

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS General Certificate of Education Ordinary Level

CHEMISTRY 5070/01

Paper 1 Multiple Choice May/June 2009

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.

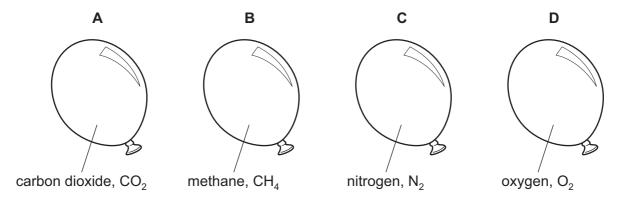


International Examinations

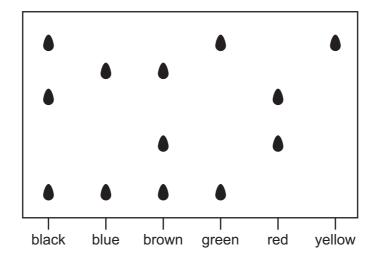
1 An inflated balloon goes down because gas molecules can diffuse through the rubber.

Four balloons are filled with different gases at the same temperature and pressure.

Which balloon would go down quickest?

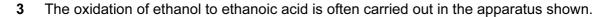


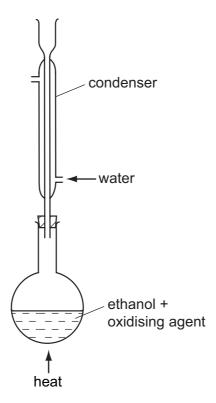
2 The diagram shows a chromatogram of several inks.



Which statement is correct?

- A Black ink can be made by mixing green, red and yellow inks.
- **B** Brown ink can be made by mixing blue and red inks.
- **C** Yellow ink can be used to make brown ink.
- **D** Yellow ink may be present in green ink.

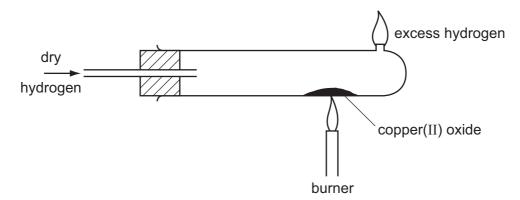




What is the purpose of the condenser?

- A to prevent air reacting with the ethanoic acid
- B to prevent any ethanol from escaping
- **C** to prevent the ethanoic acid changing back to ethanol
- **D** to prevent the ethanoic acid reacting with the ethanol

4 The diagram shows copper(II) oxide being reduced, by hydrogen, to copper. After reduction is complete, the burner is turned off but the flow of hydrogen is continued until the tube is cool.



Why is the hydrogen allowed to flow through the tube during cooling?

- A to allow the tube to cool slowly
- **B** to lessen the risk of explosion in the hot tube
- **C** to prevent the copper from reacting with the air
- D to remove any traces of water left in the tube
- **5** A coin is analysed by dissolving it in nitric acid. To the resulting solution an excess of aqueous ammonia is added and the mixture is filtered.

A brown precipitate remains in the filter paper and a deep blue solution is obtained as the filtrate.

Which metals does the coin contain?

- A aluminium and copper
- **B** copper and iron
- C iron and lead
- **D** lead and zinc
- **6** An element X forms a positive ion with the electronic structure 2,8,8.

What is the proton (atomic) number of X?

- **A** 16
- **B** 17
- **C** 18
- **)** 19
- 7 Which two substances are elements with a giant molecular structure?
 - A diamond and graphite
 - B diamond and sand
 - C methane and iodine
 - D methane and sand

- 8 Which compound has both ionic and covalent bonds?
 - A ammonium chloride
 - B carbon dioxide
 - C ethyl ethanoate
 - **D** sodium chloride
- **9** Which statement about the numbers of particles in atoms is correct?

Apart from hydrogen, most atoms contain

- A more neutrons than protons.
- **B** more protons than neutrons.
- **C** more electrons than protons.
- **D** more protons than electrons.
- 10 Which gas contains the same number of molecules as 9g of water?
 - A 2g of hydrogen
 - B 14g of nitrogen
 - C 32g of oxygen
 - D 44 g of carbon dioxide
- 11 The equation for the reaction between copper and nitric acid is shown.

$$vCu + wHNO_3 \rightarrow xCu(NO_3)_2 + yNO + zH_2O$$

v, w, x, y and z are whole numbers.

