



Cambridge O Level

CANDIDATE
NAME

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CHEMISTRY

5070/22

Paper 2 Theory

May/June 2026

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

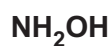
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [].
- The Periodic Table is printed in the question paper.

This document has **20** pages. Any blank pages are indicated.

- 1 Choose from the following compounds to answer the questions.



Each compound can be used once, more than once or not at all.

State which compound:

- (a) is an amphoteric oxide

..... [1]

- (b) has a molecule containing only two atoms

..... [1]

- (c) has a molecule with only 10 electrons

..... [1]

- (d) has an element with an oxidation number of +3

..... [1]

- (e) is an alkane.

..... [1]

[Total: 5]



- 2 Potassium superoxide, KO_2 , reacts with carbon dioxide to make potassium carbonate and oxygen.



- (a) A sample of 13.0 g of potassium superoxide reacts with excess carbon dioxide.

Calculate the volume of oxygen, measured at r.t.p., that is formed.

Give your answer to **three** significant figures.

volume of oxygen = dm^3 [3]

- (b) Potassium superoxide is an ionic compound.

Deduce the formula of a superoxide ion.

..... [1]

- (c) Potassium superoxide has a giant ionic lattice.

Explain what is meant by the term giant ionic lattice.

.....

 [1]

- (d) Describe the separation, arrangement and motion of particles in **solid** carbon dioxide.

.....

 [3]



- (e) Draw a dot-and-cross diagram to show the electronic configuration in a molecule of carbon dioxide.

Show only the outer shell electrons.

[2]

- (f) Explain why carbon dioxide has a low boiling point.

.....

..... [1]

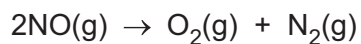
[Total: 11]





Turn over

- 3 The equation for one of the reactions that happens in a catalytic converter is shown.



This decomposition reaction is exothermic.

- (a) Complete the reaction pathway diagram in Figure 3.1 for this decomposition reaction.

Label the:

- axes
- reactants and products
- enthalpy change, ΔH .

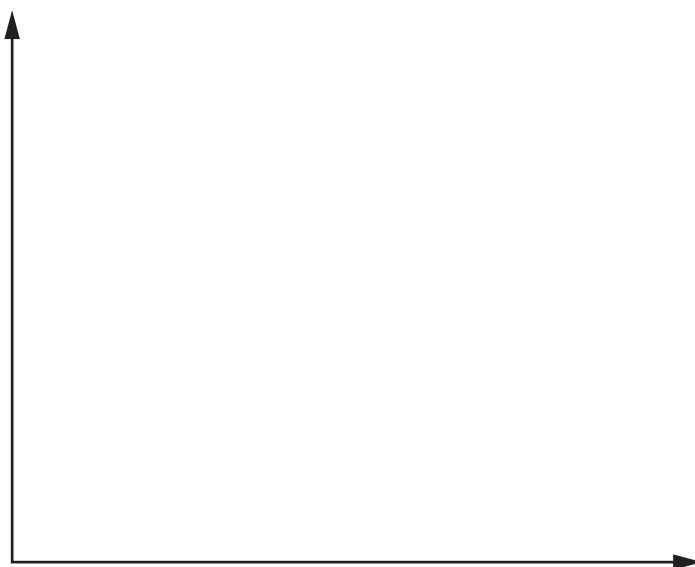


Figure 3.1

[3]

- (b) The rate of the decomposition reaction is increased by using a catalyst.

Explain how a catalyst increases the rate of the decomposition reaction.

.....
..... [1]

- (c) Suggest why it is important that the solid catalyst in a catalytic converter has a large surface area.

.....
..... [1]



- (d) The rate of the decomposition reaction increases when the pressure of the reactants is increased at constant temperature.

Explain why.

.....

.....

..... [2]

- (e) The rate of the decomposition reaction increases when the temperature of the reactants is increased at constant pressure.

Explain why.

.....

.....

..... [2]

[Total: 9]

4 Copper(II) sulfate is an ionic compound.

(a) The electrolysis of aqueous copper(II) sulfate is done using copper or graphite electrodes.

Complete Table 4.1 about the observations made in the two electrolysis reactions.

Table 4.1

	observation at anode	observation at cathode
using copper electrodes		
using graphite electrodes		

[4]

(b) Molten barium iodide is electrolysed using graphite electrodes.

Construct ionic half-equations to show the reactions at the anode and at the cathode.

anode

cathode

[2]

(c) Graphite is a suitable material for the electrodes used in electrolysis because it is inert and has good electrical conductivity.

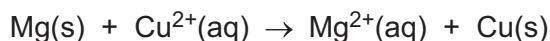
(i) State the meaning of the word inert.

..... [1]

(ii) Name one metal that is used as an inert electrode.

..... [1]

(d) The ionic equation for the reaction between magnesium and aqueous copper(II) sulfate is shown.



(i) State the oxidation number of copper in copper(II) sulfate.

..... [1]



(ii) The reaction is an example of a redox reaction.

Explain how the equation shows that both oxidation and reduction take place during the reaction.

oxidation

.....

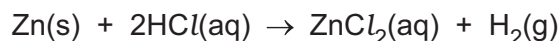
reduction

.....

[2]

[Total: 11]

- 5 Zinc chloride is prepared by reacting excess zinc with warm dilute hydrochloric acid.



- (a) Use the equation to predict **one** observation made during this reaction.

..... [1]

- (b) Explain why an excess of zinc is used in this preparation.

..... [1]

- (c) A sample of 3.24 g of zinc is added to 50.0 cm³ of 1.50 mol/dm³ hydrochloric acid.

