OCR
RECOGNISING ACHIEVEMENT

GCE

Chemistry (Salters)

Advanced GCE **2849/01**

Mark Scheme for June 2010

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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.

OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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ADVICE TO EXAMINERS ON THE ANNOTATION OF SCRIPTS

1. Please ensure that you use the **final** version of the Mark Scheme.
   You are advised to destroy all draft versions.

2. Please mark all post-standardisation scripts in red ink. A tick (✓) should be used for each answer judged worthy of a mark. Ticks should be placed as close as possible to the point in the answer where the mark has been awarded. The number of ticks should be the same as the number of marks awarded. If two (or more) responses are required for one mark, use only one tick. Half marks (½) should never be used.

3. The following annotations may be used when marking. No comments should be written on scripts unless they relate directly to the mark scheme. Remember that scripts may be returned to Centres.

   x = incorrect response (errors may also be underlined)
   ^ = omission mark
   bod = benefit of the doubt (where professional judgement has been used)
   ecf = error carried forward (in consequential marking)
   con = contradiction (in cases where candidates contradict themselves in the same response)
   sf = error in the number of significant figures

4. The marks awarded for each part question should be indicated in the margin provided on the right hand side of the page. The mark total for each question should be ringed at the end of the question, on the right hand side. These totals should be added up to give the final total on the front of the paper.

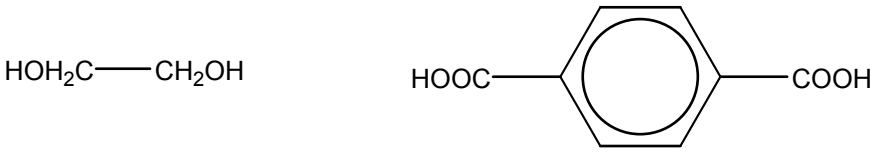
5. In cases where candidates are required to give a specific number of answers, (e.g. 'give three reasons'), mark the first answer(s) given up to the total number required. Strike through the remainder. In specific cases where this rule cannot be applied, the exact procedure to be used is given in the mark scheme.

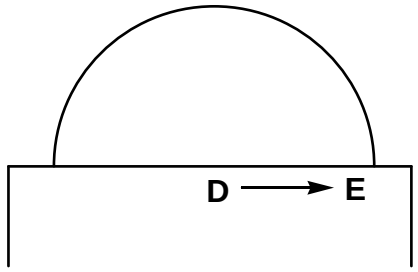
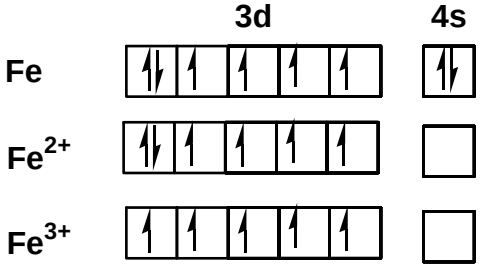
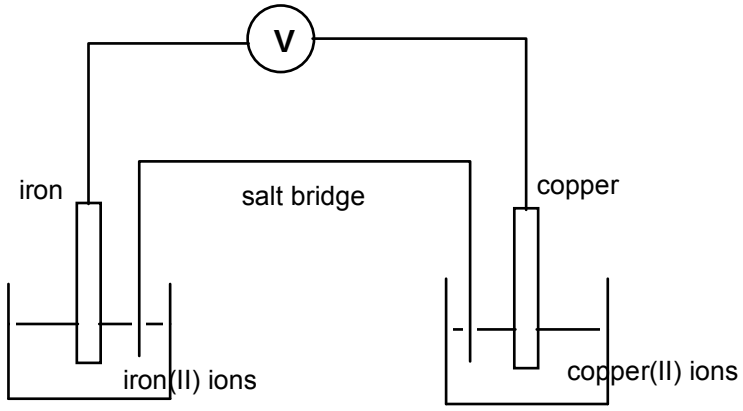
6. Correct answers to calculations should gain full credit even if no working is shown, unless otherwise indicated in the mark scheme. (An instruction on the paper to 'Show your working' is to help candidates, who may then gain partial credit even if their final answer is not correct.)

7. Strike through all blank spaces and/or pages in order to give a clear indication that the whole of the script has been considered.

