

Candidate Name _____

Centre Number	Candidate Number

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
CHEMISTRY
PAPER 2
OCTOBER/NOVEMBER SESSION 2001

0620/2

1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

A copy of the Periodic Table is printed on page 16.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
6	
7	
TOTAL	

This question paper consists of 16 printed pages.

- 1 Some jewellery is made from an alloy of gold and nickel.

Nickel is a transition element.

- (a) State two properties of transition metals that are not shown by other metals.

1.

2.[2]

- (b) Sweat from the skin is slightly acidic and reacts with jewellery containing nickel.

- (i) Suggest how you could find out the pH of the sweat on the surface of your skin.

.....

.....[2]

- (ii) Which one of the values represents a pH which is **slightly** acidic.

Put a ring around the correct answer.

pH 2 pH 6 pH 7 pH 8 pH 13 [1]

- (iii) Nickel ions are formed when nickel reacts with sweat.

These ions cause the skin to become very sensitive.

State what is meant by the term *ion*.

.....[1]

- (iv) Complete the equation to show the formation of nickel ions from nickel.



- (c) The table shows the volumes of gas produced in one minute when different metals reacted with hydrochloric acid. All other conditions remained the same in the experiment.

metal	volume of gas / cm ³
iron	8
magnesium	56
nickel	3
zinc	14

Put these metals in the correct order of reactivity.

most reactive

least reactive

[1]

- (d) Alloys of zinc are used for making zip-fasteners.

Describe a test for zinc ions

test

result

.....[3]

2 The table shows some properties of five substances, A, B, C, D and E.

substance	melting point /°C	boiling point /°C	conducts electricity in the solid state	conducts electricity when molten
A	-7	59	no	no
B	801	1413	no	yes
C	1083	2567	yes	yes
D	-189	-186	no	no
E	1610	2230	no	no

(a) Which one of the substances A to E is a metal?

.....[1]

(b) Which one of the substances A to E has a giant structure of ions?

.....[1]

(c) Which one of the substances A to E has the lowest melting point?

.....[1]

(d) (i) Which one of the substances A to E is a gas at room temperature?

.....[1]

(ii) Describe the arrangement and movement of the particles in a gas.

Arrangement

Movement[2]

(e) Two of the substances in the table are compounds.

Explain what is meant by the term compound.

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

- (f) The table below gives information about the electron arrangement of a sodium atom and a chlorine atom.

atom	electron arrangement
sodium	2.8.1
chlorine	2.8.7

- (i) Sodium chloride, NaCl, has an ionic giant structure.

Describe the changes in electron arrangement that take place when sodium chloride is formed from sodium and chlorine atoms.

.....

.....

.....

.....[4]

- (ii) Calculate the relative formula mass of sodium chloride.

Use the Periodic Table to help you.

[2]

3 Use the Periodic Table to help you answer these questions.

(a) Tellurium, Te, is in Group VI of the Periodic Table.

In which Period is tellurium?

.....[1]

(b) What determines the order of the elements in the Periodic Table?

.....[1]

(c) How many electrons does an atom of tellurium have in its outer shell?

.....[1]

(d) State the name of a metallic element which is in the same Period as tellurium.

.....[1]

(e) Tellurium reacts with excess chlorine to form tellurium(IV) chloride, TeCl_4 .

(i) Chlorine is a diatomic molecule.

Explain what is meant by

1 *diatomic*,

2. *molecule*.

.....[3]

(ii) Complete the following equation for the reaction between tellurium and excess chlorine.



4 Ethanol, C₂H₅OH, is formed when yeast ferments a solution of glucose in water.

(a) State the name of the gas given off during fermentation.

.....[1]

(b) Fermentation is caused by the action of enzymes in the yeast.

Explain the meaning of the term *enzyme*.

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

(c) The boiling point of ethanol is 78 °C.

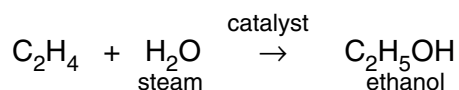
Explain how ethanol can be separated from water.

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

(d) Draw the structure of ethanol to show how the atoms and bonds are arranged.

[1]

(e) Ethanol can also be produced by the following reaction:



(i) Choose a word from the list below which best describes this reaction.

Put a ring around the correct answer.

addition combustion neutralisation polymerisation [1]

(ii) What is the function of the catalyst?

.....[1]

(iii) State the name of the reactant, C₂H₄.

.....[1]

(iv) The other reactant is steam. The steam is made by boiling water.

What is the boiling point of water?

.....[2]

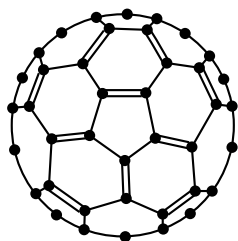
(f) State **one** use of ethanol.

