
	(b)		evidence that 1.95 is one quarter of 7.8 (1) 0.4 (g) (1)	**2**	**allow** full marks for correct answer on the answer line whether or not there is any working out
	(c)		carbon-12	**1**	
			Total	**4**	

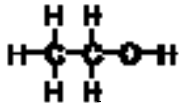
Question			Expected Answers	Marks	Additional Guidance
6	(a)	(i)	64 (cm^3) (1)	1	
		(ii)	$\frac{40}{24000}$ (1) moles = 0.00167 (1)	2	**allow** 2 sig figs or more eg 0.0017 / 0.001666667 **allow** ecf from wrong volume for the second mark
	(b)		reactant that is used up first (1)	1	**allow** the reactant that is not in excess
	(c)		does not completely dissociate / does not completely ionise (1) has hydrogen ions / has a pH between 3 to 6.99 (1)	2	**allow** forms an equilibrium mixture **allow** pH less than 7
			Total	6	

Question			Expected Answers	Marks	Additional Guidance
7	(a)	(i)	0.88 (g) (1)	1	
		(ii)	(mass) increases (1)	1	**allow** directly proportional to the time
		(iii)	(mass) increases (1)	1	**allow** directly proportional to the current
	(b)		$Cu \rightarrow Cu^{2+} + 2e^-$ / $Cu - 2e^- \rightarrow Cu^{2+}$ correct reactants and products (1) balanced equation (1)	2	**allow** any correct multiple **allow** = or ⇆ **not** and or & balanced equation mark dependent on correct formulae but **allow** one mark for balanced equation with minor errors in formulae eg CU → Cu2+ + $2e^-$
			Total	5	

Question			Expected Answers	Marks	Additional Guidance
8	(a)		starting pH below 7 and finishing pH above 7 (1) general shape correct including an almost vertical section centred around pH 7 (1)	2	
	(b)		0.00375 (1)	1	
	(c)	(i)	neutralisation indicated by the sudden change of colour / when (one drop makes) indicator change colour / (one drop makes) the indicator go from red to blue (1)	1	**allow** at point of neutralisation litmus changes from red to blue
		(ii)	does not have a sudden change of colour / gives a continuous colour change (1)	1	**allow** is a mixed indicator
			Total	5	

Question			Expected Answers	Marks	Additional Guidance
9	(a)	(i)	prevent formation of ethanoic acid (1)	1	to stop ethanol reacting with oxygen or to prevent oxidation of the ethanol is **not** sufficient (1) **allow** prevent formation of vinegar
		(ii)	at 0^{o}C yeast inactive / reaction rate too slow (1) at 70^{o}C temperature too high enzyme denatured / changes shape of active site / yeast killed (1)	2	it will not work is **not** sufficient **allow** it is not very active **allow** enzyme is inactive **not** yeast denatured / enzyme killed
	(b)		ethene + water → ethanol (1)	1	**allow** = instead of → but **not** and / & **allow** steam instead of water **allow** $C_2H_4 + H_2O \rightarrow C_2H_6O$ / word equation with mix of correct formulae and words and ignore incorrect **balancing**.
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
10	(a)		redox (1)	1	
	(b)		**any two from:** zinc (acts as a barrier) to prevent water reaching iron / (barrier) to prevent oxygen reacting iron / (barrier) to prevent air reacting (1) zinc acts as a sacrificial metal / zinc reacts instead of iron (1) zinc is more reactive (than iron) / ora zinc loses electrons more easily (than iron) / ora (1)	2	**ignore** zinc rusting
			Total	3	

Question			Expected Answers	Marks	Additional Guidance
11	(a)		ethanol is  (1) paracetamol is $C_8H_9NO_2$ (2)	3	**allow** any order of symbols if there is any error in counting atoms **allow** one mark if one error and no marks if two errors eg $C_8H_8O_2N$ (1), C_8H_9ON (1) but $C_8H_8O_2$ (0) if a molecular formula is not written allow one mark if all the atom counting is correct eg C_8H_9ONO (1) and C_8H_8NOOH (1) if an atom counting error and a formula error then 0 marks eg C_8H_8ONO
	(b)		change the molecule from covalent to ionic / make the –COOH group into the $-COO^-$ ion (1)	1	**allow** make the sodium salt / structure has a Na^+
	(c)		salicylic acid (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line blank.
			Total	5	

Question			Expected Answers	Marks	Additional Guidance
12			calcium hydrogencarbonate (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line blank. **allow** $Ca(HCO_3)_2$
			Total	1	

Question			Expected Answers	Marks	Additional Guidance
13	(a)	(i)	chlorine (1)	1	
		(ii)	$2H^+ + 2e^- \rightarrow H_2$ correct symbols (1) correct balancing (1)	2	**allow** $H^+ + e^- \rightarrow H$ for one mark **allow** $H^+ + e^- \rightarrow H$ followed by $H + H \rightarrow H_2$ (2) balanced equation mark dependent on correct formulae but **allow** one mark for balanced equation with minor errors in formulae eg 2H+ + 2e- → H2
	(b)		exothermic (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line blank.
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
14	(a)		bromine (water) (1) red/brown / yellow to colourless (1)	2	**allow** 2 marks for bromine water is decolourised **ignore** goes clear
	(b)		saponification (1)	1	**allow** correct answer ticked, circled or underlined in list if answer line blank.
			Total	3	

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