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Mark Scheme (Results)
January 2010

GCE

GCE Chemistry (6CH07/01)

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Using the Mark Scheme

The mark scheme gives examiners:

- an idea of the types of response expected
- how individual marks are to be awarded
- the total mark for each question
- examples of responses that should NOT receive credit.

/ means that the responses are alternatives and either answer should receive full credit.

( ) means that a phrase/word is not essential for the award of the mark, but helps the examiner to get the sense of the expected answer.

Phrases/words in **bold** indicate that the meaning of the phrase or the actual word is **essential** to the answer.

ecf/TE/cq (error carried forward) means that a wrong answer given in an earlier part of a question is used correctly in answer to a later part of the same question.

Candidates must make their meaning clear to the examiner to gain the mark. Make sure that the answer makes sense. Do not give credit for correct words/phrases which are put together in a meaningless manner. Answers must be in the correct context.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

Question Number	Acceptable Answers	Reject	Mark
1 (a)(i)	Nichrome (1) ALLOW Platinum/Pt/ceramic rod ACCEPT recognisable spelling Second mark depends on first. Unreactive/inert/chemically stable (at high temperatures in air/with acid)/does not colour flame/high melting point (1)	 High resistance Does not decompose Not easily burned/does not catch fire/does not react with flame Can withstand high T/thermodynamically stable	**2**

Question Number	Acceptable Answers	Reject	Mark
1 (a)(ii)	Sodium/sodium ion/Na^+	Na/sodium atom/Na^-	**1**

Question Number	Acceptable Answers	Reject	Mark
1 (b)(i)	Silver bromide ALLOW AgBr/Ag^+Br^-((s))		**1**

Question Number	Acceptable Answers	Reject	Mark
1 (b)(ii)	Br^- $Br^{-1/1-}$ ALLOW I^- or Cl^- if iodide or chloride given in (b)(i)	Br/Br_2 AgBr	**1**

Question Number	Acceptable Answers	Reject	Mark
1 (b)(iii)	The precipitate darkens ALLOW Precipitate turns purple/grey/black/ blue/silver	Green, orange, red, brown, yellow	**1**

Question Number	Acceptable Answers	Reject	Mark
1 (c)(i)	Hydrogen bromide/HBr/BrH ALLOW hydrobromic acid	HCl/HI Hydrogen chloride/hydrogen iodide	**1**

Question Number	Acceptable Answers	Reject	Mark
1 (c)(ii)	**Test:** Ammonia (solution on glass rod) (1) **Result:** gives white smoke (1) ALLOW white fumes/solid Result mark dependant on ammonia. ALLOW Other indicators with correct colour change from and to. Eg litmus from blue to red for 1max ALLOW addition to silver nitrate solution to form cream precipitate for 1max Reward unexpected correct chemistry! Eg Mix gas with chlorine gas to form a brown liquid/gas for both marks	Steamy fumes	**2**

Question Number	Acceptable Answers	Reject	Mark
1 (c)(iii)	Bromine/Br_2 ALLOW bromine liquid/gas/water/solution	Br^-/Br Bromide/bromine water Chlorine/Cl_2 Iodine/I_2	**1**

Question Number	Acceptable Answers	Reject	Mark
1 (c)(iv)	**Gas:`** Sulfur dioxide (1) ALLOW SO_2 **Type:** Reduction (of sulfuric acid) Redox ALLOW oxidation of (hydrogen) bromide (1) Second mark depends on first unless hydrogen sulfide given.	Displacement	**2**

Question Number	Acceptable Answers	Reject	Mark
2 (a)	**Liquid B** H H | | H-C – C – C = O | | | H H H (1) Allow CH_3CH_2CHO/C_2H_5CHO **Name of X** Propan-1-ol/1-propanol (1) Check for 'o' rather than 'a' in propan-1-ol ALLOW correct formula and consistent name for butan-1-ol and pentan-1-ol for 1max	Propanal/prop-1-ol Propanol	**2**