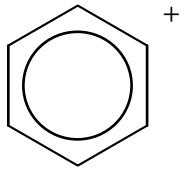
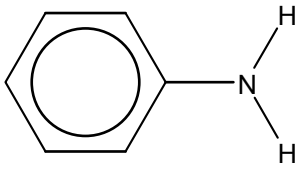
8. An element of professional judgement is required in the marking of any written paper, and candidates may not use the exact words that appear in the mark scheme. If the science is correct and answers the question, then the mark(s) should normally be credited. If you are in doubt about the validity of any answer, contact your Team Leader/Principal Examiner for guidance.

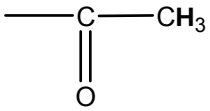
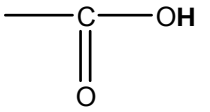
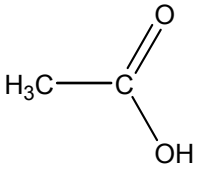
Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit ( ) = words which are not essential to gain credit ____ = (underlining) key words which **must** be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument			

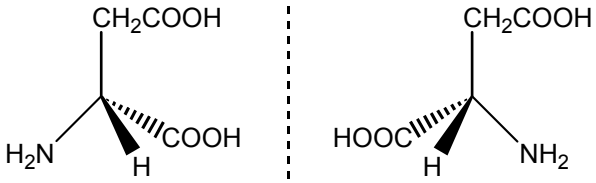
Question	Expected answers	Marks
1 (a)	**A** condensation **B** condensation **C** addition all correct (2); one incorrect (1). DO NOT ALLOW additional	2
1 (b)	Ester (1).	1
1 (c)	Biodegradable AW e.g. 'broken down by organisms' (1).	1
1 (d)	Hydrogen-bonding is stronger than permanent dipole-permanent dipole forces which are stronger than instantaneous dipole-induced dipole forces / hydrogen bonding is the **strongest** type of intermolecular force (1); **C** only id-id forces (1); **B** + pd-pd forces (1); **A** has hydrogen bonding (1);	4
1 (e)	At low temperatures polymers may become brittle/AW e.g. 'may break when force applied' (1); temperature below polymer T_g (1); due to chains unable to move over each other (without breaking)/chain movement not possible (without breaking) (1).	3
1 (f) (i)	aqueous acid / alkali NOT concentrated OR weak acid (1); (heat under) reflux (1).	2
1 (f) (ii)	 *If alkali is used then the COOH group should be written as COO^-:* *1 mark for each structure* (2).	2
	Total Mark	**15**

Question	Expected answers	Marks
2 (a) (i)	$Fe \rightarrow Fe^{2+} + 2e^-$ Correct formulae for reactant and product (1); electrons balanced correctly and on RHS (1). IGNORE state symbols	2
2 (a) (ii)	$O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$ Correct formulae reactants and product (1); electrons and formulae balanced correctly and on LHS (1). *Allow halved/doubled equation*	2
2 (a) (iii)	 Arrow correct direction (1); arrow only shown in steel (1).	2
2 (b)	 Correct number of electrons in Fe (*8 electrons*) (1); loss of 2 and 3 electrons respectively for Fe(II) and Fe(III) (1); correct arrangement for Fe and Fe(II) (1).	3
2 (c) (i)	 metals connected to voltmeter only, ALLOW other way around (1); correct solutions (1); salt bridge (1).	3

2 (c) (ii)	0.78 V (1).	1
2 (c) (iii)	$Cu^{2+}(aq) + Fe(s) \rightarrow Fe^{2+}(aq) + Cu(s)$ *Correct formulae (1);* *state symbols correct, allow for reverse reaction (1).*	2
2 (c) (iv)	(Standard) electrode potential for Fe/Fe(II) is more negative than Cu/Cu(II) ora (1); means Fe is a stronger reducing agent than Cu ora / electrons will flow from Fe (atoms) to Cu(II) (ions) (1); additional/more AW Fe is converted into Fe(II) ions (and hence rust) (1).	3
	Total Mark	**18**

Question	Expected answers	Marks
3 (a) (i)	(Secondary) amide (1).	1
3 (a) (ii)	Ethanoyl chloride (CH_3COCl) / ethanoic anhydride ($(CH_3CO)_2O$) (1).	1
3 (b) (i)	93 (1).	1
3 (b) (ii)	16 (1) *ecf for 92 then 15*	1
3 (b) (iii)	NH_2 (1) ecf CH_3 DO NOT ALLOW if charged.	1
3 (b) (iv)	$C_6H_5^+$ *allow*  *Correct structure/molecular formula for phenyl group (1);* *positive charge on structural formula (1).*	2
3 (b) (v)	 *NH_2 group on molecule (1);* *phenyl group (1).*	2

