



Western Australian Certificate of Education Examination, 2013

Question/Answer Booklet

CHEMISTRY

Stage 2

Please place your student identification label in this box

Student Number: In figures

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In words

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Time allowed for this paper

Reading time before commencing work: ten minutes

Working time for paper: three hours

Materials required/recommended for this paper

To be provided by the supervisor

This Question/Answer Booklet

Multiple-choice Answer Sheet

Chemistry Data Sheet

Number of additional
answer booklets used
(if applicable):

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To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,
correction fluid/tape, eraser, ruler, highlighters

Special items: non-programmable calculators approved for use in the WACE examinations

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Suggested working time (minutes)	Marks available	Percentage of exam
Section One: Multiple-choice	25	25	45	25	25
Section Two: Short answer	12	12	70	101	40
Section Three: Extended answer	5	5	65	86	35
Total					100

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2013*. Sitting this examination implies that you agree to abide by these rules.

2. Answer the questions according to the following instructions.

Section One: Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Sections Two and Three: Write your answers in this Question/Answer Booklet.

3. When calculating numerical answers, show your working or reasoning clearly. Express numerical answers to **three** significant figures and include appropriate units where applicable.
4. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.
5. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
 - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
 - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.
6. The Chemistry Data Sheet is **not** handed in with your Question/Answer Booklet.

See next page

Section One: Multiple-choice

25% (25 Marks)

This section has **25** questions. Answer **all** questions on the separate Multiple-choice Answer Sheet provided. For each question, shade the box to indicate your answer. Use only a blue or black pen to shade the boxes. If you make a mistake, place a cross through that square, then shade your new answer. Do not erase or use correction fluid/tape. Marks will not be deducted for incorrect answers. No marks will be given if more than one answer is completed for any question.

Suggested working time: 45 minutes.

1. Homogeneous mixtures are sometimes referred to as 'solutions'. Which one of the following statements about solutions is true?
- (a) All solutions are made by dissolving a solid in a liquid.
 - (b) The properties of solutions remain constant throughout.
 - (c) Solutions are pure compounds.
 - (d) Solutions become more homogeneous as they are heated.
2. When a gas is cooled in a sealed, rigid container, the
- (a) pressure increases.
 - (b) volume and pressure decrease.
 - (c) pressure decreases.
 - (d) pressure might increase or decrease depending on the size of the gas particles.
3. Water boils
- (a) when its vapour pressure equals the surrounding atmospheric pressure.
 - (b) when its temperature reaches 100 °C.
 - (c) at its surface when it is heated and exposed to atmospheric pressure.
 - (d) when its particles become hot enough to move quickly throughout the liquid.
4. Which of the following describes what will happen to a solution's vapour pressure, melting point and boiling point as the concentration of its solute particles increases from 0.2 mol L⁻¹ to 3 mol L⁻¹?
- | | vapour pressure | melting point | boiling point |
|-----|-----------------|---------------|---------------|
| (a) | increases | increases | decreases |
| (b) | decreases | decreases | decreases |
| (c) | increases | increases | increases |
| (d) | decreases | decreases | increases |
5. An ammonia solution that is 8 mol L⁻¹ is best described as a
- (a) concentrated weak base.
 - (b) dilute weak base.
 - (c) concentrated strong base.
 - (d) dilute strong base.

See next page

6. Which one of the following lists the solutions, all 0.1 mol L^{-1} , in order of increasing electrical conductivity?

- | | | | |
|-----|-------------------------------------|-------------------------------------|------------------------------------|
| (a) | $\text{HNO}_3(\text{aq})$ | $\text{CH}_3\text{COOH}(\text{aq})$ | $\text{H}_2\text{SO}_4(\text{aq})$ |
| (b) | $\text{CH}_3\text{COOH}(\text{aq})$ | $\text{NaCl}(\text{aq})$ | $\text{MgCl}_2(\text{aq})$ |
| (c) | $\text{H}_2\text{SO}_4(\text{aq})$ | $\text{CH}_3\text{COOH}(\text{aq})$ | $\text{HNO}_3(\text{aq})$ |
| (d) | $\text{MgF}_2(\text{aq})$ | $\text{KI}(\text{aq})$ | $\text{HCl}(\text{aq})$ |

7. Which one of the following has the greatest hydrogen ion concentration?

- (a) $0.1 \text{ mol L}^{-1} \text{HCl}(\text{aq})$
(b) $0.1 \text{ mol L}^{-1} \text{CH}_3\text{COOH}(\text{aq})$
(c) $0.1 \text{ mol L}^{-1} \text{H}_2\text{SO}_4(\text{aq})$
(d) $0.1 \text{ mol L}^{-1} \text{HNO}_3(\text{aq})$

8. Which one of the following statements about elements in Groups 1 and 2 on the Periodic Table is correct?

- (a) They can only become positively charged and form strong covalent molecules.
(b) They form negative ions because they have few valence electrons.
(c) They can either lose or share electrons to form positive ions or a strong metallic lattice.
(d) They can form positive ions because they have loosely held valence electrons.