Question Number	Acceptable Answers	Reject	Mark
2 (b)	**C** propanone ALLOW $(CH_3)_2CO$/fully displayed formula/propan-2-one/propan-2-one (1) **Y** propan-2-ol/2-propanol (1) Ignore punctuation ALLOW consistent answers based on butan-2-ol and pentan-2-ol for **1 max**	If both formula and name given both must be correct Prop-2-ol	**2**

Question Number	Acceptable Answers	Reject	Mark
3 (a)	Add an **excess** of calcium hydroxide/calcium oxide to water /until no more will dissolve(1) OWTTE leave for 24 hours/heat and leave to cool/ decant/filter/keep temperature constant (1) Accept unexpected correct Chemistry!	Add excess Ca to water	**2**

Question Number	Acceptable Answers	Reject	Mark
3 (b)(i)	(10 cm^3) pipette ALLOW recognisable spelling (eg pipet /pippette)	Burette/measuring cylinder/cylinder	**1**

Question Number	Acceptable Answers	Reject	Mark
3 (b)(ii)	**Indicator** Methyl orange (1) From yellow to orange (1) ALLOW to red/pink ALLOW any named acid-base indicator (recognisable spelling) with correct colour change eg Phenolphthalein (1) From pink/purple/red to colourless (1)	Litmus / universal indicator/ pH paper	**2**

Question Number	Acceptable Answers	Reject	Mark
3 (c)(i)	8.95 (1)		**1**

Question Number	Acceptable Answers	Reject	Mark
3 (c)(ii)	First titration is likely to be inaccurate/rough/only a range finder/ not concordant / not within ± 0.2/0.1 cm^3	Too high unless explained as overshoot Difference to high	**1**

Question Number	Acceptable Answers	Reject	Mark
3 (c)(iii)	8.90 (1) ALLOW 8.9 ACCEPT TE from (i)	Use of 9.20 (ans 9.00)	**1**

Question Number	Acceptable Answers	Reject	Mark
3 (c)(iv)	$\frac{8.90 \times 0.05}{1000}$ = 4.45×10^{-4} / $4.45.10^{-4}$ / 0.000445 (mol) ALLOW Answer to (iii) x 0.00005 ALLOW $4.5x10^{-4}$/$4.5.10^{-4}$/ 0.00045		**1**

Question Number	Acceptable Answers	Reject	Mark
3 (c)(v)	2.225×10^{-4} / 0.0002225 (mol) ALLOW Answer to (iv) divided by 2 ALLOW 2.23×10^{-4} / 0.000223 2.2×10^{-4} / 0.00022	2.3×10^{-4} / 0.00023	**1**

Question Number	Acceptable Answers	Reject	Mark
3 (c)(vi)	$2.225 \times 10^{-4} \times 100 = 2.225 \times 10^{-2}$ (mol dm^{-3}) ALLOW answer to (v) x 100		**1**

Question Number	Acceptable Answers	Reject	Mark
3 (c)(vii)	$2.225 \times 10^{-2} \times 74.1$ = 1.648725 = 1.65 (g dm^{-3}) if Mr 74 the answer is 1.6465 = 1.65 (g dm^{-3}) ALLOW Answer to (vi) x 74.1 or x 74 Ignore s.f. Note that 2.23×10^{-4} gives 1.650 with 74 or 1.652 with 74.1 2.3 gives 1.702 and 1.704 respectively 2.2 gives 1.628 and 1.630 respectively		**1**

Question Number	Acceptable Answers	Reject	Mark
3 (d)(i)	50 x 4.18 x 5.5 = 1150/1149.5 (J) ALLOW 1.1/1.150/1.1495 **kJ**	50.74 as mass	**1**

Question Number	Acceptable Answers	Reject	Mark
3 (d)(ii)	$\frac{1149.5 \times 10^{-3}}{0.01}$ =-114.95/-115 kJ mol^{-1} kJ/mol ALLOW -114950/-115000 J mol^{-1} Value (1) Sign and unit (1) ALLOW TE from (d)(i) ALLOW division by incorrect number of moles eg $\frac{1149.5 \times 10^{-3}}{0.05}$ (0) = -22.99/-23.0 kJ mol^{-1} (1) internal TE for sign/unit but only for dividing by an incorrect number of moles.		**2**

