UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS General Certificate of Education Ordinary Level

CHEMISTRY 5070/01

Paper 1 Multiple Choice

October/November 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.

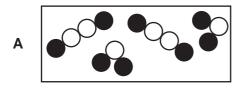
Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

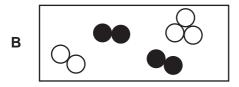
Any rough working should be done in this booklet.

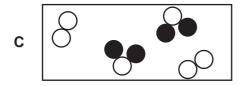
A copy of the Periodic Table is printed on page 16.

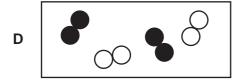
- 1 At which temperature does a concentrated aqueous solution of sodium chloride begin to boil?
 - **A** 96°C
- **B** 99°C
- **C** 100°C
- **D** 104 °C
- 2 The symbols O and represent atoms of different elements.

Which diagram shows a mixture of an element and a compound?









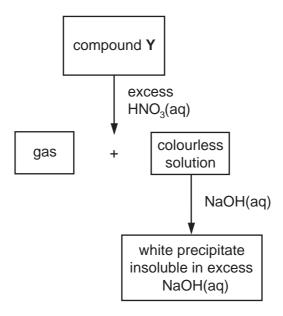
3 An aqueous solution of compound **X** reacts with aqueous sodium hydroxide to form a green precipitate and then aluminium powder is added. The mixture is heated and a gas that turns damp red litmus paper blue is given off.

What is X?

- A ammonium nitrate
- B copper(II) chloride
- **C** iron(II) nitrate
- D iron(III) chloride

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- Which of the following reagents could be used to distinguish between dilute nitric acid and dilute hydrochloric acid?
 - A aqueous barium chloride
 - B copper(II) carbonate
 - C aqueous silver nitrate
 - D aqueous sodium hydroxide
- **5** The scheme shows some reactions of a compound **Y**.



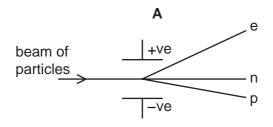
What could the compound **Y** be?

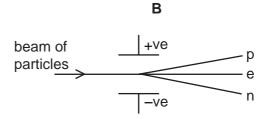
- A aluminium sulphate
- **B** calcium carbonate
- **C** copper(II) carbonate
- D zinc carbonate

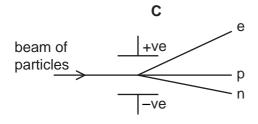
6 A beam of particles contains neutrons, n, protons, p, and electrons, e.

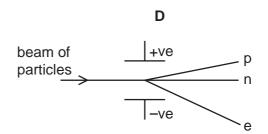
The beam is passed between charged plates.

Which diagram shows how the particles are affected by the plates?







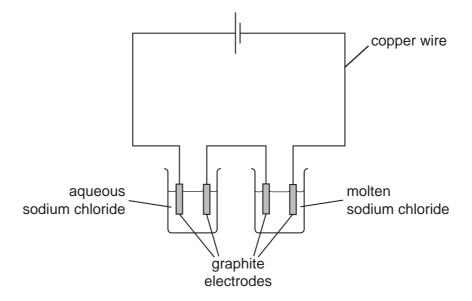


7 The table shows the properties of some substances.

Which substance is a covalent compound?

	melting point	electrical conductivity			
	/°C	of solid	of liquid		
Α	-38	conducts	conducts		
В	–7	does not conduct	does not conduct		
С	801	does not conduct	conducts		
D	1540	conducts	conducts		

8 The diagram shows the electrolysis of aqueous sodium chloride and of molten sodium chloride.



Which substance has both positive ions and mobile electrons?

- A aqueous sodium chloride
- B copper wire
- **C** graphite electrodes
- D molten sodium chloride
- 9 Hydrogen can form both ionic and covalent compounds.

With which element will hydrogen form an ionic compound?

- A carbon
- **B** chlorine
- C nitrogen
- **D** sodium
- **10** Which quantity is the same for one mole of ethanol and one mole of ethane?
 - A mass
 - B number of atoms
 - C number of molecules
 - **D** volume at r.t.p.

11 In an experiment 264 g of strontium reacts with 213 g of chlorine.

What is the formula of strontium chloride?

