

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**CHEMISTRY**

**5070/01**

Paper 1 Multiple Choice

May/June 2006

**1 hour**

Additional Materials: Multiple Choice Answer Sheet  
Soft clean eraser  
Soft pencil (type B or HB is recommended)

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A, B, C** and **D**.

Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**Read the instructions on the Answer Sheet very carefully.**

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

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

This document consists of **15** printed pages and **1** blank page.



- 1 The table gives data about four substances.

Which substance has particles in a disorderly arrangement at room temperature?

	melting point/°C	boiling point/°C
<b>A</b>	-114	-80
<b>B</b>	120	445
<b>C</b>	750	1407
<b>D</b>	1610	2230

- 2 Which gas has the slowest rate of diffusion?

- A** ammonia, NH<sub>3</sub>
- B** methane, CH<sub>4</sub>
- C** oxygen, O<sub>2</sub>
- D** nitrogen, N<sub>2</sub>

- 3 An excess of calcium hydroxide is added to an acidic soil.

What happens to the pH of the soil?

	change in pH	final pH
<b>A</b>	increase	7
<b>B</b>	increase	10
<b>C</b>	decrease	7
<b>D</b>	decrease	5

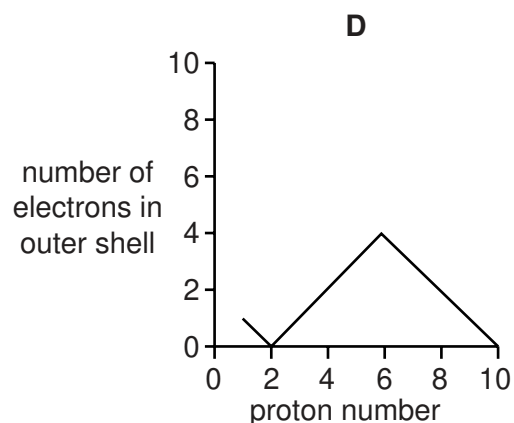
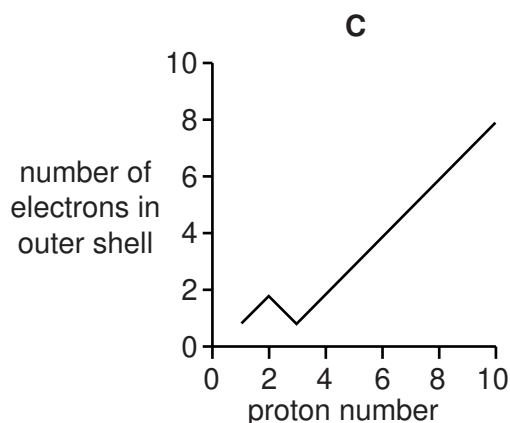
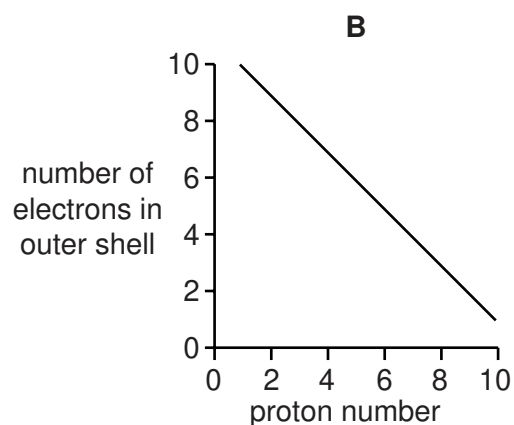
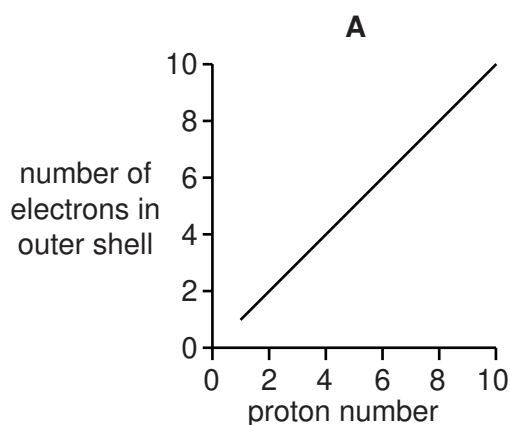
- 4 Which test could be used to show that a sample of water is pure?