9. Use the table to identify a pair of isotopes.

Element	Number of protons	Number of electrons	Number of neutrons
W	20	21	21
X	19	18	19
Y	19	21	19
Z	20	19	20

- (a) Elements X and W
(b) Elements X and Y
(c) Elements W and Z
(d) Elements Y and W
10. Which one of the following ions carries a negative two charge?
- (a) sulfite
(b) phosphate
(c) nitride
(d) nitrate

11. The common name for dihydrogenmonoxide is
- (a) ammonia.
 - (b) hydrogen peroxide.
 - (c) hydroxide ion.
 - (d) water.
12. What is the molar mass of calcium oxide (CaO)?
- (a) 32.00 g mol⁻¹
 - (b) 40.08 g mol⁻¹
 - (c) 56.08 g mol⁻¹
 - (d) 72.08 g mol⁻¹
13. When considering a chemical reaction where reactants are changed into products, several characteristics can be determined. These include mass, charge, volume and number of particles. Which one of the following does **not** change during a chemical reaction?
- (a) the total mass and volume of the system and net charge
 - (b) the mass of the reactants and the number of their atoms
 - (c) the total volume of the system and the number of product atoms
 - (d) the total mass of the system, the total charge and number of atoms
14. In an endothermic reaction, the
- (a) reactants absorb heat and so the reaction container would feel cold.
 - (b) reactants absorb heat and so now have lower enthalpy.
 - (c) products will have lower enthalpy.
 - (d) heat of reaction is negative as the products have lower energy.
15. In enthalpy equations, the symbol used to depict the heat lost or gained is
- (a) H.
 - (b) ΔH .
 - (c) E_a .
 - (d) pH.
16. Which one of the following changes would have the **least** effect on the rate of reaction between a block of magnesium metal and 0.01 mol L⁻¹ hydrochloric acid?
- (a) doubling the temperature of the hydrochloric acid
 - (b) using tap water rather than distilled water in preparing the hydrochloric acid
 - (c) using magnesium powder rather than a block of magnesium
 - (d) changing the concentration of hydrochloric acid to 2.00 mol L⁻¹

17. In an investigation, the volume of a gas produced during a reaction was measured every five seconds and plotted on a graph until the reaction stopped. This was repeated for the same reaction at different temperatures. The aim of the investigation was to determine

- (a) the rate of this reaction.
- (b) the effect of time on the rate of this reaction.
- (c) the effect of temperature on the rate of this reaction.
- (d) the effect of gas volume on the rate of this reaction.

18. Which one of the following sets of pH **best** corresponds to 0.1 mol L⁻¹ solutions of the stated substances?

	nitric acid	ammonia	sodium hydroxide
(a)	1	9	13
(b)	7	13	9
(c)	4	7	14
(d)	1	13	9

19. If a substance is oxidised, it means that

- (a) electrons have been transferred to it.
- (b) it has lost electrons.
- (c) it has produced oxygen in a reaction.
- (d) it can now donate oxygen to another substance.

20. In an electrolytic cell, the electrons flow

- (a) clockwise from the positive electrode to the negative electrode.
- (b) from the anode to the cathode.
- (c) through the solution to balance the charge build-up.
- (d) from the oxidising agent to the reducing agent.

21. Which one of the following is the correct molecular formula for benzene?

- (a) C₁H₂
- (b) C₆H₁₂
- (c) C₆H₁₄
- (d) C₆H₆

22. In the analysis of combustion reactions of hydrocarbons it is noticed that the reactions involve the
- (a) reduction of organic materials with oxygen gas.
 - (b) production of oxygen.
 - (c) production of water and oxygen.
 - (d) production of water and carbon dioxide.
23. Which one of the following correctly names a pair of geometrical isomers?
- (a) pentane and pentene
 - (b) *cis*-1,1-dichloro-pent-1-ene and *trans*-1,1-dichloro-pent-1-ene
 - (c) *cis*-pent-2-ene and *trans*-pent-2-ene
 - (d) 1,2-dibromopentane and 2,3-dibromopentane
24. When an aqueous solution of iodine is added to cyclohexane in the presence of ultraviolet light which one of the following is observed?
- (a) The brown solution fades.
 - (b) A purple solid appears.
 - (c) A yellow precipitate is formed.
 - (d) A colourless gas is evolved.
25. A difference between electro-winning and electro-refining is that one of the processes
- (a) uses electrolysis while the other uses a redox reaction.
 - (b) involves electroplating the desired metal onto the cathode while the other does not.
 - (c) uses an inert anode while the other uses an anode made of the unrefined impure metal.
 - (d) has the metal forming on the anode while the other has the metal forming on the cathode.

