



**CHEMISTRY**

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

**MATERIAL REQUIRED/RECOMMENDED FOR THIS PAPER**

*TO BE PROVIDED BY THE SUPERVISOR*

This Question/Answer Booklet

Separate Multiple Choice Answer Sheet

Chemistry Data Sheet (inside front cover of this Question/Answer Booklet)

*TO BE PROVIDED BY THE CANDIDATE*

*Standard Items:* Pens, pencils, eraser or correction fluid, ruler

*Special Items:* Calculators satisfying the conditions set by the Curriculum Council and a 2B, B or HB pencil for the separate Multiple Choice Answer Sheet.

**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 THE PAPER

Part	Format	No. of Questions Set	No. of Questions to be Attempted	Marks Allocated	Recommended Time (Approx) /Minutes
1	Multiple choice	30	ALL	60 (30%)	55
2	Short answers	14	ALL	70 (35%)	60
3	Calculations	5	ALL	50 (25%)	45
4	Extended answers	3	1	20 (10%)	20

Total marks for paper = 200 (100%)

## INSTRUCTIONS TO CANDIDATES

**Reading Time:** The examiners recommend that candidates spend the reading time mainly reading the Instructions to Candidates and Parts 2, 3 and 4.

**Part 1 - Multiple Choice**

Use a 2B, B or HB pencil to answer on the separate Multiple Choice Answer Sheet. **Do not** use a ballpoint or ink pen.

If you consider that two or more of the alternative responses are correct, choose the one you think is best. If you think you know an answer, mark it even if you are not certain you are correct. Marks will **not** be deducted for incorrect answers.

FEEL FREE TO WRITE OR DO WORKING ON THE QUESTION PAPER; many students who score high marks in the Multiple Choice Section do this.

**Parts 2, 3 and 4**

Use a ballpoint or ink pen. **Do not** answer in pencil. Write your answers in this Question/Answer Booklet.

At the end of the examination make sure that your Student Number is on your Question/Answer Booklet and on your separate Multiple Choice Answer Sheet.

## CHEMICAL EQUATIONS

For full marks, chemical equations should refer only to those species consumed in the reaction and the new species produced. These species may be **ions** [for example  $\text{Ag}^+(\text{aq})$ ], **molecules** [for example  $\text{NH}_3(\text{g})$ ,  $\text{NH}_3(\text{aq})$ ,  $\text{CH}_3\text{COOH}(\text{l})$ ,  $\text{CH}_3\text{COOH}(\text{aq})$ ] or **solids** [for example  $\text{BaSO}_4(\text{s})$ ,  $\text{Cu}(\text{s})$ ,  $\text{Na}_2\text{CO}_3(\text{s})$ ].

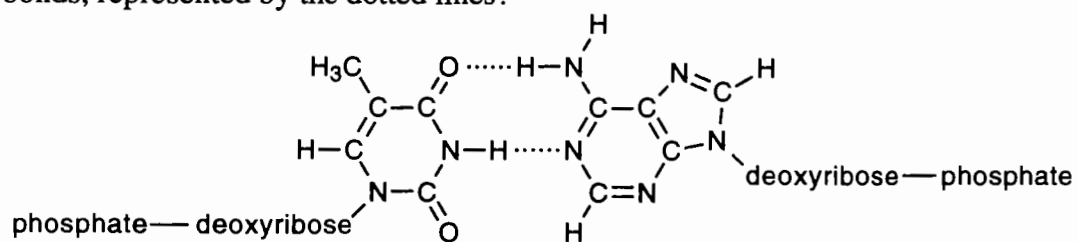
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7. Which of the following **best** explains the polarity of carbon dioxide?
- The  $\text{CO}_2$  molecule is non-polar because, although the carbon/oxygen bond is polar, the molecule is linear.
  - The  $\text{CO}_2$  molecule is non-polar because the valence electrons in the molecule are distributed evenly over the volume of the molecule.
  - The  $\text{CO}_2$  molecule is polar because O is more electronegative than C.
  - The  $\text{CO}_2$  molecule is polar because the molecule is bent (or V-shaped).
  - The  $\text{CO}_2$  molecule is polar because, both the molecule is bent (or V-shaped), and O is more electronegative than C.