.....[1]

(g) State the names of the products formed when ethanol burns.

..... and[2]

- 5 Buckminsterfullerene is a form of carbon which was discovered in 1985. It is shaped like a football and has the formula C_{60} . Its structure is shown below.



• carbon atom

- (a) Is buckminsterfullerene a compound or an element?

Give a reason for your answer.

.....
[1]

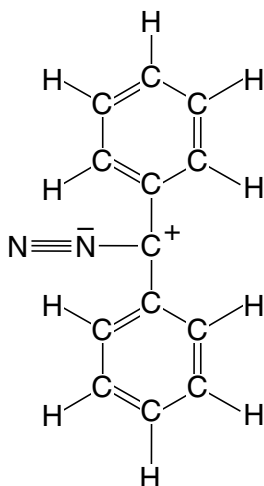
- (b) Choose a word from the list below which best describes the bonding shown on the diagram of buckminsterfullerene.

Put a ring around the correct answer.

covalent ionic metallic [1]

- (c) Buckminsterfullerene reacts with diphenyldiazomethane (DDM).

The structure of DDM is shown below.



- (i) State the total number of atoms in one molecule of DDM.

.....[1]

- (ii) Write down the molecular formula of DDM.

[1]

- (iii) When buckminsterfullerene reacts with DDM, nitrogen gas, N_2 , is given off.
State the total number of protons in **one molecule** of nitrogen.

.....[1]

- (d) Buckminsterfullerene is one of the three forms of solid carbon.

State the names of the **two** other forms of carbon and give a use for each.

name of first form

use of first form

name of second form

use of second form

[4]

- (e) (i) Complete the word equation for the incomplete combustion of carbon.

carbon + oxygen \rightarrow [1]

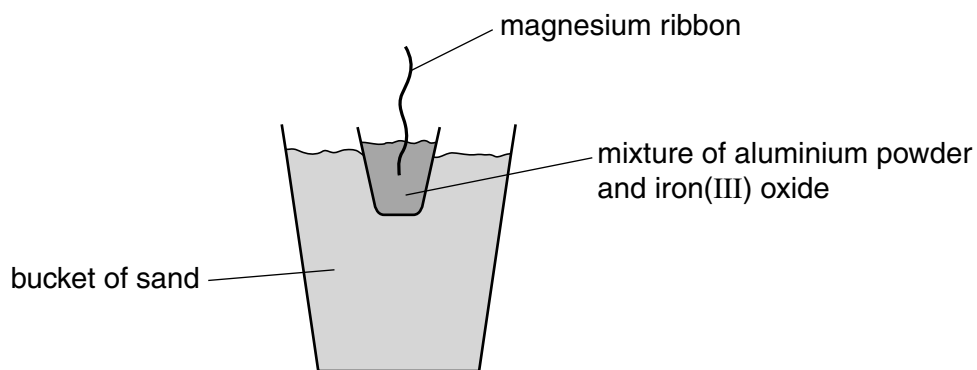
- (ii) Write down the chemical formula of the product in this reaction.

.....[1]

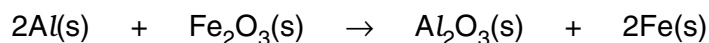
6 In the 'thermit' reaction, aluminium powder reacts violently with iron(III) oxide.

A magnesium ribbon is lit to start the reaction.

The reaction gives out a great deal of heat.



The equation for the reaction is:



(a) Complete the following sentence about the 'thermit' reaction using words from the list.

added
electrolysed
neutralised
oxidised
reduced

In the 'thermit' reaction, the aluminium is to aluminium oxide and
the iron(III) oxide is to iron. [2]

- (b) Aluminium oxide which has been heated to a high temperature is called fused aluminium oxide.

Fused aluminium oxide does not react with hydrochloric acid.

Iron reacts with hydrochloric acid.

- (i) What would you **observe** when hydrochloric acid is added to a mixture of fused aluminium oxide and iron?

.....[1]

- (ii) After reaction with hydrochloric acid, the mixture contains fused aluminium oxide solid and a solution of iron(II) chloride.

Describe with the help of a labelled diagram, how you would separate the aluminium oxide from the iron(II) chloride solution.

[4]

- (c) The magnesium ribbon used to start the 'thermit' reaction burns in oxygen and gives out heat.

What term describes a reaction that gives out heat?