- A** It freezes at exactly 0°C.
- B** It turns anhydrous copper(II) sulphate blue.
- C** It turns cobalt(II) chloride paper pink.
- D** When it evaporates, it leaves no residue.

- 5 Hydrogen can form both  $H^+$  ions and  $H^-$  ions.

Which statement about these two ions is correct?

- A** An  $H^+$  ion has no electrons in its first shell.  
**B** An  $H^+$  ion has more protons than an  $H^-$  ion.  
**C** An  $H^-$  ion has one more electron than an  $H^+$  ion.  
**D** An  $H^-$  ion is formed when a hydrogen atom loses an electron.
- 6 Which graph shows the number of electrons in the outer shell of an atom, plotted against the proton (atomic) number for the first ten elements in the Periodic Table?



- 7 The symbols and electronic structures for some elements are shown below.

silicon, Si (2,8,4)

oxygen, O (2,6)

hydrogen, H (1)

fluorine, F (2,7)

nitrogen, N (2,5)

Which formula is correct for a compound containing silicon?

- A**  $Si_4F$       **B**  $SiH_4$       **C**  $SiN_5$       **D**  $Si_2O$

8 Substance **X** conducts electricity when in the solid state.

**X** reacts with hydrochloric acid.

Which substance could **X** be?

- A copper(II) oxide
- B silicon(IV) oxide
- C sodium chloride
- D zinc

9 Rubidium is in Group I and bromine is in Group VII of the Periodic Table.

How is a compound formed between rubidium and bromine?

- A Each atom of bromine shares an electron with an atom of rubidium.
- B Each atom of bromine shares a pair of electrons with an atom of rubidium.
- C Each atom of bromine gives an electron to an atom of rubidium.
- D Each atom of bromine receives an electron from an atom of rubidium.

10  $2\text{ dm}^3$  of aqueous sodium hydroxide of concentration  $5\text{ mol/dm}^3$  were required for an experiment.

How many moles of sodium hydroxide were needed to make up this solution?

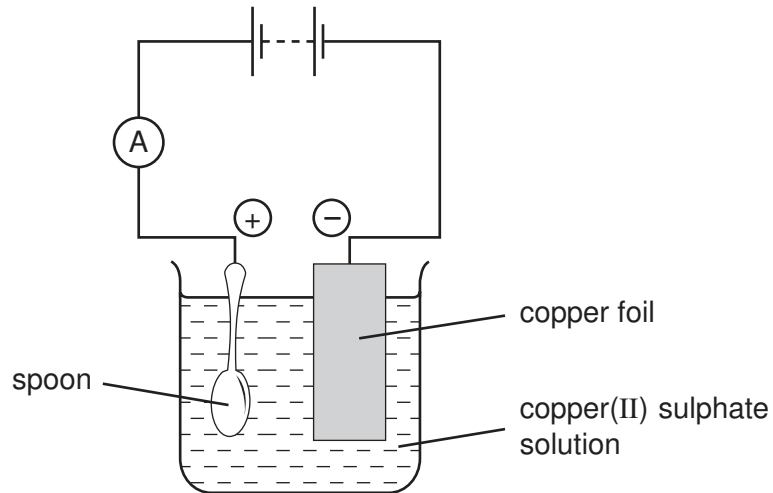
- A 2.5                      B 5                      C 7                      D 10

11 An 8g sample of oxygen atoms contains the same number of atoms as 16g of element **X**.

What is the relative atomic mass,  $A_r$ , of **X**?

- A 4                      B 8                      C 16                      D 32

12 The apparatus shown below was set up to copper plate the metal spoon.

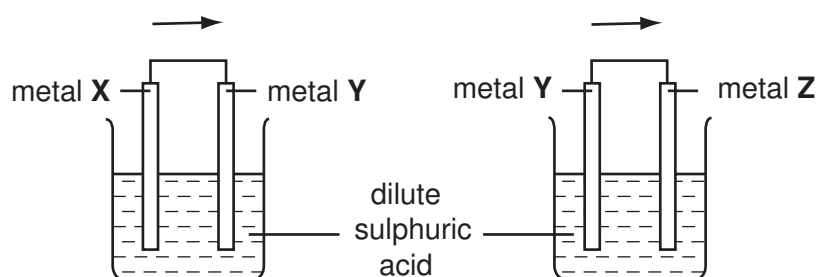


The experiment did **not** work.