8. Which of the following elements has the lowest melting point?

- barium
- lead
- magnesium
- silicon
- sulfur

9. The diagram shows part of the DNA double helix in which the bases thymine (on the left) and adenine (on the right) are linked. What is the name given to the linking bonds, represented by the dotted lines?



- covalent bonds
- hydrogen bonds
- ionic bonds
- metallic bonds
- nitrogen bonds

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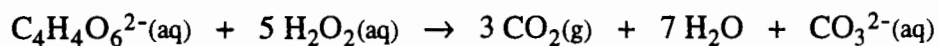
10. Which one of the following at 25°C is a good conductor of electricity?
- (a) 1,2-dichloroethane (ethylene dichloride),  $\text{ClCH}_2\text{CH}_2\text{Cl}(\ell)$
  - (b) sodium trichloroethanoate (sodium trichloroacetate),  $\text{CCl}_3\text{CO}_2\text{Na}(\text{s})$
  - (c) a water solution of sodium trichloroethanoate
  - (d) tellurium(II) chloride,  $\text{TeCl}_2(\text{s})$
  - (e) tin(IV) chloride,  $\text{SnCl}_4(\ell)$
11. A white crystalline solid dissolves in both dilute hydrochloric acid and dilute sodium hydroxide solution. Which one of the following could it be?
- (a) calcium carbonate
  - (b) hydrogen chloride
  - (c) iron(II) hydroxide
  - (d) iron(III) hydroxide
  - (e) sodium hydroxide
12. Which of the following **best** describes a condition which is necessary for the following reaction to be at equilibrium?
- $$\text{CH}_4(\text{g}) + \text{H}_2\text{O}(\text{g}) \rightleftharpoons \text{CO}(\text{g}) + 3 \text{H}_2(\text{g})$$
- (a) All species are present in equal concentrations.
  - (b) The concentrations of  $\text{CH}_4(\text{g})$ ,  $\text{H}_2\text{O}(\text{g})$  and  $\text{CO}(\text{g})$  are equal.
  - (c) The pressure in the reaction vessel remains constant.
  - (d) The ratio  $\frac{[\text{CO}] [\text{H}_2]^3}{[\text{CH}_4] [\text{H}_2\text{O}]}$  is equal to 1.
  - (e) The sum of the concentrations of all species is constant.

10. Which one of the following at 25°C is a good conductor of electricity?
- (a) 1,2-dichloroethane (ethylene dichloride),  $\text{ClCH}_2\text{CH}_2\text{Cl}(l)$
  - (b) sodium trichloroethanoate (sodium trichloroacetate),  $\text{CCl}_3\text{CO}_2\text{Na}(s)$
  - (c) a water solution of sodium trichloroethanoate
  - (d) tellurium(II) chloride,  $\text{TeCl}_2(s)$
  - (e) tin(IV) chloride,  $\text{SnCl}_4(l)$
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- (a) calcium carbonate
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  - (c) iron(II) hydroxide
  - (d) iron(III) hydroxide
  - (e) sodium hydroxide
12. Which of the following **best** describes a condition which is necessary for the following reaction to be at equilibrium?
- $$\text{CH}_4(g) + \text{H}_2\text{O}(g) \rightleftharpoons \text{CO}(g) + 3 \text{H}_2(g)$$
- (a) All species are present in equal concentrations.
  - (b) The concentrations of  $\text{CH}_4(g)$ ,  $\text{H}_2\text{O}(g)$  and  $\text{CO}(g)$  are equal.
  - (c) The pressure in the reaction vessel remains constant.
  - (d) The ratio  $\frac{[\text{CO}] [\text{H}_2]^3}{[\text{CH}_4] [\text{H}_2\text{O}]}$  is equal to 1.
  - (e) The sum of the concentrations of all species is constant.

