

2006 Senior External Examination

Chemistry

Paper Two

Wednesday 25 October 2006

1.00 pm to 3.10 pm



Directions

1. Perusal time: **10 minutes**.

You may make notes in this paper during perusal time.

A page for planning is on the reverse of this cover.

2. Working time: **2 hours**.

3. Materials provided:

- resource book
- response book.

4. Equipment allowed:

- any hand-held, solar- or battery-operated non-programmable calculator
- pens (blue or black ink). Do not use pencil
- normal writing implements
- other QSA-approved equipment.

This paper is an **open book** examination. You may refer to any paper-based written or printed material that you have brought into the examination room. You may make notes on your material at any time during the examination.

5. This paper has **five** complex reasoning processes questions.

Attempt **four** of the **five** questions.

Give full reasoning.

6. You may take this paper with you when you leave the examination room.

Notes

Assessment:

This paper assesses the following criterion published in the 1998 Senior External Syllabus in Chemistry:

- Complex reasoning processes.

Criteria and standards for assessment are on page 3 of this paper.

Planning space

There are **five** complex reasoning processes questions in this paper. All questions are of equal value.

Respond to only **four** questions.

Write your responses in the response book provided.

Assessment criteria specific to each question are printed in the response book.

In your response give full reasoning, explaining as fully as you can in terms of your knowledge and application of chemistry, and using the range of scientific processes and complex reasoning objectives learned throughout your study of the subject.

Refer to page 1 of the response book for instructions on how to use and identify any sources of information that you use in your responses.

Question 1 — Partial pressures of gaseous mixture

A gaseous mixture contains equal masses of ethane C_2H_6 and carbon dioxide CO_2 . The partial pressure of the ethane is 22.0 torr. Calculate the partial pressure of the carbon dioxide.

$$(1 \text{ atm} = 760 \text{ torr} = 760 \text{ mm Hg} = 101.3 \text{ kPa})$$

Question 2 — Oxidation of oxalic acid

Oxalic acid is a pure white crystalline substance with the formula $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$. Because of its purity, it makes an excellent primary standard for the determination of concentrations of dilute solutions of potassium permanganate in the presence of an acidic solution.

Write and balance the equation for the reaction between an oxalic acid solution and potassium permanganate in a dilute solution of sulfuric acid.

Question 3 — Determination of composition of gas mixture

A 12 mL mixture of ethyne (also called acetylene) and methane gases was exploded with excess air. The residual gases were passed over potassium hydroxide at room temperature. It was found that 17 mL of the residual gas was absorbed.

Find the volume of each gas in the original mixture.

Question 4 — Isomers of C_4H_8

Write the full structural formulae and names for all the structural and geometric isomers of C_4H_8 .

Question 5 — Separating metal ions

A mineral was analysed and found to contain copper, silver and nickel. A large sample was reacted with nitric acid in order to separate the metals in the form of their ions, from which the metals could be recovered and purified if so desired.

Describe how copper ions, silver ions and nickel ions could be separated using suitable chemical theories and practices. Clear explanations must be given throughout.

End of Paper Two

Minimum standards associated with exit criteria

	Very High Achievement	High Achievement	Sound Achievement	Limited Achievement	Very Limited Achievement
<p>Complex reasoning processes</p>	<p>A high ability to use complex reasoning in challenging situations involving the candidate's understanding of subject matter, and a high ability to use scientific processes at an advanced level.</p>	<p>Competence in using complex reasoning in challenging situations involving the candidate's understanding of subject matter, and competence in using scientific processes at an advanced level.</p>	<p>Some success in using complex reasoning in challenging situations involving the candidate's understanding of subject matter, and some success in using scientific processes at an advanced level.</p>		