Show by calculation that the zinc is in excess.

[3]

- (d) State how excess zinc is removed from the reaction mixture.

..... [1]

- (e) Describe how pure dry zinc chloride crystals are prepared from aqueous zinc chloride.

.....
.....
.....
.....
..... [3]



- (f) The formula of a sample of zinc chloride crystals is $\text{ZnCl}_2 \cdot 3\text{H}_2\text{O}$.

Calculate the percentage by mass of water of crystallisation in these crystals.

percentage by mass = [3]

- (g) Describe the effect of adding aqueous ammonia drop by drop until in excess to a sample of aqueous zinc chloride.

.....
.....
..... [2]

[Total: 14]

6 Copper and aluminium are metals.

Both metals have good electrical conductivity.

(a) Explain why both metals have good electrical conductivity.

Use ideas about structure and bonding.

.....
..... [1]

(b) Copper is a transition element but aluminium is **not**.

Aluminium has a lower melting point and boiling point than copper.

(i) Suggest one **other** difference between the physical properties of these two metals.

..... [1]

(ii) Suggest **one** difference between the chemical properties of these two metals.

..... [1]

(c) Copper is used to make the alloy brass.

(i) Name the main element mixed with copper to make brass.

..... [1]

(ii) Brass is harder than pure copper.

Explain why.

Use ideas about structure and bonding.

.....
.....
..... [2]

(d) Aluminium is used to manufacture food containers because of its resistance to corrosion.

(i) Explain why aluminium is resistant to corrosion.

.....
.....
..... [2]



- (ii) State one **other** use for aluminium and explain why aluminium is suitable for this use.

use

explanation

[2]

- (e) Aluminium is manufactured by the electrolysis of purified bauxite mixed with cryolite. Carbon electrodes are used.

- (i) Explain why cryolite is added to the purified bauxite.

.....

..... [1]

- (ii) Explain why the carbon anodes need to be regularly replaced.

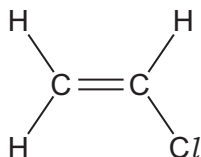
.....

..... [1]

[Total: 12]

- 7 Chloroethene is a monomer used to make poly(chloroethene).

The displayed formula of chloroethene is shown.



- (a) Draw the structure of poly(chloroethene).

[2]

- (b) There is an accumulation of plastics such as poly(chloroethene) in the oceans.

Suggest **two** properties of poly(chloroethene) that explain this accumulation.

1

2 [2]

- (c) Burning is used for the disposal of some plastics.

This method of disposal causes environmental challenges.

- (i) One of these challenges is the production of greenhouse gases.

Name a greenhouse gas produced by burning plastics.

..... [1]

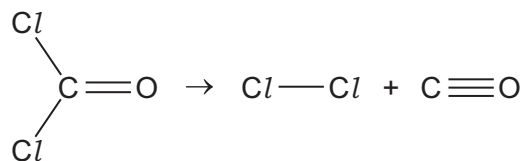
- (ii) Another environmental challenge is the production of toxic gases.

Name **one** toxic gas produced during the burning of plastics.

..... [1]



(d) Phosgene, COCl_2 , decomposes when heated strongly.



Show that the enthalpy change for the reaction is +101 kJ/mol.

Use the bond energies shown in Table 7.1.

Table 7.1

bond	bond energy in kJ/mol
$\text{C}=\text{O}$	740
$\text{C}-\text{Cl}$	340
$\text{Cl}-\text{Cl}$	242
$\text{C}\equiv\text{O}$	1077

[3]

[Total: 9]

8 This question is about carboxylic acids.

(a) Vinegar is an aqueous solution containing ethanoic acid.

During the production of vinegar, ethanoic acid is formed from ethanol.

Water is also formed as a product.

Describe the formation of ethanoic acid from ethanol during the production of vinegar.

Include a symbol equation for the formation of ethanoic acid from ethanol and the conditions for the production of vinegar.

.....
.....
.....
..... [2]

(b) Draw the displayed formula of butanoic acid.

[1]

(c) Ethyl ethanoate is a structural isomer of butanoic acid.

State the meaning of the term structural isomer.

.....
..... [1]



(d) Propanoic acid reacts with butan-1-ol to make an ester.

(i) Name the ester made in this reaction.

..... [1]

(ii) Draw the structural formula of the ester made in this reaction.

[1]

(iii) State **one** condition needed for this esterification reaction.

..... [1]

(e) Deduce the molecular formula of an unbranched carboxylic acid that has only eight carbon atoms in its molecule and no other functional groups.

..... [2]

[Total: 9]





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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII

lanthanoids

57	La	lanthanum	139	58	Ce	cerium	140	59	Pr	praseodymium	141	60	Nd	neodymium	144	61	Pm	promethium	—	62	Sm	samarium	150	63	Eu	euroium	152	64	Gd	gadolinium	157	65	Tb	terbium	159	66	Dy	dysprosium	163	67	Ho	holmium	165	68	Er	erbium	167	69	Tm	thulium	169	70	Yb	ytterbium	173	71	Lu	lutetium	175
89	Ac	actinium	—	90	Th	thorium	232	91	Pa	protactinium	231	92	U	uranium	238	93	Np	neptunium	—	94	Pu	plutonium	—	95	Am	americium	—	96	Cm	curium	—	97	Bk	berkelium	—	98	Cf	californium	—	99	Es	einsteinium	—	100	Fm	fermium	—	101	Md	merdelevium	—	102	No	nobelium	—	103	Lr	lawrencium	—

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).