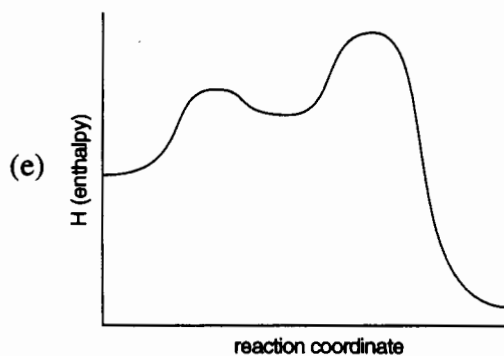
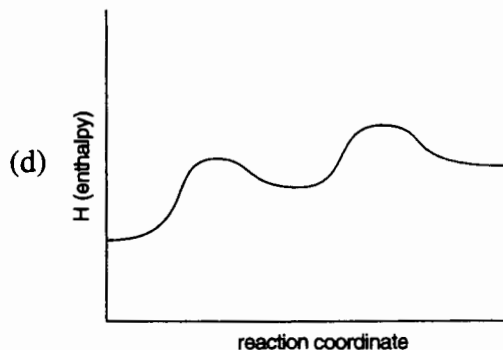
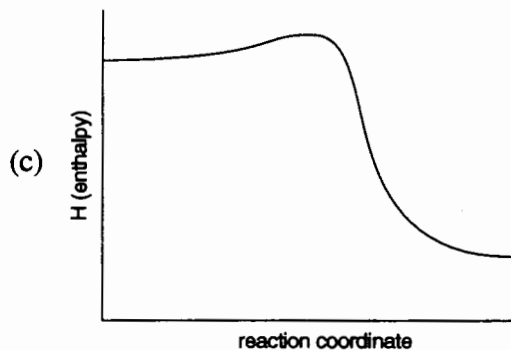
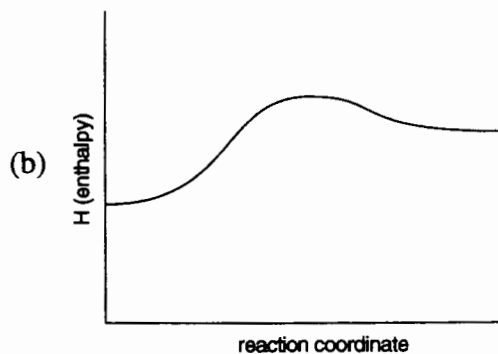
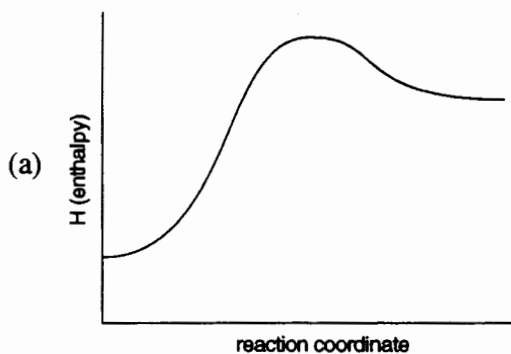
13. In the laboratory under the heading 'Effect of catalysts on reaction rate' you may have carried out the following experiment.

- Some hydrogen peroxide solution is added to sodium potassium tartrate solution: there is no evidence of reaction.
- The mixture is then heated to 65°C: there is still no evidence of reaction.
- A few drops of cobalt chloride solution are then added: the red colour of the cobalt changes to blue; the reaction mixture bubbles violently and the temperature rises rapidly; and after a few seconds the bubbles stop forming and the red colour returns.

The overall reaction is

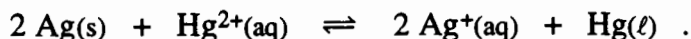


Which one of the following reaction profiles is consistent with the experiment?



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14. In 50.0 mL of solution, silver metal and mercury(II) ion have reacted and established equilibrium according to the equation



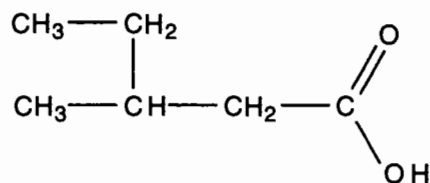
At equilibrium, the concentration of mercury(II) ion is  $0.00020 \text{ mol L}^{-1}$  and the concentration of silver ion is  $0.10 \text{ mol L}^{-1}$ . [Solid silver and liquid mercury are also present.] Water is added to the solution so that the volume increases to 100.0 mL, and the mixture is then shaken. What is the new equilibrium concentration of mercury(II) ion?

