MARK SCHEME for the October/November 2008 question paper

5070 CHEMISTRY

5070/03   Paper 3 (Practical Test), maximum raw mark 40

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.

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 must be read in conjunction with the question papers and the report on the examination.

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the October/November 2008 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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1 For **Question 1**, Examiners are asked to write the Supervisor's value on each question paper.

    (a) Titration

        <u>Accuracy</u>   8 marks

        These marks are given using any of the candidate's values not just ticked ones.

        For the two best titres give:
            4 marks for a value within 0.2 cm^3 of Supervisor
            2 marks for a value within 0.3 cm^3 of Supervisor
            1 mark for a value within 0.4 cm^3 of Supervisor

        If candidate's or Supervisor's results are given to 2 decimal places, take to the nearest 0.1 cm^3.
        If halfway, round up or down so as to favour the candidate.

        <u>Concordance</u>   3 marks

        These are based on all the values ticked by the candidate (not just those chosen for the accuracy marks) and are independent of the accuracy marks.

        Give: 3 marks if all the ticked values are within 0.2 cm^3
              2 marks if all the ticked values are within 0.3 cm^3
              1 mark if all the ticked values are within 0.4 cm^3

        To score any concordance mark at least two of the ticked value must be within **0.6 cm^3** of the Supervisor's value.

        If the candidate ticks only one value, or none at all, then see the notes on next page.

        <u>Average</u>   1 mark

        Give 1 mark if the candidate calculates a correct average (error not greater than 0.05) of all his ticked values.

        If the candidate ticks only one value, or none at all, then see the notes on next page.

        If the majority of candidates are not scoring at least 6 out of 8 for accuracy, it may be necessary to consider awarding the accuracy marks based on a 'candidate average' rather than the Supervisor's value.

                                                  [12]

<u>Fewer than two ticked values.</u>

If the candidate has two or more identical values, ticks only one of them (or none) and uses this value in the calculation, then a score of 3 marks should be awarded for concordance (provided it is within 0.6 cm^3 of the Supervisor), 0 for the average, but no deduction should be applied. Maximum is then 11 (4 + 4 + 3 + 0).

If the candidate ticks one value, uses this, and has no identical values, then the concordance and average marks are both 0, there is no further deduction. Maximum is then 8 (4 + 4 + 0 + 0). However, if the ticked value is also an **obvious** average then treat as in the next paragraph.
i.e. 23.5, 23.6 (✓), 23.7   23.6 used   then 4 + 4 + 3 – 1 (T) + 1.

In all other circumstances the concordance mark (provided there are two values within 0.6 cm^3 of the Supervisor's value) is based on all the values and there is a –1(T) applied to the concordance mark, **not to any accuracy marks**. The average mark can be scored, **based on all the values**.
Maximum is then 11 (4 + 4 + 3 – 1(T) + 1).
Values labelled rough (**or clearly not used**) may be ignored, if this helps the candidate.
i.e. 24.0, 23.4 (✓), 23.5   23.45 used   then 4 + 4 + 3 – 1 (T) + 1.

If a candidate has only two values which differ by 0.1 and ticks and uses one of them, then treat as in paragraph 3, i.e. the maximum is 11.

If the candidate makes it clear by a method other than ticking (e.g. carrying out the averaging on his answer sheet) which values he has used, then the concordance and average marks are based on this and there is no deduction.
It is not intended that Examiners should try to work out which values the candidate has used, he must make it clear how he has treated the results.

Other deductions from the total marks so far are made for the following reasons, which should be indicated by the appropriate abbreviations.

Initial and final burette readings not shown or 50 used instead of 0   deduct 2 (Br)
If the candidate's titre has to be deducted from 50 to give him accuracy marks
then the deduction is –3 (Br)
There is no penalty for reversing initial and final values.