End of Section One

See next page

Section Two: Short answer

40% (101 Marks)

This section has **12** questions. Answer **all** questions. Write your answers in the space provided.

When calculating numerical answers, show your working or reasoning clearly. Express numerical answers to **three** significant figures and include appropriate units where applicable.

Do not use abbreviations, such as 'nr' for 'no reaction', without first defining them.

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- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.

Suggested working time: 70 minutes.

Question 26

(5 marks)

Interpreting the information contained in the symbol $^{34}_{16}\text{S}^{2-}$, answer the following questions.

The element represented is called _____

The ion shown has the following number of neutrons _____

The ion shown has the following number of electrons _____

The ion in this form has the following electron configuration _____

The ion has an electron configuration that is the same as the element called _____

Question 27

(6 marks)

(a) Complete the table below by writing the formula of each of the substance listed.

(3 marks)

Name	Formula
phosphoric acid	
magnesium oxide	
iron(II) sulfate	

(b) Complete the table below by writing the name of each of the substance listed. (3 marks)

Formula	Name
$\text{Fe}(\text{OH})_3$	
H_2PO_4^-	
CH_4	

See next page

Question 28

(4 marks)

For the species listed in the table below, draw electron dot diagrams.

All valence shell electron pairs should be represented either as : or as —

For example, water $\text{H} \begin{array}{c} \cdot\cdot \\ \cdot\cdot \\ \cdot\cdot \\ \cdot\cdot \end{array} \text{O} \begin{array}{c} \cdot\cdot \\ \cdot\cdot \\ \cdot\cdot \\ \cdot\cdot \end{array} \text{H}$ or $\text{H} - \begin{array}{c} \cdot\cdot \\ \cdot\cdot \\ \cdot\cdot \\ \cdot\cdot \end{array} \text{O} - \text{H}$ or $\text{H} - \overset{\cdot\cdot}{\underset{\cdot\cdot}{\text{O}}} - \text{H}$

Species	Electron dot diagram
Na_2S	
SO_2	

See next page

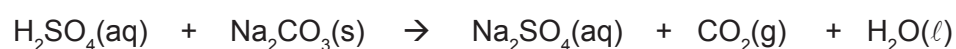
Question 29

(9 marks)

- (a) When solid zinc metal is dropped into a container of dilute hydrochloric acid it reacts. The solid dissolves and bubbles of a colourless gas are given off.

Write the balanced chemical equation for this reaction. Show only those species that take part in the reaction and use the appropriate state symbols. (3 marks)

- (b) When solid sodium carbonate is mixed with excess dilute sulfuric acid, a gas is produced according to the following equation.



- (i) If 10.0 moles of solid sodium carbonate is reacted, how many moles of carbon dioxide gas will be produced? (1 mark)

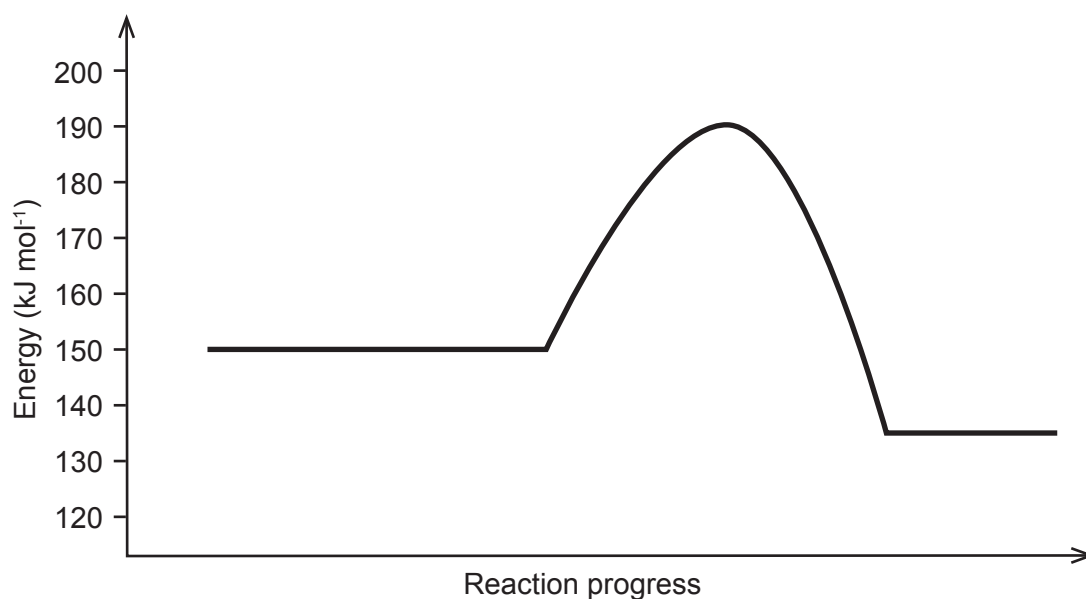
- (ii) What volume will this carbon dioxide gas occupy under standard conditions of temperature and pressure? (2 marks)