- (a) less than  $0.00010 \text{ mol L}^{-1}$
- (b)  $0.00010 \text{ mol L}^{-1}$
- (c) between  $0.00010$  and  $0.00020 \text{ mol L}^{-1}$
- (d)  $0.00020 \text{ mol L}^{-1}$
- (e) greater than  $0.00020 \text{ mol L}^{-1}$
15. Which one of the following solutions has a pH greater than 7?
- (a)  $0.010 \text{ mol L}^{-1}$  aluminium nitrate
- (b)  $0.010 \text{ mol L}^{-1}$  ammonium chloride
- (c)  $0.010 \text{ mol L}^{-1}$  barium nitrate
- (d)  $0.010 \text{ mol L}^{-1}$  rubidium chloride
- (e)  $0.010 \text{ mol L}^{-1}$  sodium acetate (sodium ethanoate)
16. Sodium hydroxide solution is added from a burette to 1.000 L of a solution of  $1.000 \text{ mol L}^{-1}$  phosphoric acid. How many moles of NaOH are required to reach the final equivalence point?
- (a) 1.00 mol
- (b) between 1.00 mol and 2.00 mol
- (c) 2.00 mol
- (d) between 2.00 mol and 3.00 mol
- (e) 3.00 mol

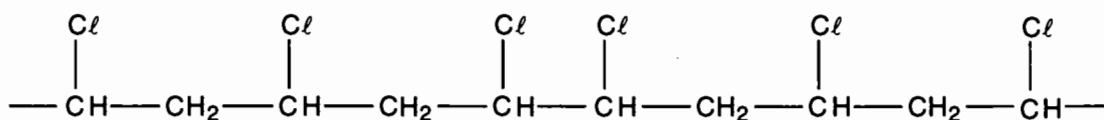
17. The indicator methyl red changes colour over the pH range 4.4 to 6.2, and the indicator phenolphthalein changes colour over the range 8.3 to 10.0. Which one of the following statements about the titration of  $0.100 \text{ mol L}^{-1}$  ammonia with  $0.100 \text{ mol L}^{-1}$  hydrochloric acid is true?
- (a) Methyl red is a suitable indicator because the solution is acidic at the equivalence point.
  - (b) Methyl red is a suitable indicator because the solution is basic at the equivalence point.
  - (c) Phenolphthalein is a suitable indicator because the solution is acidic at the equivalence point.
  - (d) Phenolphthalein is a suitable indicator because the solution is basic at the equivalence point.
  - (e) Either methyl red or phenolphthalein is suitable because the solution is neutral at the equivalence point.
18. A drop of water is added to a litre of pure liquid acetic acid (ethanoic acid) and the mixture shaken. Which of the following statements **best** describes the resulting solution?
- (a) It is a concentrated solution of a strong acid.
  - (b) It is a dilute solution of a strong acid.
  - (c) It is a concentrated solution of a weak acid.
  - (d) It is a dilute solution of a weak acid.
  - (e) It is not a true solution because there is insufficient solvent.
19. In which one of the following processes is water acting as a base?
- (a)  $\text{HNO}_3 + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{NO}_3^-$
  - (b)  $\text{H}_2\text{O}(\ell) \rightarrow \text{H}_2\text{O}(\text{g})$
  - (c)  $\text{NH}_3 + \text{H}_2\text{O} \rightarrow \text{NH}_4^+ + \text{OH}^-$
  - (d)  $\text{NaCl}(\text{s}) + \text{H}_2\text{O}(\ell) \rightarrow \text{Na}^+(\text{aq}) + \text{Cl}^-(\text{aq})$
  - (e)  $\text{O}^{2-} + \text{H}_2\text{O} \rightarrow 2 \text{OH}^-$