What was the mistake in the apparatus?

- A A variable resistor should be included in the electrical circuit.
  - B Dilute sulphuric acid should be used as the electrolyte.
  - C The copper electrode should all be in the solution.
  - D The spoon should be the negative electrode.
- 13 Which pair of substances act as reducing agents in the blast furnace?
- A carbon and oxygen
  - B carbon monoxide and carbon dioxide
  - C carbon and carbon monoxide
  - D carbon dioxide and oxygen

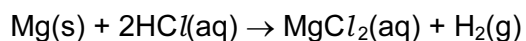
- 14 Two cells were set up as shown in the diagram. The arrows show the direction of electron flow in the external circuits.



Which set of metals would give the electron flows in the directions shown?

	metal X	metal Y	metal Z
<b>A</b>	Ag	Cu	Zn
<b>B</b>	Ag	Zn	Cu
<b>C</b>	Cu	Zn	Ag
<b>D</b>	Zn	Cu	Ag

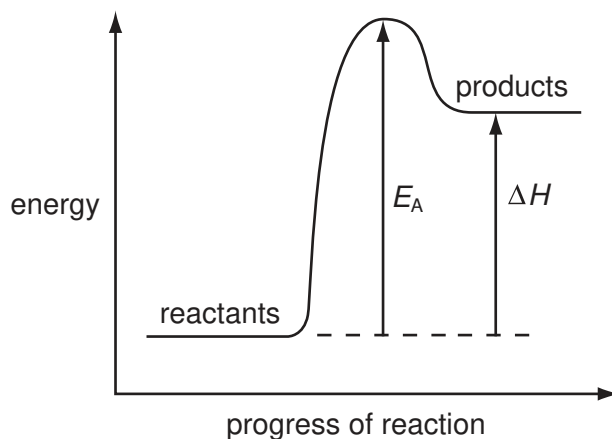
- 15 The equation below shows an exothermic reaction.



Which statement about this exothermic reaction is **not** correct?

- A** Magnesium chloride is soluble in water.
- B** Magnesium is above hydrogen in the reactivity series.
- C** One mole of magnesium produces one mole of hydrogen gas.
- D** The total energy of the products is greater than that of the reactants.

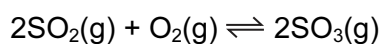
16 The diagram shows the energy profile for a chemical reaction.



What is the correct description of the reaction?

	sign of $\Delta H$	overall energy change	sign of $E_A$
<b>A</b>	–	exothermic	–
<b>B</b>	+	endothermic	+
<b>C</b>	+	endothermic	–
<b>D</b>	+	exothermic	+

17 In the Contact process for making sulphuric acid, one step involves the oxidation of sulphur dioxide as shown below.



The forward reaction is exothermic.

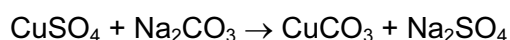
Which change would increase the amount of sulphur trioxide produced at equilibrium?

- A** increasing the temperature
- B** decreasing the temperature
- C** decreasing the pressure
- D** adding a catalyst

18 Which statement about conduction of electricity is correct?

- A** Electricity is conducted in aqueous solution by electrons.
- B** Electricity is conducted in a metal wire by ions.
- C** Electricity is conducted in a molten electrolyte by electrons.
- D** Electricity is conducted in an acid solution by ions.

