OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry B

General Certificate of Secondary Education **B642/02**

Unit 2: Modules C4, C5, C6

Mark Scheme for June 2010

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Question			Expected Answers	Marks	Additional Guidance
1	(a)		K_2SO_4 (1)	1	**allow** any order of symbols e.g. SO_4K_2
	(b)		precipitation (1)	1	answer on answer line takes precedence but **allow** other ways of indicating answer e.g. ticking or ringing precipitate
	(c)		→ sodium nitrate + silver chloride	1	**allow** any order or products **allow** $NaNO_3$ + AgCl **allow** mix of names and formula
	(d)		add universal (indicator) / pH paper (1) compare colour obtained against a colour chart / AW (1)	2	indicator on its own is not sufficient **not** litmus / phenolphthalein / methyl orange **allow** full range indicator **allow** colour chart mark even with wrong indicator **allow** its colour tells you the pH **but** to see what colour it goes is **not** sufficient **allow** examples of matching colour with pH e.g. if it is green then pH is 7 – the colour stated must match the pH i.e. red, yellow, orange for a pH below 7 and blue-green, blue or purple for pH above 7 colour linked to acid, alkali or neutral is **not** sufficient
			Total	5	

Question			Expected Answers	Marks	Additional Guidance
2	(a)		**any two from:** saves energy / saves electricity (1) can wash more delicate materials / AW(1) can use biological washing powder / can use enzymes (1)	2	unless specified assume answer refers to low temperature wash **ignore** saves the environment / cheaper **allow** stops clothes shrinking / clothes will not be damaged / clothes will not lose colour **allow** with hot water the dye may run **allow** enzymes are destroyed at higher temperatures / enzymes are denatured at high temperatures / ora **ignore** enzymes are killed **allow** reduces carbon dioxide emissions / reduces carbon footprint
	(b)	(i)	region attracted to polar molecules / water loving (1)	1	**allow** forms attraction to water (molecules) **allow** bonded to water but not covalently bonded to water **ignore** oil hating / fat hating
		(ii)	region attracted to non-polar molecules / water hating (1)	1	**ignore** forms attraction to fat or oil (molecules) / repels water / oil loving / fat loving / not attracted to water
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
3	(a)		**any two from:** crushed (1) with sand / in a mortar and pestle (1) dissolved in a solvent (1) distillation (1) chromatography (1)	2	 **allow** squeezed / ground up **ignore** filtration **allow** dissolved in water / dissolved in a named solvent / made into a solution **allow** description of distillation **allow** a description of chromatography
	(b)		**any one from:** specialist staff needed / expert workers needed / scientists needed (1) raw materials needed may be rare (1) complex equipment / sterile conditions needed (1)	1	 **not** lots of testing **allow** highly qualified staff
			Total	3	

Question			Expected Answers	Marks	Additional Guidance
4	(a)		$N_2 + 3H_2 \rightarrow 2NH_3$ correct formulae (1) correct balancing – dependant on correct formulae (1)	2	**allow** correct multiples **allow** equilibrium or arrow **ignore** state symbols **not** and or & for + **allow** one mark for balanced equation with minor error with subscript / superscipt e.g. N2 + 3H2 → 2NH3
	(b)	(i)	to get as high as possible (percentage) yield / move (position of) equilibrium to the right / increase rate of reaction (1)	1	**allow** to get a high (percentage) yield
		(ii)	to get as high a rate of reaction as possible without lowering the (percentage) yield too much / get a fast reaction without shifting equilibrium to the left / AW (1)	1	
	(c)		% yield = $\frac{\text{actual mass}}{\text{predicted mass}} \times 100$ / $\frac{37.5}{50} \times 100$ (1) 75 (1)	2	**allow** $\frac{\text{am}}{\text{pm}} \times 100$ **allow** full marks for correct answer with no working out
	(d)		M_r = 80 (1) % = 35 (1)	2	 **allow** full marks for correct answer with no working out **allow** ecf from wrong M_r providing it is obvious there is an ecf involving the use of $\frac{28}{\text{Mr}} \times 100$
			Total	8	

Question			Expected Answers	Marks	Additional Guidance
5	(a)		$C_2H_2O_4$ (1)	1	**allow** any order of symbols **not** use of superscripts **not** use of h rather than H
	(b)		H^+ (1)	1	answer on answer line takes precedence but **allow** other ways of indicating answer e.g. ticking or ringing H^+
	(c)	(i)	56 (1)	1	unit not needed
		(ii)	36 - 38 (1)	1	unit not needed
		(iii)	no more acid / no more H^+ (1)	1	**allow** limiting reagent runs out **not** all the reactants run out / magnesium runs out
	(d)		0.0025 (1)	1	**allow** 2.5×10^{-3} **allow** $\frac{1}{400}$
			Total	6	

Question			Expected Answers	Marks	Additional Guidance
6	(a)	(i)	0.04 (1)	1	**allow** 0.04031 / 0.0403 / 0.040
		(ii)	0.02 (1)	1	
		(iii)	Cu_2O (1)	1	**allow** ecf from wrong number of moles in (i) and (ii) **but** the formula must use integers
	(b)		5.12 (1)	1	unit not needed **not** 5.1
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
7	(a)		goes up / AW (1) goes down / AW (1)	2	
	(b)		ions (1) cannot move (1)	2	assume answer refers to solid unless specified **allow** no free ions (2) **allow** electrons cannot move / no free electrons (1) **allow** particles cannot move (1) **allow** ora for solution if specified
	(c)		$K^+ + e^- \rightarrow K$ (1)	1	**allow** e for electron **allow** correct multiples of this equation
			Total	5	