20. A dilute solution of lead nitrate is to be stored in a metal container. Which one of the following metals could be used?
- (a) aluminium
  - (b) copper
  - (c) iron
  - (d) nickel
  - (e) zinc
21. A solution containing both copper(II) chloride and zinc chloride is made so that the concentration of each salt is  $1 \text{ mol L}^{-1}$ . What is the first product formed at the cathode when the solution is electrolysed using platinum electrodes?
- (a) chlorine
  - (b) copper
  - (c) hydrogen
  - (d) oxygen
  - (e) zinc
22. Which of the following oxides has the highest acidity?
- (a)  $\text{Al}_2\text{O}_3$
  - (b)  $\text{CO}_2$
  - (c)  $\text{MgO}$
  - (d)  $\text{Na}_2\text{O}$
  - (e)  $\text{SO}_2$
23. A colourless liquid is known to be one of the following: a primary alcohol, a secondary alcohol, a tertiary alcohol, a ketone, or a carboxylic acid. When a sample of the liquid is shaken with a water-solution containing both potassium dichromate and sulfuric acid the orange colour of the solution changes to green. What can be concluded about the liquid?
- (a) It could be a primary alcohol or a secondary alcohol.
  - (b) It could be a tertiary alcohol only.
  - (c) It could be a tertiary alcohol or a ketone.
  - (d) It could be a tertiary alcohol, a ketone or a carboxylic acid.
  - (e) It could be a ketone or a carboxylic acid.

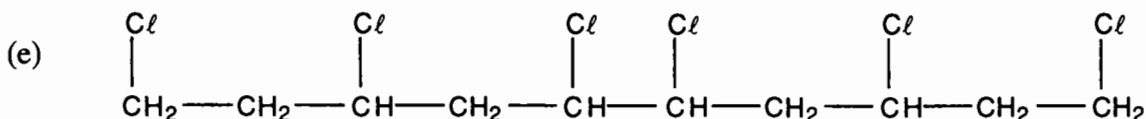
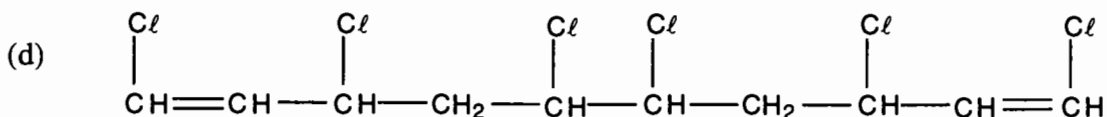
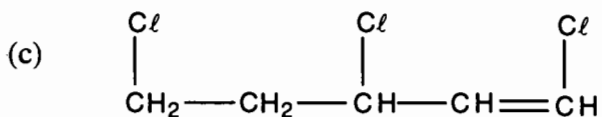
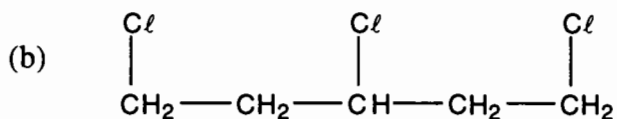
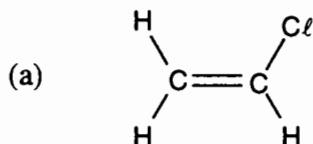
24. What is the systematic name for the following?



- (a) 2-ethylbutanoic acid  
 (b) 3-ethylbutanoic acid  
 (c) 2-ethylhexanoic acid  
 (d) 3-ethylhexanoic acid  
 (e) 3-methylpentanoic acid
25. An addition polymer is made from a single monomer. A part of the polymer is shown below.



Which one of the following compounds could have been the monomer?