Decimal point never shown, or **all** integer values   deduct 2 (Dp)

Error in subtracting burette readings or if no subtraction attempted,   deduct 1 (Sub)
(unless initial value is zero).
Apply irrespective of whether the value is used. (max –2)
Accuracy marks should be given on the corrected value but concordance marks are given on the uncorrected value, provided the corrected values are within 0.6 cm^3.

Wrong solution in the burette (only apply if absolutely certain that solutions
have been interchanged).   deduct 2 (B)
No penalty for incorrect pipette size, even if results have to be scaled.

(b) Assuming a 25 cm^3 pipette and a titre of 24.6 cm^3

concentration of hydrogen peroxide, in mol/dm^3

$$conc = \frac{24.6 \times 0.1}{2 \times 25.0} \quad (1)$$

= 0.0492 (correct to 0.0001) (1)

Allow 0.05 for 0.0500 etc., answers should be correct to ±1 in the third significant figure.

[2]

(c) Relative formula mass of barium peroxide

Mr = 8.5/0.0492 (1)

= 173 (±1) (1)

Answers should be correct to ±1 in the third significant figure.

Penalise over-approximation only once but other arithmetic errors every time they occur. Do not penalise, in **(b)**, a candidate who works out the correct answer but uses an over-approximated answer in the answer line. Apply the penalty, in **(c)**, if the final answer is not correct to ±1. [2]

2 **R** is potassium chromium (III) sulphate (chrome alum) **S** is potassium dichromate (VI) [24]

Test	Notes
General points for ppt allow solid, suspension, powder do not allow substance, particles, deposit, residue, sediment, gelatinous, insoluble, etc. do not allow cloudy/milky etc for ppt forms but do allow cloudy/milky remains or clears for ppt remains or dissolves for gases name of gas requires test to be at least partially correct effervesces = bubbles = gas vigorously evolved but not gas evolved solutions colourless not equivalent to clear, clear not equivalent to colourless	
Test 1 **3 marks** white ppt (2) insoluble in excess (1)	give one mark for a ppt of any colour
Test 2 **2 marks** no reaction (1) no reaction with acid (1)	allow stays or turns 'blue/green' or clear Any implication of a reaction with silver nitrate i.e. turns <u>dark</u> green, loses both marks. Any reaction with acid loses the second mark. Ignore <u>slight</u> colour changes i.e. becomes paler/less blue/green.
Test 3 **7 marks** green ppt (1) ppt soluble in excess (1) green solution (1) + *hydrogen peroxide* effervesces (1) gas relights glowing splint (1) oxygen (1) yellow solution (1)	allow shades of green, including blue/green but not blue forms a green solution (2) solution turns green without mentioning the lack of ppt (1) gas relights glowing splint with a pop (1) but if gas = oxygen **and** hydrogen then zero for the name of gas ignore intermediate colours the final **solution** must be yellow

Conclusion **1 mark** SO_4^{2-} or sulphate (1)	ppt (any colour) in Test 1 ignore any ppts with silver nitrate for conclusion mark
Test 4 **4 marks** yellow solution (1) yellow ppt (1) ppt dissolves (1) orange or yellow solution (1)	 forms an orange (yellow) solution (2) solution turns orange (yellow) without mentioning the lack of ppt (1)
Test 5 **5 marks** solution turns blue or purple (1) effervesces (1) gas relights glowing splint (1) oxygen (1) green solution (1)	 allow blue but not black Ignore intermediate colours the final solution must be green. Allow turns green (any shade) for the final colour mark, wherever it occurs, provided there is no subsequent colour.
Test 6 **2 marks** red or brown solution initially (1) grey/black ppt (1)	 do not allow black solution allow brown ppt (not red brown or red) but only if brown solution is not reported i.e. brown solution and black ppt (2) brown solution and brown ppt (1) brown solution or brown ppt (1)
Conclusion **1 mark** variable oxidation state (1) or acts as a catalyst	 allow more than one ion, etc.

any 24 marks to score