- 19 Which change is an example of oxidation?
- A chloride ions to chlorine atoms
  - B copper(II) ions to copper atoms
  - C iron(III) ions to iron(II) ions
  - D oxygen atoms to oxide ions
- 20 Which cation, on reaction with aqueous sodium hydroxide, forms a precipitate that dissolves in excess sodium hydroxide?
- A  $\text{Ca}^{2+}$                       B  $\text{Cu}^{2+}$                       C  $\text{Fe}^{3+}$                       D  $\text{Zn}^{2+}$
- 21 Which of the following is a reaction of dilute sodium hydroxide?
- A It reacts with ammonium chloride to produce ammonia.
  - B It reacts with calcium carbonate to produce carbon dioxide.
  - C It reacts with copper(II) oxide to produce water.
  - D It reacts with Universal Indicator solution turning it red.
- 22 The equation for one method of making copper carbonate is shown below.



The reaction is an example of

- A neutralisation.
  - B oxidation and reduction.
  - C precipitation.
  - D synthesis.
- 23 A lump of element **X** can be cut by a knife.
- During its reaction with water **X** floats and melts.
- What is **X**?
- A calcium
  - B copper
  - C magnesium
  - D potassium



24 Which deduction about the element astatine, At, can be made from its position in Group VII?

- A It forms covalent compounds with sodium.
- B It is displaced from aqueous potassium astatide, KAt, by chlorine.
- C It is a gas.
- D It is more reactive than iodine.

25 Which atom has the same electronic configuration as the strontium ion?

- A calcium
- B krypton
- C rubidium
- D selenium

26 Rubidium is in Group I of the Periodic Table.

What are properties of rubidium chloride?

	formula	approximate melting point / °C	solubility in water
A	RbCl	70	insoluble
B	RbCl	700	soluble
C	RbCl <sub>2</sub>	70	soluble
D	RbCl <sub>2</sub>	700	insoluble

27 Iron pipes corrode rapidly when exposed to sea water.

Which metal, when attached to the iron, would **not** offer protection against corrosion?

- A aluminium
- B copper
- C magnesium
- D zinc

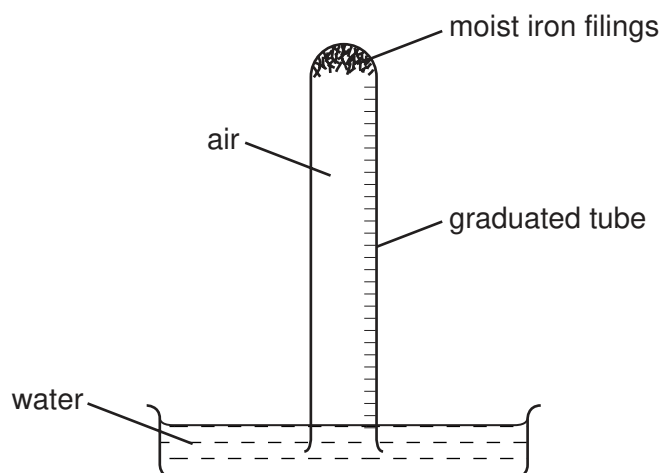
28 Metal carbonates decompose when heated.

Which carbonate is **most** stable to heat?

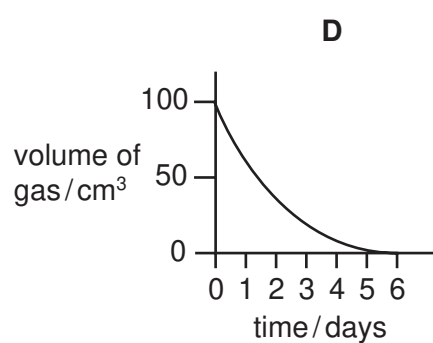
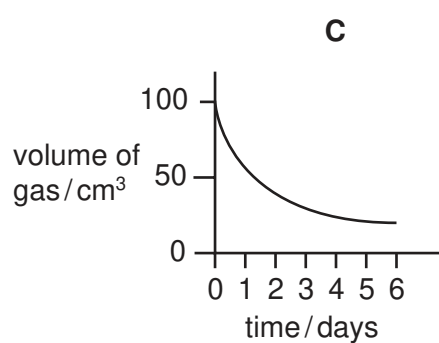
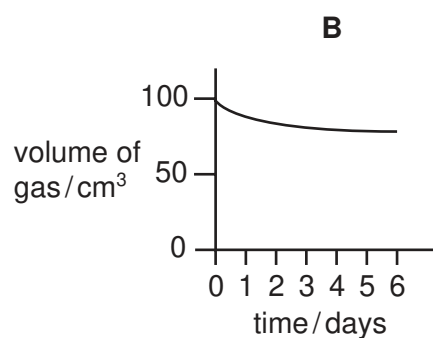
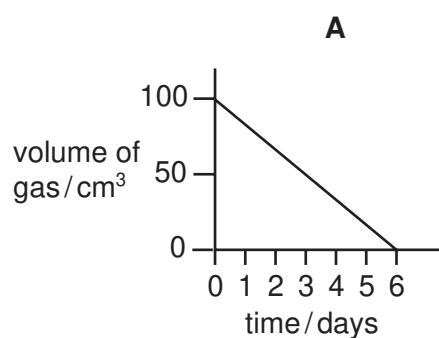
- A calcium carbonate
- B copper(II) carbonate
- C lead(II) carbonate
- D zinc carbonate