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26. Which one of the following is a soap?
- (a)  $\text{CH}_3(\text{CH}_2)_{16}\text{CO}_2\text{Na}$
- (b) 
$$\begin{array}{c} \text{CH}_2\text{OOC}(\text{CH}_2)_{16}\text{CH}_3 \\ | \\ \text{CHOOC}(\text{CH}_2)_{16}\text{CH}_3 \\ | \\ \text{CH}_2\text{OOC}(\text{CH}_2)_{16}\text{CH}_3 \end{array}$$
- (c)  $\text{CH}_3\text{CH}_2\text{OH}$
- (d)  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$
- (e)  $\text{NaOH}$
27. Which one of the following is **not** a property of zinc?
- (a) Zinc dissolves in dilute hydrochloric acid to give chlorine gas.
- (b) Zinc exists as  $\text{Zn}^{2+}$  in most of its compounds.
- (c) Zinc forms the  $\text{Zn}(\text{NH}_3)_4^{2+}$  ion.
- (d) Zinc is a good reducing agent.
- (e) Zinc is malleable and ductile.
28. You should always take any exhausted dry cells (Leclanché cells) out of an appliance because of the risk that the cells will leak. Why are these dry cells likely to leak?
- (a) The ammonia reaction product formed during the operation of the dry cell is a gas which raises the pressure inside the zinc casing and causes it to burst.
- (b) The ammonium ion in the electrolyte of the dry cell is a weak acid and eventually dissolves the zinc casing of the cell.
- (c) The ammonium ion in the electrolyte of the dry cell is a weak acid which reacts with the zinc to produce hydrogen gas which raises the pressure inside the casing and causes it to burst.
- (d) The manganese dioxide oxidising agent in the dry cell will eventually come in contact with the zinc casing and corrode it.
- (e) The metal contacts of the appliance eventually oxidise the zinc casing and dissolve it.

29. Which one of the following equations represents a process which is **not** part of the industrial transformation of bauxite into aluminium?
- (a)  $Al_2O_3 + 3 H_2O + 2 OH^- \rightarrow 2 Al(OH)_4^-$
- (b)  $2 Al(OH)_4^- \rightarrow Al_2O_3 + 3 H_2O + 2 OH^-$
- (c)  $Al \rightarrow Al^{3+} + 3 e^-$
- (d)  $C + O^{2-} \rightarrow CO + 2 e^-$
- (e)  $C + 2 O^{2-} \rightarrow CO_2 + 4 e^-$
30. In the blast furnace, iron ore is converted into iron. Which one of the following statements about the operation of the blast furnace is **false**?
- (a) Carbon monoxide is the chief reagent which reduces iron oxide ( $Fe_2O_3$  or  $Fe_3O_4$ ) to iron.
- (b) Lime ( $CaO$ ) combines with silica ( $SiO_2$ ) to form molten calcium silicate ( $CaSiO_3$ ) which is the main constituent of slag.
- (c) Limestone ( $CaCO_3$ ) decomposes to produce carbon dioxide.
- (d) Molten iron is more dense than slag and falls to the bottom of the blast furnace.
- (e) The highest temperature in the blast furnace is towards the top.

END OF PART 1

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## PART 2

Answer ALL questions in Part 2 in the spaces provided below. This part carries 70 marks (35% of the total).

1. Write equations for any reactions that occur in the following procedures. If no reaction occurs write 'no reaction'.

In each case describe **in full** what you would observe, including any

- colours
- odours
- precipitates (give the colour)
- gases evolved (give the colour or describe as colourless).

If a reaction occurs but the change is not visible, you should state this.

- (a) Dilute hydrochloric acid is added to sodium acetate solution (sodium ethanoate solution).

Equation \_\_\_\_\_

Observation \_\_\_\_\_

\_\_\_\_\_

[3 marks]

- (b) Dilute sulfuric acid is added to cobalt carbonate.

Equation \_\_\_\_\_

Observation \_\_\_\_\_

\_\_\_\_\_

[3 marks]

- (c) Barium sulfate is shaken with dilute hydrochloric acid.

Equation \_\_\_\_\_

Observation \_\_\_\_\_

\_\_\_\_\_

[3 marks]

- (d) Cyclohexene is shaken with bromine water.

Equation \_\_\_\_\_

Observation \_\_\_\_\_

\_\_\_\_\_

[3 marks]

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2. The ten substances listed are important chemicals in industry or the home. Complete the table below by writing the **formula** of one of the substances which fits the description.

calcium oxide (quicklime)

sodium cyanide

copper

sodium hexafluoroaluminate (cryolite)

hydrochloric acid

sodium hydroxide

hydrogen

sulfur dioxide

octane

sulfuric acid

Description	Formula
A component of petrol	
A secondary standard used in many titrations	
Can be obtained by a disproportionation reaction	
Used as a food preservative	
Used for filling weather balloons	
Used in car batteries	
Used in making brick mortar for the building industry	
Used in the extraction of gold	
Used in the production of aluminium from bauxite	
Used to control the pH in swimming pools	

