2225 – 6211M

Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

May 2025

Chemistry

Standard level

Paper 1b

9 pages

Subject Details: Chemistry Standard Level Paper 1B Markscheme

Candidates are required to answer **ALL** questions. Maximum total = **[25 marks]**.

1. Each row in the "Question" column relates to the smallest subpart of the question.

2. The maximum mark for each question subpart is indicated in the "Total" column.

3. Each marking point in the "Answers" column is shown by means of a tick (✓) at the end of the marking point.

4. A question subpart may have more marking points than the total allows. This will be indicated by "**max**" written after the mark in the "Total" column. The related rubric, if necessary, will be outlined in the "Notes" column.

5. An alternative word is indicated in the "Answers" column by a slash (*/*). Either word can be accepted.

6. An alternative answer is indicated in the "Answers" column by "***OR***". Either answer can be accepted.

7. An alternative markscheme is indicated in the "Answers" column under heading **ALTERNATIVE 1** *etc*. Either alternative can be accepted.

8. Words inside chevrons **« »** in the "Answers" column are not necessary to gain the mark.

9. Words that are underlined are essential for the mark.

10. The order of marking points does not have to be as in the "Answers" column, unless stated otherwise in the "Notes" column.

11. If the candidate's answer has the same "meaning" or can be clearly interpreted as being of equivalent significance, detail and validity as that in the "Answers" column then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by ***OWTTE*** (or words to that effect) in the "Notes" column.

12. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.

13. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking, indicate this by adding **ECF** (error carried forward) on the script.

14. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the "Notes" column.

15. If a question specifically asks for the name of a substance, do not award a mark for a correct formula unless directed otherwise in the "Notes" column. Similarly, if the formula is specifically asked for, do not award a mark for a correct name unless directed otherwise in the "Notes" column.

16. If a question asks for an equation for a reaction, a balanced symbol equation is usually expected, do not award a mark for a word equation or an unbalanced equation unless directed otherwise in the "Notes" column.

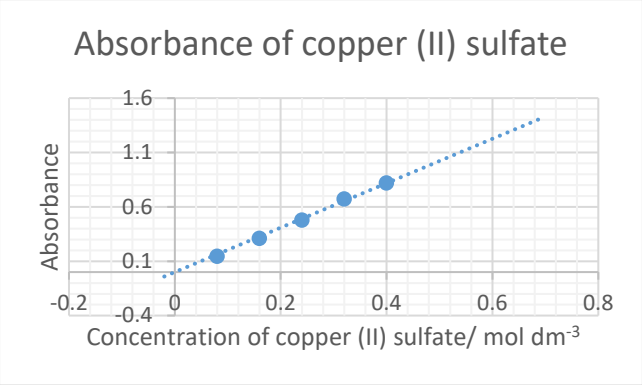
Ignore missing or incorrect state symbols in an equation unless directed otherwise in the "Notes" column.

Question			Answers	Notes	Total
1.	(a)		158.12 «g mol^{-1}» ✓ «0.5000 dm^3 * 0.1500 mol dm^{-3} * 158.12 g mol^{-1} =» 11.86 «g $Na_2S_2O_3$» ✓	*Award **[2]** for correct final answer.*	**2**
1.	(b)		«fully» dissolve $Na_2S_2O_3$ in distilled/deionized water ✓ fill up to line/mark ✓ «stopper the flask and» turn flask over «several times»/shake/homogenize «the solution» ✓	*Marking points can be in any order.* *Accept "pure water" for "deionized water".* *Do **not** award any marks for preparation of solution by dilution.* *Penalize missing deionized/distilled once only in both 1b and 1c.*	**3**
1.	(c)		«100.0 cm^3 * 0.03000 mol dm^{-3}/0.1500mol dm^{-3} =» 20.00 «cm^3» ✓ *Any two of:* use volumetric/graduated pipette «to remove 20.00 cm^3» ***OR*** burette «to transfer 20.00 cm^3» ✓ use 100 cm^3 volumetric flask ✓ fill to mark/line with deionized/distilled water ✓ «stopper the flask and» turn flask over «several times» shake/homogenize «the solution» ✓	*Accept "0.02000 dm^3" for M1.* *Do **not** accept graduated cylinder for M2.* *Penalize missing deionized/distilled once only in both 1b and 1c.*	**3 Max**
1.	(d)		at lower concentration/mass/moles «of thiosulfate» is smaller ***AND*** relative value of uncertainty is larger ✓	*Accept explanation using equations.*	**1**