Question Number	Acceptable Answers	Reject	Mark
3 (d)(iii)	$\frac{0.2 \times 100}{5.5}$ = 3.6/3.64 % (2) 3.63 % (1max) **First mark** total error = 0.2 **Second mark** percentage ALLOW $\frac{0.1 \times 100}{5.5}$ = 1.8/1.82 % (1max)	1.81 %	**2**

Question Number	Acceptable Answers	Reject	Mark
3 (d)(iv)	as the same neutralisation reaction/ same ionic equation ALLOW as nitric acid is a strong acid /both acids the same strength /same volume of same concentration of acid /same numbers of moles of protons/H^+ **and** same volume.	Same numbers of moles of acid	**1**

Question Number	Acceptable Answers	Reject	Mark
3 (d)(v)	11 ^oC /doubles	increases	**1**

Question Number	Acceptable Answers	Reject	Mark
3 (d)(vi)	Experiment (v)/ more concentrated hydrochloric acid A bigger temperature change (1) IF temperature rise is the same in (v) ALLOW TE eg (iv) as larger volume gives(lower percentage error in volume measurement) Also: A smaller temperature change in (v) means (iv) is more accurate		**1**

Question Number	Acceptable Answers	Reject	Mark
4 (a)	$\frac{0.2 \times 74.1}{0.789}$ = 18.8 /18.78 (cm^3) but check unit is not wrong ie dm^3 ignore s.f. except one ALLOW 18.76/19 (from M = 74)	18.79	**1**

Question Number	Acceptable Answers	Reject	Mark
4 (b)	Funnel with tap (1) ALLOW any shaped tube with opening at the top(which may be stoppered) with tap at the bottom **Upper** layer labelled as 2-chloro-2-methylpropane (1) Mark independently		**2**

Question Number	Acceptable Answers	Reject	Mark
4 (c)(i)	To remove/react with acid/neutralize (hydrochloric acid)		**1**

Question Number	Acceptable Answers	Reject	Mark
4 (c)(ii)	No more bubbles/gas/pressure build up/carbon dioxide	Use of indicators	**1**

Question Number	Acceptable Answers	Reject	Mark
4 (d)	(Anhydrous) sodium sulfate/calcium chloride/magnesium sulfate	anhydrous copper sulfate /anhydrous cobalt chloride/concentrated sulfuric acid /calcium oxide	**1**

Question Number	Acceptable Answers	Reject	Mark
4 (e)	Round-bottom/pear shaped flask with 'heat'/arrow underneath/heating mantle/hot water bath(ignore drying agent in the flask)(1) Still head with thermometer at exit (1) Condenser with water (flowing up) (1) collection of product (1) Be generous on drawing – ignore accidental closures by poor drawing	Closed apparatus -1 Significant gaps allowing escape of product (eg between condenser and flask/around thermometer at top of still head (ie no bung)) -1	**4**

Question Number	Acceptable Answers	Reject	Mark
4 (f)	$\frac{18.7 \times 0.842}{92.6}$ = 0.17 (1) $\frac{0.17 \times 100}{0.2}$ =85% /85.0% /85.018% (1) It is possible and acceptable to arrive at the answer by working out masses or volumes: Masses give $\frac{15.754 \times 100}{18.52}$ Volumes give $\frac{18.7 \times 100}{21.995}$ ALLOW Internal TE for incorrect number of moles, providing there is a clear attempt to find the number of moles OR ALLOW second mark for $\frac{\text{Actual amount} \times 100}{\text{Expected amount}}$ if clearly stated in words Correct answer with no working (2)		**2**

Question Number	Acceptable Answers	Reject	Mark
4 (g)(i)	To dissolve the halogenoalkane/ to mix the reagents/as a solvent/reactants are immiscible	To allow reaction	**1**

Question Number	Acceptable Answers	Reject	Mark
4 (g)(ii)	White precipitate	AgCl formed	**1**

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