	OF CAMBRIDGE INTERNATIONAL EX neral Certificate of Education Ordinary L	
CHEMISTRY		5070/01
Paper 1 Multiple (Choice	May/June 2006
Additional Materials:	Multiple Choice Answer Sheet Soft clean eraser Soft pencil (type B or HB is recommended)	1 hour

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
Α	-114	-80
В	120	445
С	750	1407
D	1610	2230

- 2 Which gas has the slowest rate of diffusion?
 - A ammonia, NH₃
 - **B** methane, CH₄
 - **C** oxygen, O₂
 - **D** nitrogen, N₂
- 3 An excess of calcium hydroxide is added to an acidic soil.

What happens to the pH of the soil?

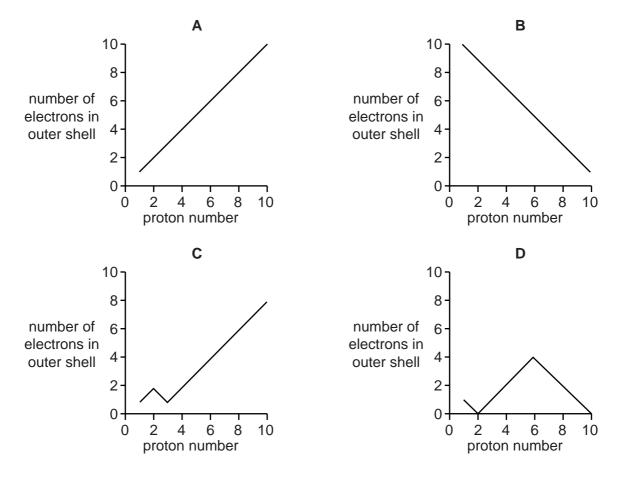
	change in pH	final pH
A increase		7
в	increase	10
C decrease		7
D	decrease	5

- 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?

 8 Substance X conducts electricity when in the solid state.

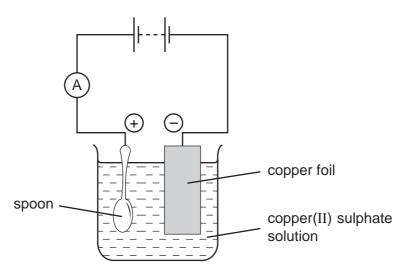
X reacts with hydrochloric acid.

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.
- 2 dm³ of aqueous sodium hydroxide of concentration 5 mol/dm³ 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



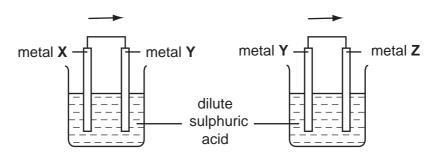
5

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

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- **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
Α	Ag	Cu	Zn
В	Ag	Zn	Cu
С	Cu	Zn	Ag
D	Zn	Cu	Ag

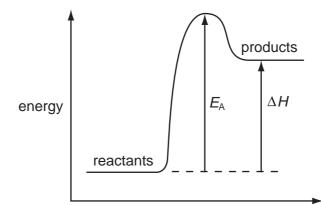
15 The equation below shows an exothermic reaction.

$$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

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.



progress of reaction

What is the correct description of the reaction?

	sign of ∆ <i>H</i>	overall energy change	sign of E_A
Α	_	exothermic	_
в	+	endothermic	+
С	+	endothermic	-
D	+	exothermic	+

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

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$$

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 Ca^{2+} **B** Cu^{2+} **C** Fe^{3+} **D** 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.

 $CuSO_4 + Na_2CO_3 \rightarrow CuCO_3 + Na_2SO_4$

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
Α	RbC1	70	insoluble
В	RbC1	700	soluble
С	$RbCl_2$	70	soluble
D	$RbCl_2$	700	insoluble

27 Iron pipes corrode rapidly when exposed to sea water.

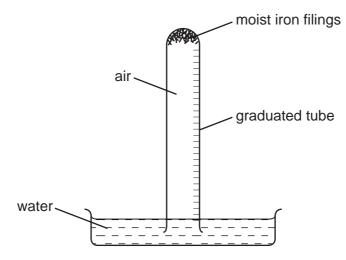
Which metal, when attached to the iron, would not offer protection against corrosion?

- **A** aluminium
- B copper
- C magnesium
- D zinc
- 28 Metal carbonates decompose when heated.

Which carbonate is most stable to heat?

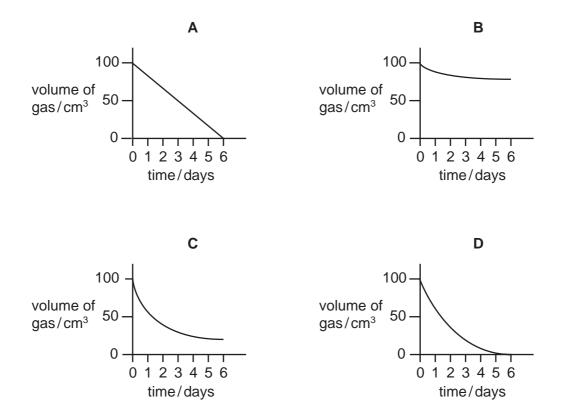
- A calcium carbonate
- **B** copper(II) carbonate
- **C** lead(II) carbonate
- D zinc carbonate

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



10

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?

