Cambridge Assessment International Education
Cambridge Pre-U Certificate

CHEMISTRY **9791/04**

Paper 4 Practical **May/June 2018**

MARK SCHEME

Maximum Mark: 40

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 3 Pre-U Certificate.

PUBLISHED

Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Question	Answer	Marks
1(a)	**I** Constructs a table for results (at least 3 volumes and 3 times recorded) (1) **II** Appropriate headings and units for recorded data given. Volumes in cm^3 or $/cm^3$ or (cm^3). Time in seconds or /s or (s) (1) **III** All volumes of **FA 1** and water given to .00 **AND** all times recorded to the nearest second (1) **IV** 3 additional volumes chosen with intervals not less than 2.00 cm^3 and all volumes of **FA 1** in the range 18.00 $\geqslant$ volume $\geqslant$ 6.00 cm^3 (1) **V** In all 3 additional experiments water is added to make a total of 20.00 cm^3 (1) **VI** All rates correctly calculated using 500 / time (1) **VII** Units for rate given as s^{-1} (1) **VIII** + **IX** Compare time for 20.00 cm^3 of **FA 1** with that of supervisor. Award 2 marks for $\pm$3 s. Award 1 mark for $\pm$6 s (2) **X** Compare ratio of time for 10.00 cm^3 of **FA 1** / time for 20.00 cm^3 of **FA 1** (given to 2 dp). Award 1 marks for ratio within 0.50 of that of supervisor (1)	**10**

Question	Answer	Marks
1(b)	**I** Rate on *y-axis* and volume on *x-axis*. Axes clearly labelled (ignore units) (1) **II** Linear scale chosen to use at least half of each axis and to include the origin (1) **III** All points plotted correctly to within half a square and in the correct square (1) **IV** Draws a line of best fit (1)	**4**
1(c)	Rate is proportional to concentration of iodide (1)	**1**
1(d)	Gives range as between 500 / (time + 0.5) and 500 / (time – 0.5) (1)	**1**
1(e)	Comments that volume of **FA 1** / KI is half that of Expt 1 and that volume of **FA 3** / $S_2O_3^{2}$ is twice that of Experiment 1 (1) Half volume of **FA 1** / KI means approximately ½ the rate of Expt 1 (1) 2 × volume of **FA 3** / $S_2O_3^{2-}$ means approximately ½ the rate of Expt 1 because it takes twice the time to react with the additional thiosulfate ions (1)	**3**

Question	Answer	Marks
	FA 4 = NH_4Cl	
2(a)	**I** Unambiguous headings for each entry **AND** masses in g or / g or (g); temperature in ºC (1) **II** All temperatures recorded to at least 0.5 ºC and masses to at least 0.1 g (1) **III** Compare ΔT / m to supervisor. Award 1 mark for $\pm$ 0.50 ºC g^{-1} (1)	**3**
2(b)	Selects NaOH **AND** formula = NH_4Cl (1)	**2**
	Observes **gas** turns red litmus blue (1)	
2(c)(i)	Shows use of correct mass of **FA 4** / 53.5 in **(c)(i)** (1)	**1**
2(c)(ii)	Shows use of $\Delta T \times 4.2 \times 25$ in **(c)(ii)** (1)	**1**
2(c)(iii)	Correct answer **AND** correct units of either J mol^{-1} or kJ mol^{-1} (1)	**1**
2(d)(i)	Burettes have a smaller uncertainty (1)	**1**
2(d)(ii)	Temperature rise is less / half so error in temperature change is greater / double (1) Increase in uncertainty in the temperature measurement is much greater than the improvement in the uncertainty in the volume (1)	**2**

Question	Answer	Marks
	FA 5 = $AlCl_3$ FA 6 = H_2SO_4	
3(a)	**I FA 5** and sodium carbonate: white ppt (1) **II FA 5** and sodium carbonate: fizzing **AND FA 6** and sodium carbonate: fizzing (1) **III FA 5** and sodium hydroxide: white ppt, sol in excess (1) **IV FA 5** and ammonia: white ppt, insol in excess (1) **V FA 5** and silver nitrate: white ppt (1) **VI FA 6** and barium chloride: white ppt insoluble in acid (1) **VII FA 6** and sodium hydroxide: no reaction **AND FA 6** and aqueous ammonia: no reaction **AND FA 6** and silver nitrate: no reaction **AND FA 5** and barium chloride: no reaction **AND FA 5** and barium chloride and acid: no reaction (1)	**7**
3(b)	$AlCl_3$ (1) H_2SO_4 (1)	**2**
3(c)	Could not distinguish between Zn^{2+} and Al^{3+} (as both give white ppt soluble in excess in NaOH)	**1**