29 The apparatus shown was set up with  $100 \text{ cm}^3$  volume of air in the tube.

The volume of gas in the tube was measured at intervals for six days.



Which graph best represents how the volume of gas changes with time?



- 30 From your knowledge of the manufacture of both aluminium and iron, what is the order of chemical reactivity of aluminium, carbon and iron towards oxygen?

	most reactive $\longrightarrow$ least reactive		
<b>A</b>	aluminium	carbon	iron
<b>B</b>	aluminium	iron	carbon
<b>C</b>	carbon	aluminium	iron
<b>D</b>	carbon	iron	aluminium

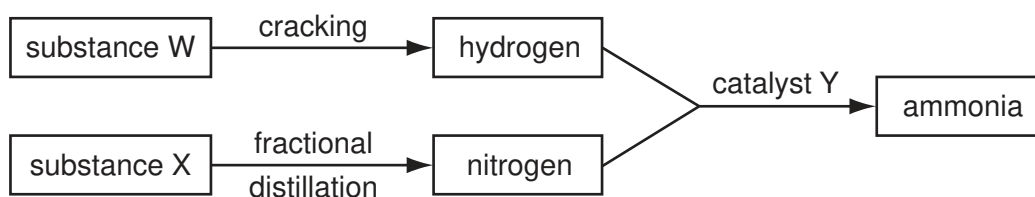
- 31 The molar heat of combustion, i.e. the heat given out when one mole of the alcohol is completely burned in oxygen, of a number of alcohols is given below.

alcohol	formula	heat of combustion kJ/mol
methanol	CH <sub>3</sub> OH	750
ethanol	C <sub>2</sub> H <sub>5</sub> OH	1380
propanol	C <sub>3</sub> H <sub>7</sub> OH	2010
butanol	C <sub>4</sub> H <sub>9</sub> OH	2640

How many carbon and hydrogen atoms would there be in an alcohol that has a molar heat of combustion of 3900 kJ/mol?

	number of carbon atoms	number of hydrogen atoms
<b>A</b>	5	11
<b>B</b>	5	12
<b>C</b>	6	13
<b>D</b>	6	14

32 The diagram shows processes that take place in the manufacture of ammonia.



What are substances W and X and catalyst Y?

	W	X	Y
<b>A</b>	air	oil	iron
<b>B</b>	air	oil	vanadium(V) oxide
<b>C</b>	oil	air	iron
<b>D</b>	oil	air	vanadium(V) oxide

33 Element **R** reacts with oxygen to form a gas, **T**.

**T** changes the colour of damp litmus paper from blue to red.

**T** is used to kill bacteria in the preservation of dried fruit.

What is **R**?

- A** carbon
- B** chlorine
- C** nitrogen
- D** sulphur

34 The gases coming from a car's exhaust contain oxides of nitrogen.

How are these oxides formed?

- A** Nitrogen reacts with carbon dioxide.
- B** Nitrogen reacts with carbon monoxide.
- C** Nitrogen reacts with oxygen.
- D** Nitrogen reacts with petrol.