11

	most reactive		least reactive
Α	aluminium	carbon	iron
в	aluminium	iron	carbon
С	carbon	aluminium	iron
D	carbon	iron	aluminium

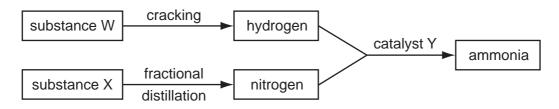
31 The molar heat of combustion, i.e. the heat given out when one mole of the alcohol is completely burned in oxygen, of a number of alcohols is given below.

alcohol	formula	heat of combustion kJ/mol
methanol	CH₃OH	750
ethanol	C_2H_5OH	1380
propanol	C ₃ H ₇ OH	2010
butanol	C₄H₀OH	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
Α	5	11
В	5	12
С	6	13
D	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	Х	Y
Α	air	oil	iron
в	air	oil	vanadium(V) oxide
С	oil	air	iron
D	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
Α	CFCs	cause destruction of the ozone layer
в	CH ₄	forms photochemical smog
С	СО	is poisonous to humans
D	NO ₂	forms acid rain

36 A student investigated the reaction of different vegetable oils with hydrogen. 100 cm³ of hydrogen was passed through 1g 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 ³
Р	100
Q	87
R	63
S	0

Which vegetable oils are unsaturated?

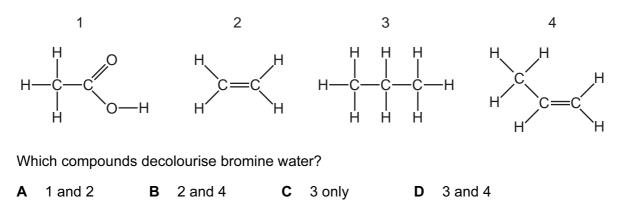
- A Ponly
- B Q and R only
- C Q, R and S only
- D S only

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

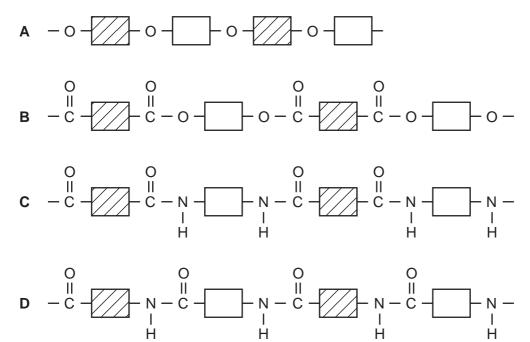
- A boiling point
- B density
- **C** empirical formula
- D molecular mass

- 38 In which pair of macromolecules are the linkages the same?
 - A fats and proteins
 - B nylon and fats
 - **C** nylon and proteins
 - **D** proteins and *Terylene*

39 The structures of four organic compounds are shown.



40 Which polymer would hydrolyse to amino acids?



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15

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DATA SHEET

								Gre	Group								
-	=											≡	2	>	N	١١	0
							Hydrogen										4 Helium
r -												≂ Ω ,	5 C 5	⁴ Z	°, 0	ф Ц	20 Ne
3 Lithium	Beryllium 4											5 5	6 6	Nitrogen 7	Oxygen 8	9 Fluorine	10 Neon
23 Na	24 Mg											27 A I	28 Si	۳ %	N 33	35.5 C1	40 Ar
Sodium 11	2 0	5										Auminium 13	Silicon 14	Phosphorus 15	5	Chlorine 17	Argon 18
39	40	45	48	51	52	55	56	59	59	64		70	73	75		80	84
Potassium 19	n Calcium	Scandium 21	T Titanium 22	Vanadium 23	Chromium 24	Manganese 25	Fe Iron 26	Co Cobalt 27	Nickel 28	Cu ^{Copper}	Zn 30	Gallium 31	Germanium 32	AS Arsenic 33	Selenium 34	Br Bromine 35	Krypton 36
85	88	89	91	93	96		101	103	106	108	112	115	119	122	128	127	131
Rb		≻	Zr	ЧN		Lc			Pd	Ag	Cq	In	Sn	Sb	Te	Ι	Xe
Rubidium 37	n Strontium 38	Yttrium 39	Zirconium 40	Niobium 41	Molybdenum 42	Technetium 43	Ruthenium 44	Rhodium 45	Palladium 46		Cadmium 48	Indium 49	Tin 50	Antimony 51	Tellurium 52	lodine 53	Xenon 54
133		139	178	181	184	186		192	195	197	201	204	207	209			
CS	Ba	La	Hf	Ta	9	Re	Os	Ir	Platinum	Au Bu	Hg	T1 Thailium	Pb	Bi Bismuth	Po	At	Ru
55	56	57 *	72	73		75	76	77	78	79	80	81	82	83		85	86
Francium 87	226 Radium 88	227 Actinium 80															
8-71	*58-71 Lanthanoid series	id series		140	141	144		150	152	157	159	162	165	167	169	173	175
0-10	190-103 Actinoid series	series		Cerium 58	Praseodymium 59	Neodymium 60	Promethium 61	Samarium 62	Eu Europium 63	Gd Gadolinium 64	Tb Terbium 65	Dy Dysprosium 66	Holmium 67	Erbium 68	Hulium 69	Yb Ytterbium	Lutetium 71
	а	a = relative atomic mass	nic mass	232		238											
Key	×	X = atomic symbol	loc	Th	Protactinium	Uranium	Neptunium	Putonium	Am Americium	Curium Curium	BK Berkelium	Cf Californium	Einsteinium	Fermium Fermium	Mendelevium	Nobelium Nobelium	Lr Lawrencium
-	٩	p = proton (atomic) number	iic) number	00		92	03	01	95	90	07	00	00	100	101	100	102

16

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

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