[5 marks]

3. The electron configuration of the lithium atom is  $1s^2 2s^1$ . Using the same notation, give the electron configuration of

(a) A sulfur atom \_\_\_\_\_

(b) A potassium ion \_\_\_\_\_

[2 marks]

SEE NEXT PAGE

4. For each molecule listed in the table below
- (i) draw the structural formula, representing **all** valence shell electron pairs either as : or as  $-$  [for example, water  $\text{H}:\ddot{\text{O}}:\text{H}$  or  $\text{H}-\ddot{\text{O}}-\text{H}$  or  $\text{H}-\ddot{\text{O}}-\text{H}$  and so on]
- (ii) indicate the shape of each molecule by either a sketch or a name

Molecule	Structural formula (showing all valence shell electrons)	Shape (sketch or name)
ammonia, $\text{NH}_3$		
carbon dioxide, $\text{CO}_2$		
chloromethane, $\text{CH}_3\text{Cl}$		

[6 marks]

5. Calcium carbide ( $\text{CaC}_2$ ) is ionic, and its crystal lattice contains  $\text{Ca}^{2+}$  and  $^-\text{C}\equiv\text{C}^-$  ions. In a caver's lamp, water is dripped on to lumps of calcium carbide. Acetylene (ethyne) is produced which lights the lamp. Write the equation for the reaction that occurs when water is dripped on to calcium carbide.

[2 marks]

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6. You are given the job of tidying-up a chemical storage area. Amongst the shelves you find two jars containing solids and two bottles containing liquids where the labels have fallen off. The labels read: 'sodium nitrate', 'sodium sulfate', '1 mol L<sup>-1</sup> hydrochloric acid' and '1 mol L<sup>-1</sup> nitric acid'.

Describe a simple chemical test that would allow you to put the correct label on each container. Give all steps, but equations are not required.

	Your chemical test. Describe fully	What you would observe in each case
sodium nitrate and sodium sulfate		with sodium nitrate
		with sodium sulfate
1 mol L <sup>-1</sup> hydrochloric acid and 1 mol L <sup>-1</sup> nitric acid		with 1 mol L <sup>-1</sup> hydrochloric acid
		with 1 mol L <sup>-1</sup> nitric acid

[4 marks]

7. Samarium (Sm) is a lanthanide metal. The following experiment is performed.
- 10.0 mL of a 0.100 mol L<sup>-1</sup> solution of a samarium chloride is treated with 0.100 mol L<sup>-1</sup> sodium hydroxide solution.
  - While 30 mL of the sodium hydroxide solution is being added with stirring a yellow precipitate forms.
  - When further sodium hydroxide solution is added no further precipitate forms.

Write the equation for the reaction that has occurred.

[2 marks]

8. When a solution of potassium bromide (KBr) is added to a solution containing potassium bromate ( $\text{KBrO}_3$ ) and sulfuric acid, the mixture turns orange which indicates that bromine is a reaction product. Work out the equation for the reaction that has occurred.

Oxidation half-equation
Reduction half-equation
Redox equation

[5 marks]

9. Two test-tubes are labelled 'X' and 'Y', and each contains a colourless solution. A few drops of potassium dichromate solution are added to each tube, and the observations set out in the table below. In each case give the oxidation number of the chromium in the product, and suggest what each of the colourless solutions could be.

	Oxidation number of Cr in the product	Suggested original contents of test-tube
With test-tube 'X' the orange of the potassium dichromate solution changes to yellow		
With test-tube 'Y' the orange of the potassium dichromate solution changes to green		

[4 marks]

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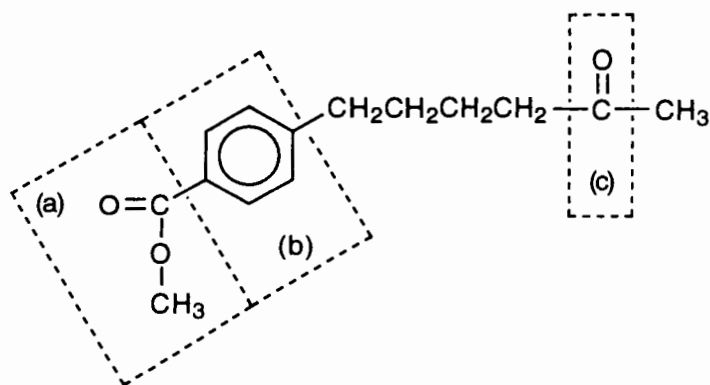
10. Draw structural formulae for and name all isomers of molecular formula  $C_4H_8$ .

