CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level

MARK SCHEME for the October/November 2013 series

8780 PHYSICAL SCIENCE

8780/04   Paper 4 (Advanced Practical Skills), maximum raw mark 30

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 will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

1 **(a)** 50° to 65° (accept supervisor value ± 5°)

(b) (c) table headings given with unit using solidus (/)   [1]
accept brackets or 'in'
e.g. *W* / N **or** *W* (N) **or** *W* in N

six sets of readings <u>and</u> *θ* decreasing as *W* increases   [1]

full range used (at least 0.20 to 0.80 N <u>and</u> no gap greater than 0.20 N)   [1]

cos *θ* calculated correctly   [1]

sensible use of significant figures/decimal point throughout
i.e. all *θ* to the nearest ½ degree, all cos *θ* to the same number of significant
figures   [1] **[5]**

(d) (i) axes labelled <u>and</u> sensible scales covering at least ½ the grid   [1]
no awkward scales (e.g. 1:3, 1:7)

all points plotted accurately to ± ½ small square <u>and</u> minimum of five points   [1]

best-fit straight line   [1] **[3]**

(ii) a sensible point circles on graph <u>and</u> appropriate reason   [1] **[1]**
e.g. point poorest fit to observed pattern / *θ* was hardest to measure at this
point because (sensible reason)

(iii) triangle uses at least half of the drawn line <u>and</u> correct substitution into
gradient formula   [1] **[1]**

(iv) gradient between 0.33 and 0.66   [1] **[1]**

(e) use of *Z* = 1/gradient   [1]
correct answer including unit of N stated   [1] **[2]**

(f) Suitable source of error   [1] **[1]**
e.g. friction / difficulty getting string perpendicular to ruler <u>and</u> suitable reason
(NOT parallax alone)

       [Total 15]

2 (a) (i) tabulates (horizontally or vertically) initial and final burette readings, and volume added in table <u>and</u> table headings given with unit (cm^3)
do not award this mark if any burette reading is inverted or if 50 is used as the initial burette reading

readings recorded to the nearest $0.05\,cm^3$ [1]

at least two uncorrected titres within $0.1\,cm^3$ [1]
titre labelled 'rough' may be included

two titres within $0.30\,cm^3$ of Supervisor's range (see Supervisor's Report) <u>and</u> titres within $0.2\,cm^3$ of each other [1] **[4]**

(ii) Working must be shown or selected titres clearly indicated in titration table

uses appropriate values or calculates an average from any titre values within $0.20\,cm^3$ of each other [1] **[1]**
accept the use of a trial or 'rough' titre
where **all** titres are given to one decimal place, the average should be calculated correct to one or two decimal places
where **any** titre is recorded to two decimal places, the average should be calculated correct to two decimal places or rounded to the nearest $0.05\,cm^3$

(iii) reaction has its own colour change [1] **[1]**

(iv) $\dfrac{0.02 \times titre \times 5}{25}$

award one mark for moles of $MnO_4^- = \dfrac{0.02 \times titre}{1000}$

and moles for $Fe^{2+} = 5 \times$ moles of MnO_4^- [2] **[2]**

(v) $55.8 \times$ answer to **(a)(iii)** [1] **[1]**

(b) (i) Test 1
(dirty) green precipitate <u>and</u> turning brown/darker on standing or insoluble in excess [1]
accept brown precipitate

detection of gas which turns red litmus blue (and has no effect on blue litmus) [1]

Test 2
yellow/orange solution [1] **[3]**

(ii) iron(II) as a dirty green precipitate with sodium hydroxide

ammonium as ammonia/gas evolved which turns red litmus blue [1]

evidence should match the cation

(award one mark if BOTH cations correctly named without evidence)

(iii) converts iron(II) into iron(III) / oxidation reaction [1] **[1]**

[Total 15]

Supervisor's Report
Check all subtractions in **2(a).**

Use the titres, corrected where necessary, to select the "best average" titre to be used as an accuracy standard using the following hierarchy:

- value of 2 identical titres
- average of titres within $0.05\,cm^3$
- average of titres within $0.10\,cm^3$, etc.