A SrC1

B $SrCl_2$

 \mathbf{C} SrC l_3

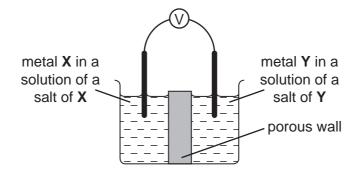
D Sr_2Cl

12 Aqueous copper(II) sulphate is electrolysed using copper electrodes.

Which observations will be made?

	at anode (+ve)	at cathode (-ve)	electrolyte		
Α	anode dissolves	pink solid forms	blue colour fades		
В	anode dissolves	pink solid forms	no change		
С	colourless gas forms	colourless gas forms	no change		
D	colourless gas forms	pink solid forms	blue colour fades		

13 Which pair of metals **X** and **Y** will produce the highest voltage when used as electrodes in a simple cell?



	metal X	metal Y		
Α	copper	silver		
В	magnesium	silver		
С	magnesium	zinc		
D	zinc	copper		

14 On combustion, which fuel **never** produces pollutants?

A diesel

B hydrogen

C methane

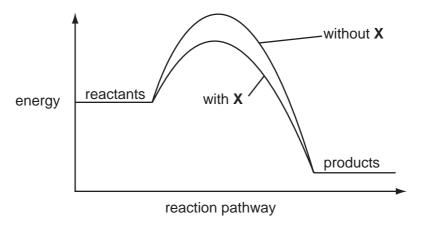
D petrol

15 The reversible reaction below has reached dynamic equilibrium.

$$N_2O_4(g) \rightleftharpoons 2NO_2(g)$$

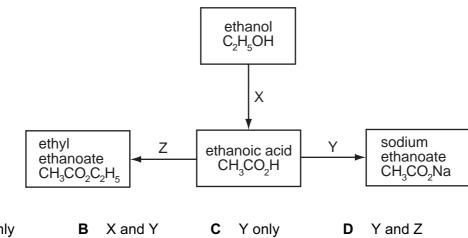
What does the term dynamic equilibrium mean?

- Α The reaction has stopped.
- В The rate of the forward reaction is now zero.
- C The concentrations of NO_2 and N_2O_4 are equal.
- D The rates of the forward and backward reactions are equal.
- The energy profile diagrams show how adding a substance **X** to a reaction mixture changes the reaction pathway.



Which change occurs when **X** is added to the reaction mixture?

- The rate of reaction decreases.
- В The rate of reaction increases.
- C The reaction becomes less exothermic.
- D The reaction becomes more exothermic.
- 17 Which of the reactions X, Y and Z involve oxidation?



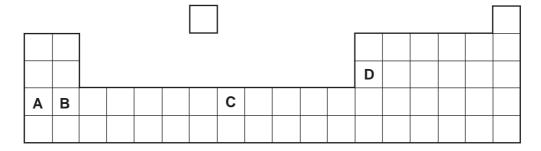
X only

- 18 Which compound, when added to aqueous iron(II) sulphate, takes part in a redox reaction?
 - A ammonia
 - B barium chloride
 - **C** acidified potassium dichromate(VI)
 - D sodium hydroxide
- 19 Which substance does not produce copper(II) sulphate when added to dilute sulphuric acid?
 - A copper
 - **B** copper(II) carbonate
 - C copper(II) hydroxide
 - D copper(II) oxide
- **20** Which ionic equation represents the neutralisation of aqueous sodium hydroxide with dilute nitric acid?
 - $\mathbf{A} \quad \mathsf{H}^{^{+}} + \mathsf{OH} \ \rightarrow \mathsf{H}_{2}\mathsf{O}$
 - **B** Na⁺ + NO₃ \rightarrow NaNO₃
 - **C** Na⁺ + HNO₃ \rightarrow NaNO₃ + H⁺
 - **D** NaOH + $H^+ \rightarrow Na^+ + H_2O$
- 21 The positions of four elements are shown on the outline of part of the Periodic Table.

Element X has a high melting point and is a good conductor of electricity.

It forms chlorides XCl₂ and XCl₃.