Question			Expected Answers	Marks	Additional Guidance
8	(a)		rate of backward reaction increases (1) until rate of backward reaction equals rate of forward reaction (1)	2	**allow** it must happen in a closed system as an extra marking point
	(b)		sulfur trioxide (concentration is much) high**er** (than concentration of sulfur dioxide) / ora (1)	1	**allow** concentration of sulfur trioxide is high **and** sulfur dioxide is low (1) **allow** more sulfur trioxide
	(c)		has no effect / does not change position of equilibrium (1)	1	**allow** stays the same **ignore** reaches position of equilibrium in a shorter time
	(d)		$SO_3 + H_2O \rightarrow H_2SO_4$ (1)	1	**allow** correct multiples **allow** equilibrium or arrow **ignore** state symbols **not** and or & for +
			Total	5	

Question			Marks	Additional Guidance	
9	(a)	(i)	ethene + water → ethanol (1)	1	**allow** $C_2H_4 + H_2O \rightarrow C_2H_5OH$ / $C_2H_4 + H_2O \rightarrow C_2H_6O$ **allow** mix of names and correct formulae **allow** steam for water **allow** = sign for arrow **not** and or & for + **not** + catalyst / + heat in the equation **but** allowed over the arrow
		(ii)	(pass ethanol vapour over heated) catalyst (1)	1	**allow** (concentrated) sulfuric acid / (concentrated) phosphoric acid / high temperature / heat / any quoted temperature equal or above 150^{o}C **ignore** the name of any named catalyst e.g. 'iron catalyst' would be awarded a mark **ignore** reference to pressure
	(b)		distillation (1)	1	
	(c)		C_4H_9OH (1)	1	**allow** $C_4H_{10}O$ / OC_4H_{10} etc.
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
10	(a)		acts as a barrier to stop water or oxygen getting to the iron (1) acts as a sacrificial metal (1)	2	**allow** prevents water or oxygen getting to the iron / prevents air getting at the iron / stops oxygen reacting with the iron **not** a protective layer of zinc oxide **allow** zinc will lose electrons in preference to iron / zinc reacts first as it is more reactive **not** reference to zinc rusting **but** allow zinc corrodes rather than iron
	(b)		Fe loses electrons and O_2 or H_2O gains electrons / electrons are transferred from iron to oxygen or water (1)	1	**not** electrons are lost and electrons are gained / electrons are transferred **but** 'electrons are lost from the first equation and gained in the second equation' is sufficient
			Total	3	

Question			Expected Answers	Marks	Additional Guidance
11	(a)		**any two from:** use same volume of water each time (1) add soap solution to water and shake (1) continue to add soap until lather stays / add the same volume of soap (1) **AND** hardest water needs the most volume of soap / hardest water gives the least amount of lather / ora (1)	3	 **allow** a measured volume e.g. 25 cm^3 of both water samples **allow** the same amount of water **allow** add soap and stir **allow** add the same amount of soap this marking point must link with the third marking point i.e. continue to add soap links with most volume of soap indicates hardest water **or** add the same amount of soap links with least amount of lather indicates hardest water **ignore** amount of scum produced
	(b)		**any two from:** carbonate ions / CO_3^{2-} react with Ca^{2+} ions / the two ions react (1) and form calcium carbonate (1) the calcium ions are locked up in calcium carbonate / calcium ions are no longer soluble / calcium ions are precipitated (1)	2	**allow** a correct ion equation scores two marks $Ca^{2+} + CO_3^{2-} \rightarrow CaCO_3$ **allow** answers involving Mg^{2+} and magnesium carbonate **allow** calcium carbonate precipitate formed / insoluble calcium carbonate formed (2)
			Total	5	

Question			Expected Answers	Marks	Additional Guidance
12	(a)		$2H_2 + O_2 \rightarrow 2H_2O$ formulae (1) balancing – dependent on correct formulae (1)	2	**allow** = instead of → **allow** correct multiples including fractions **allow** one mark for balanced equations with minor error in subscripts eg 2H2 + O2 → 2H2O
	(b)	(i)	there is less (chemical) energy in the product than in the reactants (1)	1	**allow** there is more (chemical) energy in the reactants than in the product (1) arrow going down is **not** sufficient
		(ii)	exothermic (1)	1	
			Total	4	

Question			Expected Answers	Marks	Additional Guidance
13	(a)		C (1)	1	**allow** ethene / C_2H_4
	(b)		bromine water (1)	1	**allow** Br / Br_2 answer on answer line takes precedence but **allow** other ways of indicating answer e.g. ticking or ringing bromine water
	(c)	(i)	hydrogen (1)	1	**allow** H / H_2
		(ii)	nickel / catalyst (1)	1	**allow** high pressure **allow** high temperature / heat / any quoted temperature above or equal to 150^{o}C
			Total	4	

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