- (iii) If 10.0 moles of sulfuric acid react, what mass of water would be produced? (3 marks)

Question 30

(9 marks)

The energy profile diagram for a particular chemical reaction is given below. Use it to answer the following questions.



- (a) State the heat of reaction with the correct unit. (2 marks)

- (b) State the activation energy with the correct unit. (2 marks)

- (c) Circle whether this reaction, as represented in the energy profile diagram, is exothermic, endothermic or neither. (1 mark)

exothermic endothermic neither

- (d) Circle whether during this reaction, the temperature of the mixture in the reaction vessel (1 mark)

increases decreases stays the same

- (e) Circle whether in an exothermic reaction the amount of energy in the bond-breaking process is (1 mark)

greater than less than equal to

the amount of energy in the bond-forming process.

- (f) On the energy profile diagram above, sketch what the graph would look like if a catalyst was introduced into the system. (2 marks)

See next page

Question 31

(10 marks)

- (a) List **two** features of heterogeneous mixtures that make them different from homogeneous mixtures. (2 marks)

One: _____

Two: _____

- (b) Complete the table with the name of **one** example of each category. (4 marks)

Element	Compound	Heterogeneous mixture	Solution

- (c) In terms of electron transfer, explain how the atoms of magnesium and bromine can react together to form the ionic salt, magnesium bromide. (4 marks)

Question 32

The physical properties of substances are due to their bonding and structure.

- (a) Complete the following table, outlining the differences in the physical properties of calcium fluoride and fluorine. (6 marks)

	calcium fluoride	fluorine
Type of bonding		
Electrical conductivity as a solid (high, low, nil)		
Electrical conductivity as an aqueous solution (high, low, nil)		

- (b) (i) Does calcium fluoride or fluorine have the higher melting point? Circle your answer. (1 mark)

calcium fluoride

fluorine

- (ii) By describing the bonding present in each solid substance, explain the difference in melting points. (5 marks)

See next page

Question 32 (continued)

- (c) (i) Use labelled diagrams to show the bonding structure of solid calcium and solid calcium oxide. (2 marks)

solid calcium	
solid calcium iodide	

- (ii) Describe how this bonding structure affects each substance's electrical conductivity. (2 marks)

See next page

Question 33

(6 marks)

- (a) Some atoms can form single covalent bonds with another atom, some can form double covalent bonds and some can form triple covalent bonds. Carbon can form combinations of single, double and triple bonds with atoms at the same time.

Draw structural formulae showing the bonds of the following **molecules**. (4 marks)

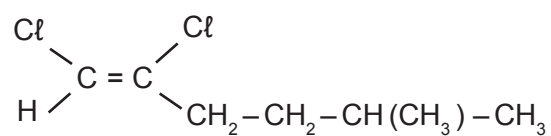
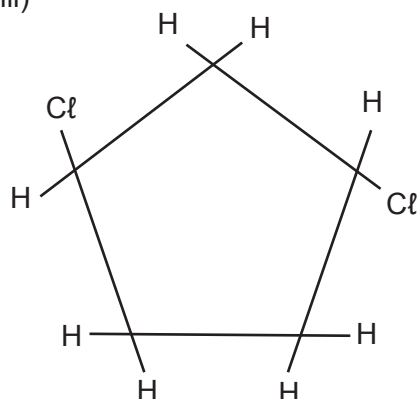
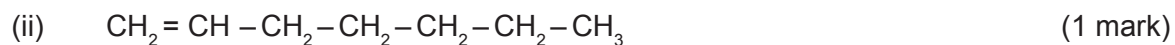
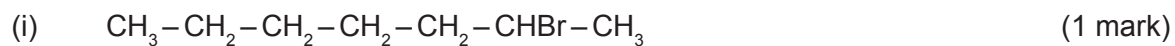
One carbon atom bonded only to hydrogen atoms	
One carbon atom bonded only to oxygen atoms	
One carbon atom bonded to only one oxygen and two hydrogen atoms	
One carbon atom bonded to one nitrogen and one hydrogen atom (The nitrogen is only bonded to the carbon atom.)	