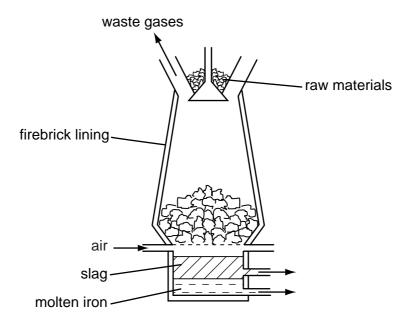
Which element is X?



- 22 Why is nickel used in the hydrogenation of alkenes?
 - A It increases the yield of products.
 - **B** It lowers the activation energy of the reaction.
 - C It makes the reaction more exothermic.
 - **D** It prevents a reverse reaction from occurring.
- **23** Three elements *X*, *Y* and *Z* have consecutive, increasing proton numbers.

If element X is a noble gas, what will be the symbol for the ions of element Z in its compounds?

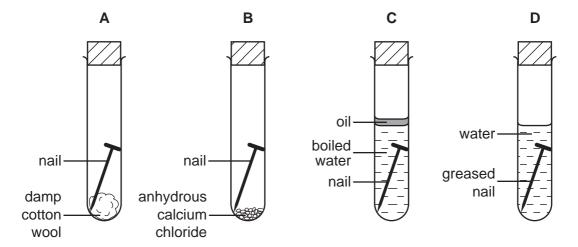
- \mathbf{A} Z^2
- $B Z^{\dagger}$
- $C Z^{2+}$
- **D** Z^{3+}
- 24 Which substance reacts with water to form a soluble compound and an insoluble gas?
 - A ammonium sulphate
 - **B** caesium
 - C calcium carbonate
 - **D** copper
- 25 Iron is extracted in the blast furnace using the raw materials haematite, coke and limestone.



Which substance undergoes thermal decomposition?

- A limestone
- B carbon dioxide
- C haematite
- **D** slag

- 26 Which gas is not formed during the manufacture of aluminium?
 - A carbon dioxide
 - B carbon monoxide
 - C oxygen
 - D sulphur dioxide
- 27 In which test-tube is the iron nail most likely to rust?



28 The carbonate of metal **X** is a white solid.

It decomposes when heated to form carbon dioxide and a yellow solid oxide.

What is metal X?

- A copper
- **B** iron
- C lead
- **D** sodium
- 29 Which metal will displace hydrogen from aqueous solutions of acids but not from cold water?
 - A calcium
 - **B** copper
 - C sodium
 - **D** zinc

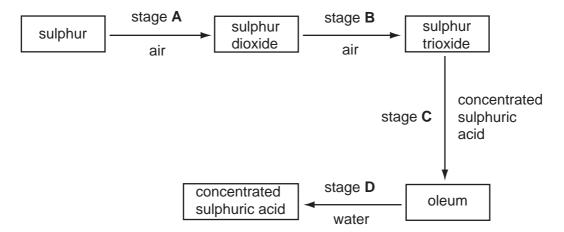
30 The table shows the solubility of some salts of metal **Y** in cold water.

salt	solubility in cold water		
carbonate	insoluble		
chloride	soluble		
sulphate	insoluble		

What is metal Y?

- **A** barium
- **B** lead
- C magnesium
- **D** sodium
- 31 Which method would not produce ammonia gas?
 - A heating concentrated aqueous ammonia
 - **B** heating ammonium chloride with calcium hydroxide
 - C heating ammonium sulphate with sodium hydroxide
 - D heating ammonium sulphate with dilute hydrochloric acid
- 32 The following scheme shows four stages in the conversion of sulphur to sulphuric acid.

In which stage is a catalyst used?



33 Vegetable matter is biodegradable.

Which gas is released into the atmosphere when vegetable matter biodegrades?

- A carbon monoxide
- **B** methane
- C nitrogen dioxide
- D sulphur dioxide
- **34** To reduce atmospheric pollution, the waste gases from a coal-burning power station are passed through powdered calcium carbonate.

Which waste gas will **not** be removed by the powdered calcium carbonate?

- A carbon monoxide, CO
- **B** nitrogen dioxide, NO₂
- C phosphorus(V) oxide, P₂O₅
- D sulphur dioxide, SO₂
- **35** A compound, \mathbf{X} , has a molecular formula $C_4H_8O_2$ and can be prepared by the reactions shown.