35 The table shows pollutants and their possible effects.

Which line is **not** correct?

	pollutant	effect
<b>A</b>	CFCs	cause destruction of the ozone layer
<b>B</b>	CH <sub>4</sub>	forms photochemical smog
<b>C</b>	CO	is poisonous to humans
<b>D</b>	NO <sub>2</sub>	forms acid rain

36 A student investigated the reaction of different vegetable oils with hydrogen. 100 cm<sup>3</sup> of hydrogen was passed through 1 g samples of vegetable oils containing a suitable catalyst.

The volume of hydrogen remaining after each reaction was recorded.

vegetable oil	volume of hydrogen remaining / cm <sup>3</sup>
P	100
Q	87
R	63
S	0

Which vegetable oils are unsaturated?

- A** P only
- B** Q and R only
- C** Q, R and S only
- D** S only

37 In the polymerisation of ethene to form poly(ethene), which of the following does **not** change?

- A** boiling point
- B** density
- C** empirical formula
- D** molecular mass





**DATA SHEET**  
**The Periodic Table of the Elements**

		Group											
I	II	III	IV	V	VI	VII	0						0
		1 <b>H</b> Hydrogen 1											4 <b>He</b> Helium 2
7 <b>Li</b> Lithium 3	9 <b>Be</b> Beryllium 4											20 <b>Ne</b> Neon 10	
23 <b>Na</b> Sodium 11	24 <b>Mg</b> Magnesium 12	27 <b>Al</b> Aluminium 13	28 <b>Si</b> Silicon 14	31 <b>P</b> Phosphorus 15	32 <b>S</b> Sulphur 16	35.5 <b>Cl</b> Chlorine 17	40 <b>Ar</b> Argon 18						84 <b>Kr</b> Krypton 36
39 <b>K</b> Potassium 19	40 <b>Ca</b> Calcium 20	70 <b>Ga</b> Gallium 31	73 <b>Ge</b> Germanium 32	75 <b>As</b> Arsenic 33	79 <b>Se</b> Selenium 34	80 <b>Br</b> Bromine 35	84 <b>Kr</b> Krypton 36						131 <b>Xe</b> Xenon 54
85 <b>Rb</b> Rubidium 37	88 <b>Sr</b> Strontium 38	115 <b>In</b> Indium 49	119 <b>Sn</b> Tin 50	122 <b>Sb</b> Antimony 51	128 <b>Te</b> Tellurium 52	127 <b>I</b> Iodine 53	131 <b>Xe</b> Xenon 54						86 <b>Rn</b> Radon 86
133 <b>Cs</b> Caesium 55	137 <b>Ba</b> Barium 56	204 <b>Tl</b> Thallium 81	207 <b>Pb</b> Lead 82	209 <b>Bi</b> Bismuth 83	210 <b>Po</b> Polonium 84	210 <b>At</b> Astatine 85	210 <b>Rn</b> Radon 86						226 <b>Ra</b> Radium 88
226 <b>Fr</b> Francium 87	227 <b>Ac</b> Actinium 89											227 <b>Ac</b> Actinium 89	

140 <b>Ce</b> Cerium 58	141 <b>Pr</b> Praseodymium 59	144 <b>Nd</b> Neodymium 60	150 <b>Sm</b> Samarium 62	152 <b>Eu</b> Europium 63	157 <b>Gd</b> Gadolinium 64	162 <b>Dy</b> Dysprosium 66	165 <b>Ho</b> Holmium 67	167 <b>Er</b> Erbium 68	169 <b>Tm</b> Thulium 69	173 <b>Yb</b> Ytterbium 70	175 <b>Lu</b> Lutetium 71		
232 <b>Th</b> Thorium 90	238 <b>Pa</b> Protactinium 91	238 <b>U</b> Uranium 92	238 <b>Np</b> Neptunium 93	238 <b>Pu</b> Plutonium 94	238 <b>Am</b> Americium 95	238 <b>Cm</b> Curium 96	238 <b>Bk</b> Berkelium 97	238 <b>Cf</b> Californium 98	238 <b>Es</b> Einsteinium 99	238 <b>Fm</b> Fermium 100	238 <b>Md</b> Mendelevium 101	238 <b>No</b> Nobelium 102	238 <b>Lr</b> Lawrencium 103

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

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

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).