.....[1]

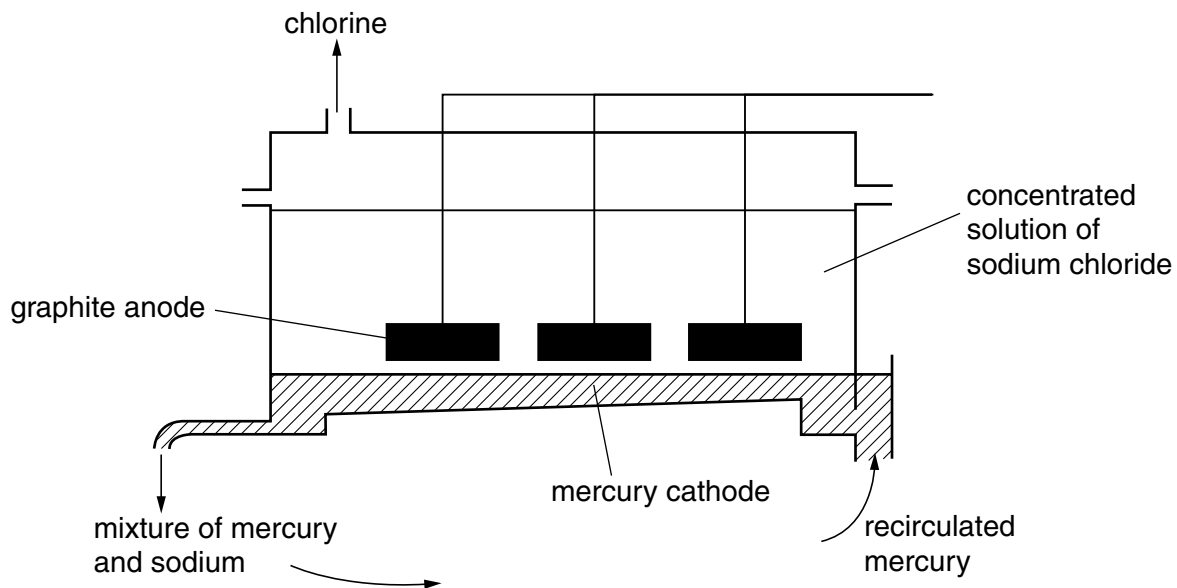
- (d) In an oxyacetylene torch, oxygen is used with acetylene to produce a flame with a temperature of about 3000 °C.

State **one** use of this flame.

.....[1]

7 Chlorine is produced by the electrolysis of concentrated sodium chloride solution.

An electrolysis cell for producing chlorine is shown below.



(a) Seawater is a source of sodium chloride.

A sample of seawater had the following composition:

sodium chloride	5.6 g
magnesium chloride	1.4 g
magnesium sulphate	1.2 g
water	191.8 g

Calculate the percentage of sodium chloride in this sample of seawater.

[1]

(b) The solution of sodium chloride used for electrolysis is about ten times more concentrated than in seawater.

State how you could increase the concentration of the salts in seawater.

.....[1]

(c) What happens to the concentration of the sodium chloride as electrolysis takes place?

.....[1]

(d) At which electrode is chlorine produced during the electrolysis of concentrated sodium chloride solution?

.....[1]

(e) State **one** property that graphite must have if it is to be used as an electrode.

.....[1]

(f) What property of mercury allows it to be recirculated easily?

.....[1]

(g) Sodium is also produced during this electrolysis.

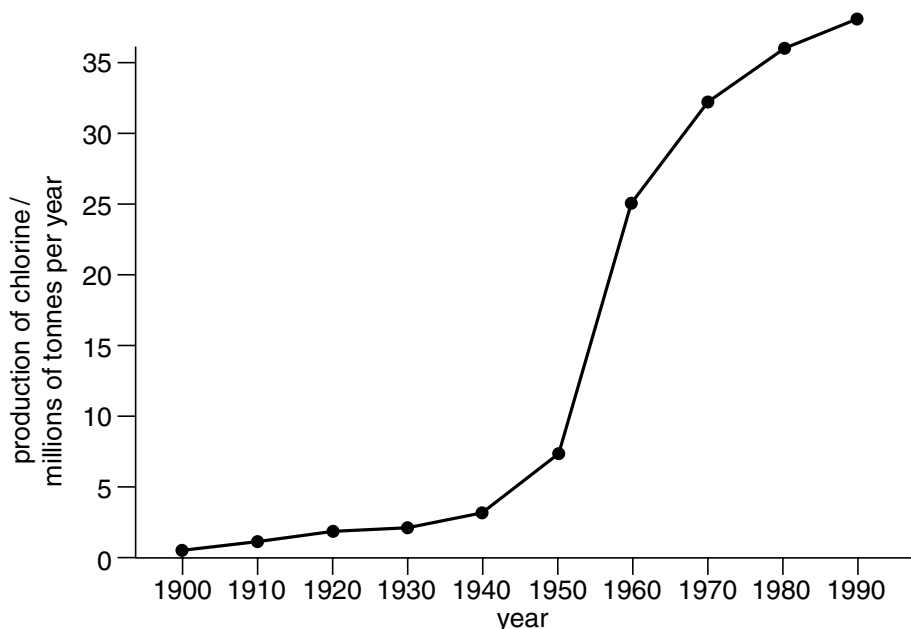
The sodium dissolves in the mercury.