- (b) Draw **two** structural isomers of butene, C_4H_8 . (2 marks)

Question 34

(7 marks)

(a) State the IUPAC name for each of the following organic compounds.



(b) Write the balanced equation for the combustion of methane gas (CH_4) in excess oxygen gas. (2 marks)

Question 35

(12 marks)

- (a) Write the balanced chemical equation for the reaction, if any, that takes place when the following substances are mixed as described. Only include those species that take part in the reaction. If no reaction occurs, write 'no reaction'.

- (i) Potassium carbonate solution is mixed with silver nitrate solution. (3 marks)

- (ii) Carbon dioxide gas is bubbled through distilled water. (3 marks)

- (b) Describe the predicted observations for the following reactions, if any, when each of the following substances is mixed as described. If no reaction occurs write, 'no observable change'.

- (i) Nickel, Ni(s), is added to a solution of silver nitrate, AgNO₃(aq). (2 marks)

- (ii) Copper(II) sulfate solution, CuSO₄(aq), is added to potassium carbonate solution, K₂CO₃(aq). (2 marks)

- (iii) Ammonium nitrate solution, NH₄NO₃(aq), is mixed with concentrated sodium hydroxide solution, NaOH(aq). (2 marks)

Question 36

(8 marks)

- (a) Write the structural formula for **one** organic product and any other products formed when pentane ($\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$) is mixed with chlorine gas (Cl_2) in the presence of UV light and a catalyst. (3 marks)

- (b) Write the structural formula for **one** organic product and any other products formed when pent-2-ene ($\text{CH}_3 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CH}_3$) is mixed with hydrogen gas (H_2) in the presence of UV light and a catalyst. (2 marks)

- (c) Bromine water ($\text{Br}_2(\text{aq})$) reacts differently with pentane and pent-2-ene. Describe the observations made when bromine water is added to samples of each and how this could be used to identify which sample was pentane and which sample was pent-2-ene. (3 marks)

See next page

Question 37

(9 marks)

Consider a 100.0 g sample of quartz (silicon dioxide, SiO_2) and a 100.0 g sample of carborundum (silicon carbide, SiC).

- (a) Calculate the percentage of silicon contained in each sample. (4 marks)

Answers:

Si in SiO_2 =	%	Si in SiC =	%
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- (b) Determine the number of moles of silicon in this quartz sample. (2 marks)

- (c) Determine the number of atoms of silicon in this quartz sample. (2 marks)

- (d) What mass of silicon is there in the 100.0 g sample of this sample of carborundum? (1 mark)

End of Section Two

See next page

Section Three: Extended answer

35% (86 Marks)

This section contains **five (5)** questions. You must answer **all** questions. Write your answers in the spaces provided.

When calculating numerical answers, show your working or reasoning clearly. Express numerical answers to **three** significant figures and include appropriate units where applicable.

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Suggested working time: 65 minutes.

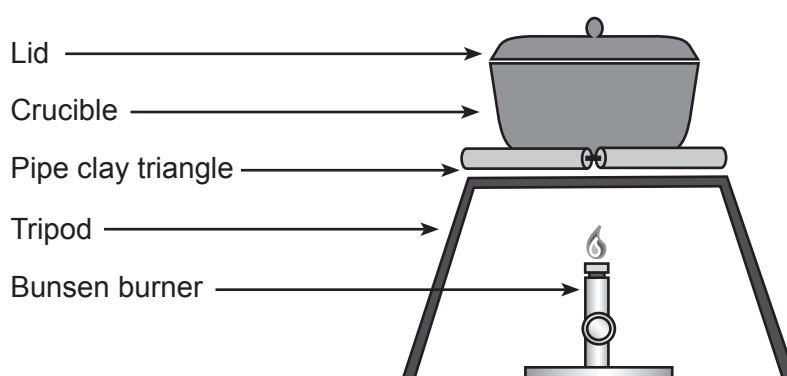
Question 38

(29 marks)

Some chemists decided to test the hypothesis that magnesium metal combines with oxygen in a 1 to 1 ratio, forming magnesium oxide with the formula MgO .

They used sandpaper to clean a strip of magnesium until it was smooth and shiny all over. They weighed a clean, dry crucible and its lid. Then they placed the strip of magnesium in the crucible, put on the lid and weighed it again.

To get the magnesium metal to react with the oxygen in the air, they heated it over a Bunsen burner flame as shown below. The chemists noticed that when they lifted the lid some white smoke appeared.