Which values of *v*, *w*, *x*, *y* and *z* balance the equation?

	V	W	X	У	Z
Α	1	2	1	1	1
В	1	4	1	2	2
С	3	4	3	2	2
D	3	8	3	2	4

12 The mass of one mole of a chloride formed by a metal Y is 74.5 g.

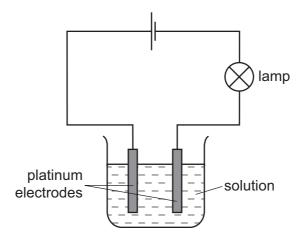
What is the formula of the chloride?

- A Y_3Cl
- **B** Y_2Cl
- **C** YC1
- **D** YCl_2

13 Which reactions take place during the electrolysis of aqueous copper(II) sulfate with copper electrodes?

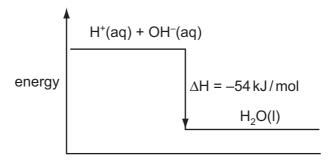
	reaction at positive electrode	reaction at negative electrode
Α	$Cu^{2+} + 2e^- \rightarrow Cu$	$Cu \rightarrow Cu^{2+} + 2e^{-}$
В	$4OH^{-} \rightarrow 2H_{2}O + O_{2} + 4e^{-}$	$Cu^{2+} + 2e^- \rightarrow Cu$
С	$Cu \rightarrow Cu^{2+} + 2e^{-}$	$2H^{+} + 2e^{-} \rightarrow H_{2}$
D	$Cu \rightarrow Cu^{2+} + 2e^{-}$	$Cu^{2+} + 2e^- \rightarrow Cu$

14 The diagram shows apparatus used to investigate the conductivity of different solutions.



Which substance, in aqueous solution of concentration $1\,\mathrm{mol}\,/\,\mathrm{dm}^3$, would cause the lamp to give the brightest light?

- **A** ammonia
- B ethanoic acid
- **C** ethanol
- **D** sulfuric acid
- 15 The energy diagram for the reaction between sodium hydroxide and hydrochloric acid is shown.



Which quantity of heat is liberated when 100 cm³ of 1 mol/dm³ hydrochloric acid reacts with 100 cm³ of 1 mol/dm³ sodium hydroxide?

- **A** 0.54 kJ
- **B** 2.70 kJ
- **C** 5.40 kJ
- **D** 10.8 kJ

16 The equation shows a reversible reaction.

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

The forward reaction is endothermic.

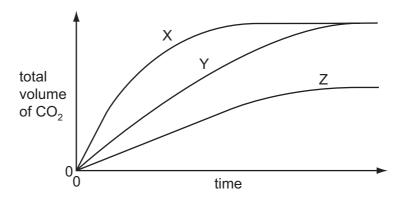
Which of these changes will increase the yield of NO₂?

	pressure	temperature
Α	decreased	decreased
В	decreased	increased
С	increased	decreased
D	increased	increased

17 In experiment 1, an excess of finely powdered marble is added to 20 cm³ of dilute hydrochloric acid.

In experiment 2, carried out under the same conditions of temperature and pressure, an excess of marble chips is added to 20 cm³ of dilute hydrochloric acid of the same concentration.

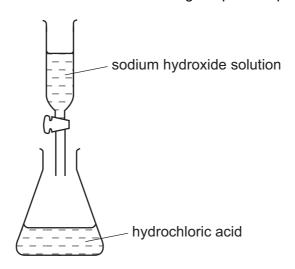
The total volumes of carbon dioxide given off are determined at intervals and plotted against time.



Which pair of curves is obtained in the two experiments?

	experiment 1	experiment 2
Α	Х	Z
В	X	Y
С	Y	Z
D	Y	X

- 18 What is **not** an example of oxidation?
 - A converting iron(III) salts into iron(II) salts
 - B converting magnesium atoms into magnesium ions
 - **C** dissolving of a copper anode during electrolysis
 - **D** liberating chlorine from a chloride
- 19 Which metal has a soluble carbonate, chloride and sulfate?
 - A barium
 - **B** calcium
 - C copper
 - **D** potassium
- **20** Sodium hydroxide solution was added to dilute hydrochloric acid. The pH of the solution in the flask was measured at intervals until no further change of pH took place.