The mixture of sodium and mercury then reacts with water.

Complete the word equation for the reaction of sodium with water.

sodium + water → + [2]

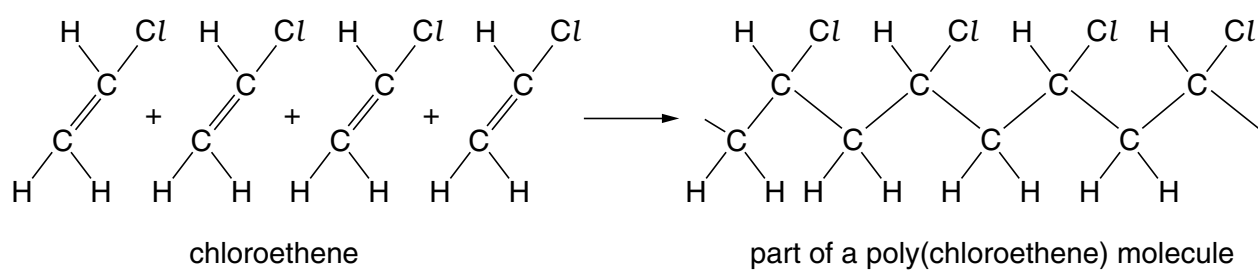
(h) The graph shows the world production of chlorine during the 20th century.



Over which ten year period did chlorine production increase most rapidly?

.....[1]

(i) Chloroethene molecules join together to form poly(chloroethene).



(i) What type of chemical reaction is shown in this equation?

.....[2]

(ii) Poly(chloroethene) is used as an electrical insulator.

What is meant by the term *electrical insulator*?

.....[1]

DATA SHEET The Periodic Table of the Elements

Group		I	II	III	IV	V	VI	VII	O	
7	9	Li Lithium 3	Be Beryllium 4	H Hydrogen 1	B Boron 5	C Carbon 6	N Nitrogen 7	O Oxygen 8	F Fluorine 9	Ne Neon 10
23	24	Na Sodium 11	Mg Magnesium 12	Al Aluminium 13	Si Silicon 14	P Phosphorus 15	S Sulphur 16	Cl Chlorine 17	Ar Argon 18	
39	40	K Potassium 19	Ca Calcium 20	Mn Manganese 25	Fe Iron 26	Co Cobalt 27	Ni Nickel 28	Cu Copper 29	Zn Zinc 30	Ga Gallium 31
85	88	Rb Rubidium 37	Sr Strontium 38	Ti Titanium 22	V Vanadium 23	Cr Chromium 24	Mn Manganese 25	Fe Iron 26	Co Cobalt 27	Ni Nickel 28
133	137	Cs Caesium 55	Ba Barium 56	Zr Zirconium 40	Nb Niobium 41	Mo Molybdenum 42	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Ag Silver 47
226	227	Fr Francium 87	Ra Radium 88	Y Yttrium 39	Sc Scandium 21	Ta Tantalum 73	Os Osmium 76	Ir Iridium 77	Pt Platinum 78	Au Gold 79
				La Lanthanum 57	Ac Actinium 89	W Tungsten 74	Rh Rhodium 45	Pd Palladium 46	Ag Silver 47	Cd Cadmium 48
				Ce Cerium 58	Pr Praseodymium 59	Re Rhenium 75	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				Th Thorium 90	Pa Protactinium 91	Os Osmium 76	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				U Uranium 92	Np Neptunium 93	Ir Iridium 77	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				Pu Plutonium 94	Am Americium 95	Pt Platinum 78	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				Sm Samarium 62	Eu Europium 63	Au Gold 79	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				Gd Gadolinium 64	Tb Terbium 65	Hg Mercury 80	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				Dy Dysprosium 66	Ho Holmium 67	Tl Thallium 81	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				Er Erbium 68	Tm Thulium 69	Pb Lead 82	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				Yb Ytterbium 70	Lu Lutetium 71	Bi Bismuth 83	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				At Astatine 85	Po Polonium 84	Po Polonium 84	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				No Nobelium 102	Md Mendelevium 101	Fr Francium 87	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48
				Lr Lawrencium 103	Lr Lawrencium 103	Ra Radium 88	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46	Cd Cadmium 48

* 58-71 Lanthanoid series
† 90-103 Actinoid series

Key

a	X
b	†

a = relative atomic mass
X = atomic symbol
b = proton (atomic) number

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