What is the structural formula of X?

- A HCO₂CH₂CH₂CH₃
- B CH₃CO₂CH₂CH₃
- C CH₃CH₂CO₂CH₃
- D CH₃CH₂CH₂CO₂H

36 The results of tests on compound **Z** are shown.

test	result		
add bromine water	turns colourless		
add aqueous sodium carbonate	carbon dioxide formed		

What is compound **Z**?

37 A compound known in industry as 'MTBE' is used as an additive in 'lead-free' petrol. The structural formula of MTBE is shown.

Which compound is an isomer of MTBE?

38 A liquid reacts with each of sodium carbonate, potassium hydroxide and ethanol.

What is the liquid?

- A aqueous ammonia
- B ethanoic acid
- C ethyl ethanoate
- D hydrochloric acid

39 The structural formula of a polymer is shown below.

$$\begin{pmatrix} H & Cl & H & Cl \\ I & I & I & I \\ C & C & C & C \\ I & I & I & I \\ C_2H_5 & H & C_2H_5 & H \end{pmatrix}$$

Which one of the following will form this polymer?

40 A polymer X was hydrolysed and the two products were



What can be deduced about X?

- A It was a condensation polymer.
- B It was starch.
- **C** It was made by addition polymerisation.
- **D** It was Terylene.

DATA SHEET
The Periodic Table of the Elements

	0	4 He Helium	20 Neon 10 Neon 40 Argon	84 K Krypton 36	131 Xe Xenon			175 Lu Lutetium	Lr Lawrenciun 103		
	II/		19 Fluorine 9 35.5 C1 Chlorine	80 Br Bromine	127 I lodine	At Astatine 85		173 Yb Ytterbium 70	Nobelium		
	I		16 Oxygen 8 32 Suphur	79 Se Selenium 34	128 Te Tellurium	Po Polonium 84		169 Tm Thulium	Md Mendelevium 101		
	>		Nitrogen 31 31 Phosphorus 5	75 AS Arsenic A33	Sb Antimony	209 Bi Bismuth 83		167 Er Erbium 68	Fm Fermium		
	2		12 Carbon 6 Silicon 14	73 Ge Germanium 32	Sn Tin 50	207 Pb Lead		165 Ho Holmium 67			
	=					11 B Boron 5 A A Auminium 13	70 Ga Gallium 31	115 In Indium	204 T 1 Thallium		162 Dy Dysprosium 66
				65 Zn Zinc 30	Cd Cadmium 48	201 Hg Mercury 80		159 Tb Terbium 65	BK Berkelium 97		
				64 Copper 29	108 Ag Silver 47	197 Au Gold		157 Gd Gadolinium 64			
Group				59 Nickel	106 Pd Palladium 46	195 Pt Platinum 78		152 Eu Europium 63	Am Americium		
Gro			,	59 Co Cobalt	103 Rh Rhodium 45	192 Ir Iridium 77		Sm Samarium 62	Pu Plutonium 94		
		T Hydrogen		56 Fe Iron	101 Ru Ruthenium 44	190 Os Osmium 76		Pm Promethium 61			
				Mn Manganese	Tc Technetium	186 Re Rhenium 75		144 Ne Neodymium 60	238 U Uranium		
				52 Cr Chromium 24	96 Mo Molybdenum 42	184 W Tungsten 74		Pr Praseodymium 59	Pa Protactinium 91		
,				51 Vanadium 23	93 Nb Niobium	181 Ta Tantalum		140 Ce Cerium	232 Th Thorium		
			8 H i	48 T itanium 22	2r Zirconium 40	178 Hf Hafnium 72		nic mass bol nic) number			
				Scandium 21	89 ×	139 La Lanthanum 57 *	227 AC Actinium 89	d series series	a = relative atomic massX = atomic symbolb = proton (atomic) number		
	=		Beryllium 4 24 Mg Magnesium 12	40 Ca Calcium	Strontium	137 Ba Barium 56	226 Ra Radium	*58-71 Lanthanoid series 190-103 Actinoid series	в Х		
	_		7 Lithium 3 23 Na Sodium 11	39 K Potassium			Fr Francium 87	*58-71 L	Key		

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

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