3 (c)	<table><tr><th>chemical shift</th><th>type of proton</th></tr><tr><td>2.1</td><td>  </td></tr><tr><td>11.4</td><td>  </td></tr></table> *1 mark each for type of proton* (2);  (1).	3
3 (d)	Line near bottom of plate with spot of sample AND pure acetanilide (dissolved in ethanol) on line (1); with solvent (labelled) in beaker below sample (1); beaker covered with lid/film (labelled) (1); Locating agent: UV light or iodine (1).	4
3 (e)	*2 marking points from* **Synthesis** (1); modification of **structure**/change **properties** *e.g. solubility,* /make more effective *e.g. increase time when effective* (1); **analysis**/identification(1) checking **purity** (1) **scaling-up** processes (1) **formulation** of preparation *e.g. tablets, solution, spray etc* (1). *Do NOT ALLOW testing alone or testing for safety etc. or on animals.*	2
	Total mark	**18**

Question	Expected answers	Marks
4 (a) (i)	Stereoisomerism/optical isomerism (1).	1
4 (a) (ii)	 Correct 3D structural formula for one enantiomer(1); Mirror image (1). (Molecule has) an asymmetric carbon atom / chiral centre / carbon bonded to 4 different atoms/groups / mirror image is non-superimposable (1).	3
4 (b) (i)	850 $\pm$ 50 (1) years for 1st reading; 850 $\pm$ 50 years for 2nd & 3rd readings (1) *units need to be present for at least one of the readings to gain both marks;* suitable construction on graph to show calculation of half-life (1).	3
4 (b) (ii)	Half-life is constant (1).	1
4 (b) (iii)	Rate = *k* x [L-aspartic acid]; [L-aspartic acid] (1); Rest correct (1).	2
4 (b) (iv)	s^{-1} / yr^{-1} (1).	1
4 (c)	Zwitterion (1).	1
4 (d) (i)	$K_c = \frac{[\text{ion } \mathbf{J}] \cdot [H^+]}{[\text{ion } \mathbf{K}]}$ 'ion' not necessary for mark (1).	1
4 (d) (ii)	$[H^+]^2 = 1.38 \times 10^{-4} \times 0.50$ (1); $[H^+] = 8.30$ *or* 8.31×10^{-3} mol dm^{-3}(1); Correct sig figs (1).	3
4 (e) (i)	Primary = order/sequence of amino acids (in protein chain) (1); Secondary = shape taken up by protein chain AW e.g. describes possible shapes helix/sheet (1).	2
4 (e) (ii)	$-NH_3^+$ and COO^- groups on enzymes (1); can attract oppositely charged groups on the substrate (1).	2
	Total mark	**20**

Question	Expected answers	Marks
5 (a) (i)	*Six from, but marking point in bold must be one of them :* **1** Use of pipette for measuring hydrogen peroxide (1); **2** use of burette for manganate(VII) (1); (Use of burette & pipette but with solutions switched is 1 mark only) **3** addition of sulphuric acid (1) *NOT hydrochloric/nitric acid*; **4** to conical flask with hydrogen peroxide (1); **5** slow addition at end point/dropwise/drop by drop/slowly/carefully (1); **6 to pink/purple colour (if reverse addition then allow colourless but NOT pink) (1);** **7** repeat to give at least two concordant/consistent readings (1). *QWC* *See separate sheet* (1).	6 1
5 (a) (ii)	Moles of MnO_4^- = (20.2/1000) x 0.0200 (1); moles of H_2O_2 = **2.5** x (18.2/1000) x 0.0200 (1) *ecf*; *mark is for the 2.5* ratio concentration = 0.910 mol dm^{-3} (1) *ecf*; *answer to 3 sig. figs*. (1).	4
5 (a) (iii)	$\underline{M_r}$ of H_2O_2 = 34 (1); mass of H_2O_2 in 100 cm^3 of water = 34 x 0.91 x 100/1000 = 3.1 g *or* max moles of H_2O_2 allowed in 100 cm^3 of water = 3.0/34 = 0.088 mol therefore NO (1) *ecf from* (iii) *and* M_r of H_2O_2.	2
5 (b) (i)	$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$ *formulae correct, balanced and state symbols correct* (1).	1
5 (b) (ii)	(Glass =) heterogeneous because two phases/states AW (1); (Transition metal ions =) homogeneous because only one phase/state AW (1).	2
5 (b) (iii)	(Measure volume of oxygen by) syringe/measuring cylinder/ over water (1); plot graph of volume of O_2 v time (1); find gradient at time = 0 (1).	3
	Total mark	**19**

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