Structures	Names

[8 marks]

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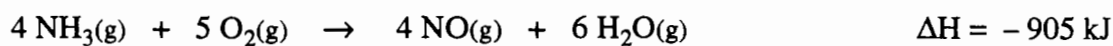
11. Name each of the indicated groups in the following molecule.



(a)	
(b)	
(c)	

[3 marks]

12. The Ostwald Process is the most widely used method for making nitric acid. In one step of the process ammonia is burnt in air at  $900^\circ\text{C}$ , at atmospheric pressure, and in the presence of a platinum/rhodium catalyst. The equation for the reaction is

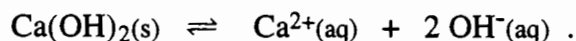


The system finally comes to equilibrium. Explain how each of the following factors affects both the rate of formation of nitrogen oxide and the yield of nitrogen oxide.

	Explanation (in terms of both rate and yield)
Why is a temperature of $900^\circ\text{C}$ used rather than room temperature?	
Why is a pressure of 1 atmosphere used rather than a higher or a lower pressure?	
Why is a catalyst used?	

[6 marks]

13. Calcium hydroxide is slightly soluble in water. The equilibrium established when solid  $\text{Ca}(\text{OH})_2$  is in contact with saturated solution is represented by



An equilibrium mixture of solid calcium hydroxide and its saturated solution is prepared. Four test-tubes are set up, each containing some of the equilibrium mixture—a little white solid under a colourless solution. Each of the tubes is treated as described below. In each case state how the equilibrium will shift, and what will be observed.

What is done	How the equilibrium shifts. Write '→', '←', or 'no change'	What is observed. Give the complete observation
A little concentrated hydrochloric acid is added to the first tube		
A little concentrated ( $3 \text{ mol L}^{-1}$ ) calcium chloride solution is added to the second tube		
A little solid calcium hydroxide is added to the third tube and the mixture shaken		
A little solid sodium chloride is added to the fourth tube and the mixture shaken		

[8 marks]

14. 10.00 mL of  $0.100 \text{ mol L}^{-1}$  hydrochloric acid is added to 15.00 mL of  $0.100 \text{ mol L}^{-1}$  sodium hydroxide. Calculate the pH of the resulting solution.

Working	
Answer	

[3 marks]

END OF PART 2

SEE NEXT PAGE





















## PART 4

Answer ONE of the following extended answer questions. Where applicable use equations, diagrams and illustrative examples of the chemistry you are describing.

Marks are awarded for the relevant chemical content of your answer, but you will lose marks if what you write is unclear or lacks coherence. Your answer should be presented in about 1½ - 2 pages, and should be written in the space beginning on page 33. This part carries 20 marks (10% of the total).

1. Across a row of the Periodic Table there are general trends in physical and chemical properties such as the following:
- the tendency for there to be metallic bonds in the element;
  - the tendency for the element to form ionic bonds in compounds;
  - the tendency for the element to form covalent bonds in compounds; and
  - the tendency for the element to act as an oxidising agent or a reducing agent.
- Choose a row of the Periodic Table; describe and explain how these characteristics change as you go across your chosen row.

OR

2. The melting-points and boiling-points of four substances are listed in the table below. Describe how an understanding of the forces between atoms in these substances can be used to explain the wide range of these values.

	Melting-point (°C)	Boiling-point (°C)
O <sub>2</sub>	-219	-183
H <sub>2</sub> O	0	100
KCl	770	1437
SiO <sub>2</sub>	1610	2230

OR

3. Write a general account of solubility and the preparation of solutions.

**END OF QUESTIONS****SEE NEXT PAGE**