Question			Answers	Notes	Total
1.	(e)		**Alternative 1** *Safety:* SO_2 (g) ***AND*** corrosive/irritant/toxic/acidic «to respiratory tract» ✓ ***OR*** SO_2 (g) ***AND*** severe skin burn ***OR*** SO_2 (g) ***AND*** eye damage *Precaution:* use fume hood/well-ventilated lab/outdoors «to avoid inhaling fumes» ***OR*** safety goggles/glasses/gloves ***OR*** use respirator ✓ **Alternative 2** *Safety concern:* S(s) ***AND*** flammable ***OR*** S(s) ***AND*** harmful if swallowed/throat irritant ***OR*** S(s) ***AND*** skin/respiratory tract/eye irritant ✓ *Precaution:* keep away from heat/flame ***OR*** keep tightly sealed/explosive free container ***OR*** safety goggles/glasses ***OR*** wear protective clothing/gloves/skin covering ✓	*Apply List Principle to both M1* ***AND*** *M2.* *Do* ***not*** *accept environmental hazards for SO_2.* *Do* ***not*** *penalize list principle for SO_2 if second safety concern is related to environmental hazards.* *Do* ***not*** *accept "use mask" for* ***Alternative 1*** *SO_2 (g) Precaution.* *Accept "S(s)* ***AND*** *allergen" for M1 for* ***Alternative 2.*** *Do* ***not*** *accept HCl(aq) for M1 as question asks for product not reactant but award M2 as ECF if Precaution correct for HCl(aq) "safety goggles/glasses* ***OR*** *wear protective clothing/gloves/skin covering"*	**2**

Question			Answers	Notes	Total
2.	**(a)**		*Any four of:* use magnet to remove iron/Fe ✓ add «excess» water to dissolve salt/NaCl ✓ filter/wash sand «into saltwater filtrate»✓ allow/heat sand to dry ✓ boil off/evaporate water from salt ***OR*** allow salt to dry overnight ✓	*Accept other reasonable orders to separations and names or formulas.* *Accept references to NaCl(aq) for M2.* *Do **not** accept responses that include sifting, separating with a sieve, **OR** by particle size.* *Accept "distill off water from salt" for M5.*	**4 max**
2.	**(b)**		*Iron:* «$\frac{2.17}{5.62}\ x\ 100$ =» 38.6% ***AND*** *Sand:* «$\frac{1.98}{5.62} x 100 =$ »35.2 % ✓		**1**

Question			Answers	Notes	Total
2.	(c)		**Alternative 1** *Error:* sand/salt/sample wet/contains water when weighed ✓ *Reduce or Eliminate:* heat/dry to a constant mass ✓ **Alternative 2** *Error:* iron oxidized ***OR*** iron changed to Fe_2O_3/FeO/rust ✓ *Reduce or Eliminate:* reduce time iron is exposed to air/water ***OR*** mix with water after removing the iron ✓	*Accept formulas or names.* *Do **not** accept systematic, random, or human error.* *Do **not** accept heat without idea of constant mass for Alternative 1 M2.*	**2**
2.	(d)		iron has high density «as compared to salt and sand» ***OR*** «salt, sand, and iron» do not have the same density ✓	*Accept "smaller volume/quantity can have larger percent mass comparatively".* *Do **not** accept answers related to molar mass alone.* *Do **not** accept answers repeating data from table.* *Accept answers related to "Fe_2O_3/rust increasing percent by mass" if student used Alternative 2 for 2c.*	**1**

Question			Answers	Notes	Total
3.	(a)		 reasonable line of best fit ✓ extrapolated past data given «extended beyond 0.08 ***AND*** 0.4 mol dm^{-3}» ✓	*Line can touch all data points.* *Accept range of extrapolation through origin to 0.02 mol dm^{-3}* ***AND*** *past data given for M2. Line can extend beyond graph range.*	**2**
3.	(b)		«directly/positively» proportional ***OR*** positive linear ✓	*Accept answers based on y=mx«+b».* *Accept "«directly/positively» proportional OR positive linear" if extrapolation started from 0.02 mol dm-3.* *Do* ***not*** *accept "positive correlation" alone.*	**1**

Question			Answers	Notes	Total
3.	**(c)**		gradient = 2.0 ✓ absorbance/A = 2.0 concentration/C ***OR*** y= 2.0 x ✓	*Accept gradient/slope range of 1.9-2.3 for M1.* *Accept "y=mx+b" with range of –0.03-0 for b.* *Do **not** accept equation with +b values for M2.*	**2**
3.	**(d)**		1.22 ✓	*Accept answer in the range of 1.20-1.30.* *Do **not** ECF from calculation as error is contradiction to graph.*	**1**