- (a) State **two** potential safety hazards of this experiment. (2 marks)

One: _____

Two: _____

See next page

- (b) Outline **two** safety procedures which would minimise the risk to the experimenter. (2 marks)

One: _____

Two: _____

- (c) Explain why the magnesium strip was cleaned with sandpaper before it was weighed. (1 mark)

- (d) Explain why the crucible and its contents were heated repeatedly and weighed rather than being heated and weighed just once. (1 mark)

- (e) Give **one** reason why using a lid to cover the crucible while heating was a good idea. (1 mark)

- (f) State **two** reasons for using the pipe clay triangle in this experiment. (2 marks)

One: _____

Two: _____

Question 38 (continued)

After four minutes of heating, the chemists took the crucible and lid off the tripod and weighed it. They repeatedly heated the crucible and its contents and then weighed it every four minutes until the mass stopped changing. They noticed that the shiny silvery strip was now a white powdery ash.

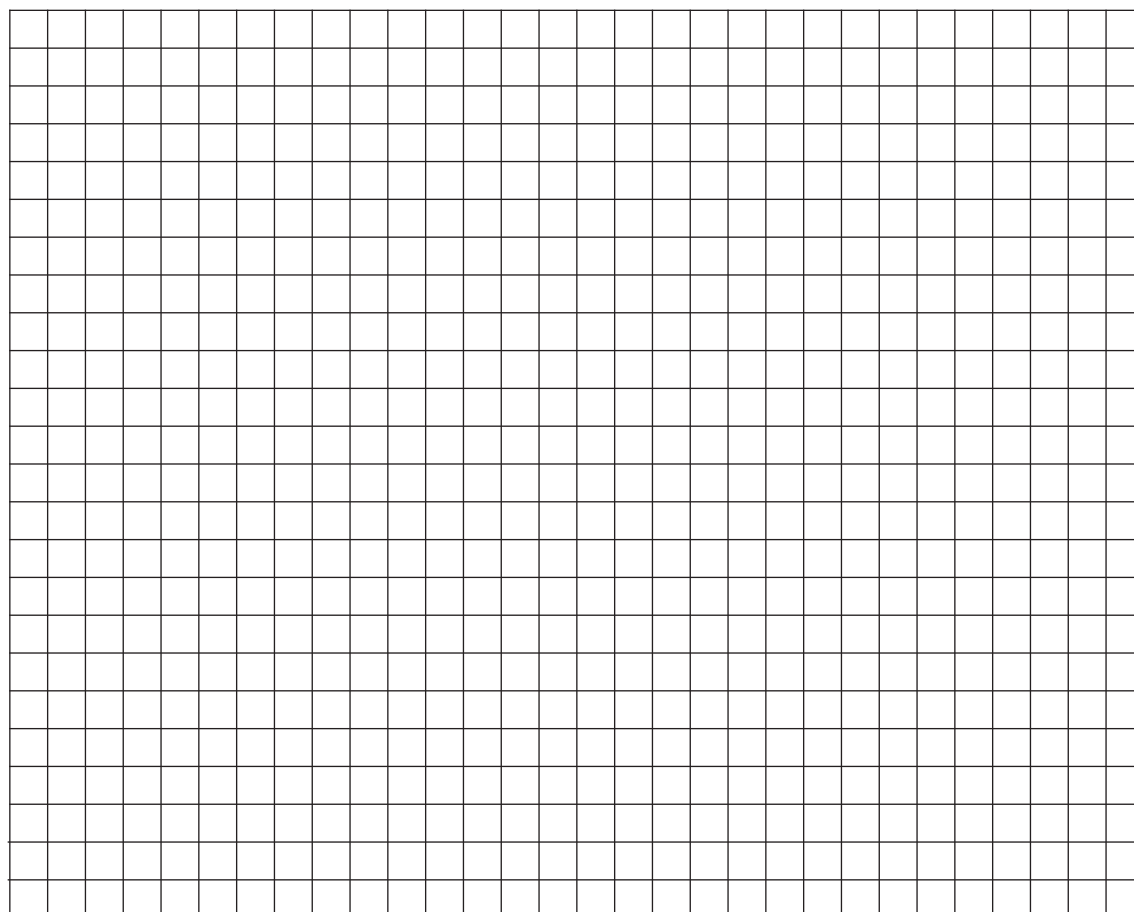
The measurements are shown below.

Mass of clean, dry crucible and lid 21.25 g

Mass of clean, dry crucible and lid plus strip of magnesium before heating 28.75 g

Mass (g) of crucible, lid and strip of magnesium after					
1st heating	2nd heating	3rd heating	4th heating	5th heating	6th heating
30.50	31.70	32.75	33.45	33.65	33.65

- (g) Graph the results using the **all seven** weighings of the crucible and its contents. (4 marks)



A spare grid is provided at the back of this Question/Answer Booklet. If you need to use it, cross out this attempt.

- (h) What was the mass of magnesium before it was heated? _____ (1 mark)
- (i) Calculate the total number of moles of magnesium metal before it was heated. (2 marks)

See next page

- (j) What was the total number of moles of magnesium present after it was heated? (1 mark)

- (k) Calculate the increase in mass of the crucible contents. (1 mark)

- (l) Why did the mass of the crucible contents increase? (1 mark)

- (m) Calculate the number of moles of oxygen in the magnesium oxide. (2 marks)

- (n) What is the simplest calculated ratio between magnesium and oxygen once they have combined to form the compound magnesium oxide? (2 marks)

- (o) Based on the experimental results, what conclusion should the experimenters have drawn about the formula of magnesium oxide? (2 marks)

- (p) State **two** sources of error in this experiment. (2 marks)

One: _____

Two: _____

- (q) Write the balanced equation for the reaction of magnesium and oxygen, showing their states of matter. (2 marks)

Question 39

(17 marks)

- (a) A gaseous organic compound, consisting of carbon, hydrogen and oxygen, was analysed by burning it in excess oxygen. When a 0.870 g sample of the compound was completely burnt, it had produced 1.98 g of carbon dioxide (CO_2) and 0.810 g of water (H_2O).

- (i) Determine the number of moles and the mass of carbon in the sample. (3 marks)

- (ii) Determine the number of moles and the mass of hydrogen in the sample. (3 marks)

- (iii) Determine the mass and the number of moles of oxygen in the sample. (2 marks)

See next page

- (iv) Determine the mole ratios of carbon, hydrogen and oxygen in the compound. (2 marks)

- (v) Answer: Empirical formula (1 mark)

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- (b) At STP 100.0 g of this compound occupied 39.7 L. What is the molecular formula of the organic compound? (6 marks)

Working:

[illegible]

Answer: Molecular formula

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Question 40

(10 marks)

In a chemical laboratory, the labels have fallen off three identical reagent bottles. Each bottle contains a colourless solution. The labels read:

sodium phosphate	ammonium carbonate	silver nitrate	sodium hydroxide
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Only three tests are required to distinguish between four unknown solutions.

Describe briefly three **chemical** tests that can be used to identify which label belongs with each of the four bottles. For every test, describe clearly the expected observations and how they are used to identify the unknown solution.

Note: You may use any reagent in your tests, but not acid-base indicators or a pH meter. No equations are required.

Test	Describe the test	Expected observations	Unknown substance
1			
2			
3			
4	The remaining label must therefore belong to _____		

See next page

Question 41

(12 marks)

- (a) Ammonia is found in household ammonia solution. List **two** uses for this solution in and around the home. (2 marks)

One: _____

Two: _____

- (b) Why is ammonia described as a weak base while sodium hydroxide is described as a strong base? Use chemical equations in your answer. (4 marks)

- (c) The label on a bottle that holds 2.50 kg of household ammonia solution states that it is a 5.00 % solution by mass of ammonia. Calculate the number of moles of ammonia that are in the bottle. Express your answer to **three** significant figures. (4 marks)

Working: _____

Answer to three significant figures:

- (d) A 2.50 kg bottle of household ammonia has a volume of 2.20 L. Express this concentration of ammonia in

- (i) mol L⁻¹. (1 mark)

- (ii) g L⁻¹. (1 mark)

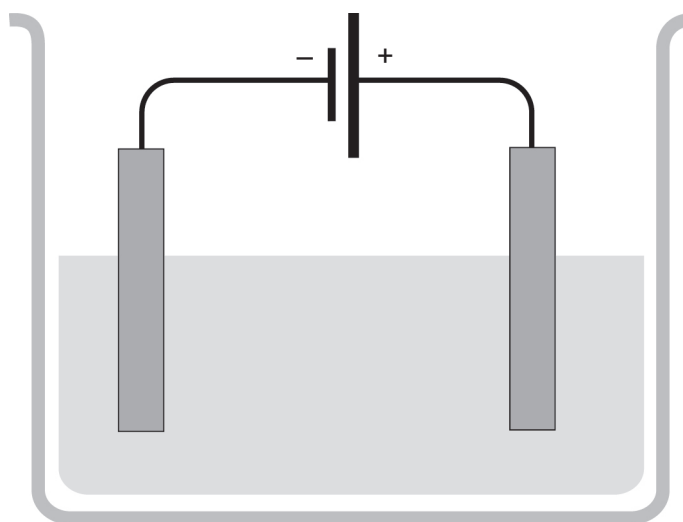
Question 42

(18 marks)

- (a) A quantity of pure chromium chloride (CrCl_3) is melted and placed in a heatproof vessel. Two inert electrodes are inserted as shown below and a current flows through the molten liquid. Complete and label the diagram below, showing the:

- anode
- cathode
- direction of electron current
- ions present and the direction in which they are flowing.

(5 marks)



- (b) Write the oxidation half equation. (2 marks)

- (c) Write the reduction half equation. (2 marks)

- (d) Write the overall redox equation. (2 marks)

- (e) Indicate (by circling) which process occurs at the electrode that is connected to the negative terminal. (1 mark)

oxidation

reduction

redox

- (f) What is acting as the oxidant in this reaction? (1 mark)

- (g) What is produced at the anode? (1 mark)

- (h) State the oxidation number of: (4 marks)

(i) Cr in solid chromium chloride _____

(ii) Cl in molten chromium chloride _____

(iii) Cr in chromium metal _____

(iv) Cl in chlorine gas _____

End of questions

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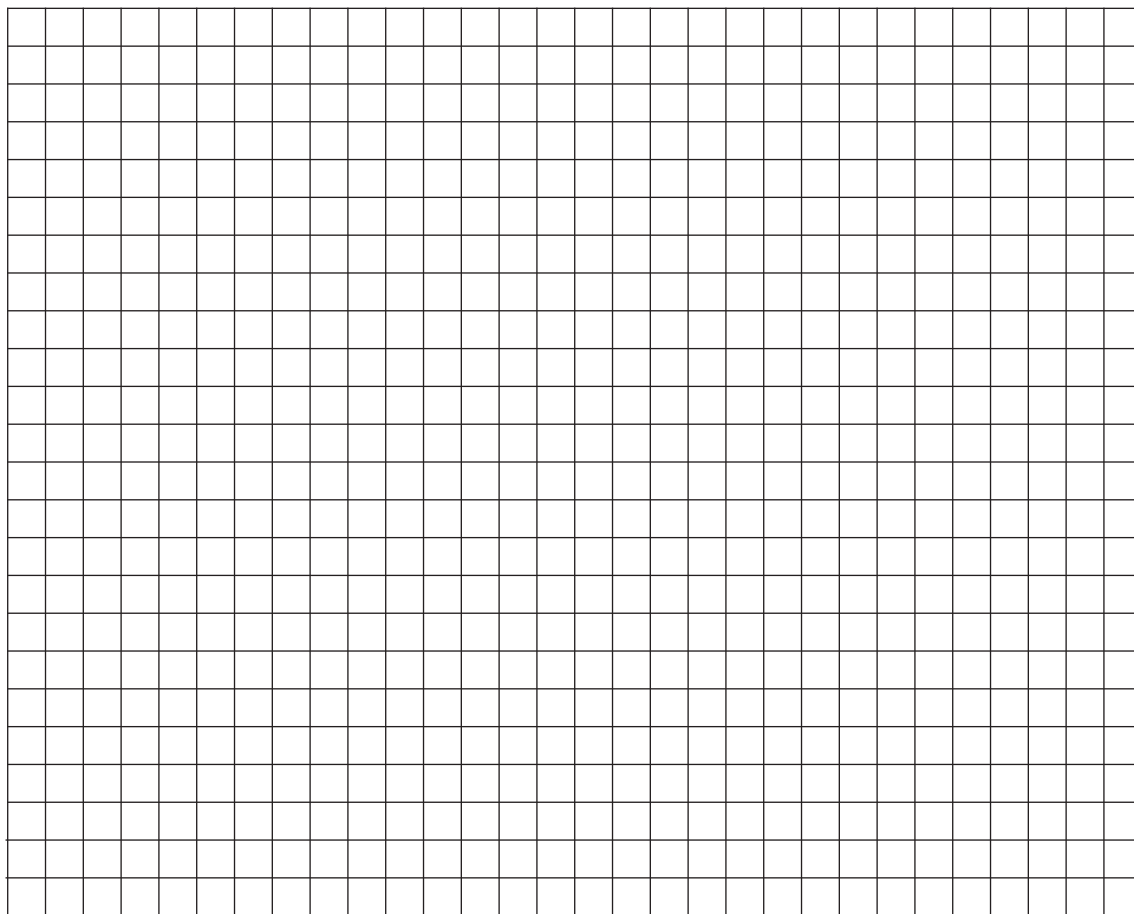
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Question 38 spare grid.



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