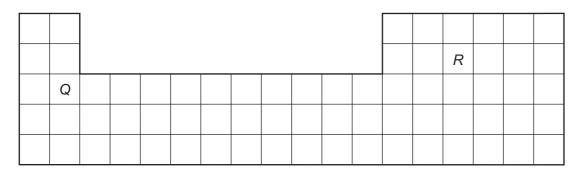
What would be the pH change in this reaction?

- A decrease to 1
- B decrease to 7
- C increase to 7
- **D** increase to 12
- 21 Why is nickel used in the addition of hydrogen to 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.

	up I of the Per	t in Gi	element	, is an	Cs,	Caesium,	22
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Which statements about Caesium are true?

- 1 Caesium conducts electricity both when solid and when molten.
- 2 Caesium reacts explosively with water.
- 3 Caesium reacts with water and forms a solution of pH < 7.
- A 1 and 2 only
- **B** 1 and 3 only
- C 2 and 3 only
- **D** 1, 2 and 3
- **23** Elements with the code letters *Q* and *R* occupy the positions shown in the outline of the Periodic Table.



What is the formula of the compound formed between them?

- \mathbf{A} QR_2
- **B** Q_2R
- \mathbf{C} Q_2R_3
- **D** Q_3R_2

- **24** The list shows some properties of metals.
 - 1 Metals are good conductors of electricity.
 - 2 Metals form ions by the loss of electrons.
 - 3 Metals have high melting points.

Mercury is a metallic element.

Which of these statements do **not** apply to mercury?

A 1 only

B 1 and 2

C 2 and 3

D 3 only

25 In the electrolysis of aluminium oxide to extract pure aluminium a compound called cryolite is first added to the oxide.

What is the reason for adding the cryolite?

- A to reduce the corrosion of the carbon electrodes by oxygen
- B to reduce energy costs
- c to enable the aluminium ions and oxygen ions to move to the electrodes
- **D** to prevent the aluminium formed from being oxidised back to aluminium oxide
- 26 Iron is extracted from its ore haematite, Fe₂O₃, by a reduction process in the blast furnace.

Which equation for reactions in the blast furnace shows the formation of the reducing agent?

- A $CaCO_3 \rightarrow CaO + CO_2$
- **B** CaO + SiO₂ \rightarrow CaSiO₃
- \mathbf{C} $CO_2 + C \rightarrow 2CO$
- $\mathbf{D} \quad \mathsf{C} + \mathsf{O}_2 \to \mathsf{CO}_2$
- 27 The steel bodies of cars can be protected from rusting by spraying them with zinc.

Why is zinc used?

- A Zinc does not react with acidic exhaust fumes.
- **B** Zinc forms a stable compound with iron.
- **C** Zinc has a high melting point.
- **D** Zinc is higher in the reactivity series than iron.
- **28** Solid Y is insoluble in water. It gives off a gas when heated and also when reacted with dilute sulfuric acid.

What is Y?

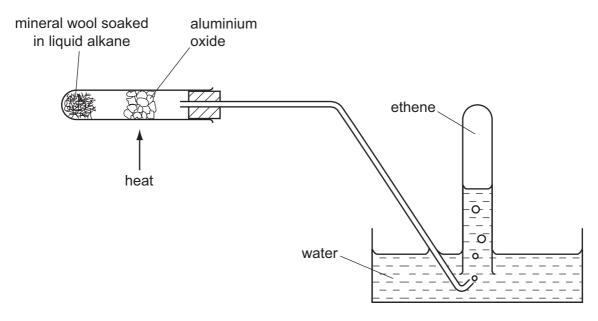
- A copper(II) carbonate
- B sodium carbonate
- C sodium nitrate
- D zinc oxide

- 29 What is the ionic equation for the reaction between zinc and aqueous copper(II) sulfate?
 - **A** $Zn^{2+}(aq) + Cu(s) \rightarrow Zn(s) + Cu^{2+}(aq)$
 - **B** $Zn^{2+}(aq) + SO_4^{2-}(aq) \rightarrow ZnSO_4(s)$
 - C $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$
 - **D** $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$
- 30 Which gas reacts with sulfuric acid to form a fertiliser?
 - A ammonia, NH₃
 - B carbon dioxide, CO₂
 - C hydrogen, H₂
 - **D** nitrogen, N₂
- 31 In the Contact process, the sulfur trioxide formed is
 - A passed into concentrated sulfuric acid.
 - **B** passed into dilute sulfuric acid.
 - **C** passed into oleum $(H_2S_2O_7)$.
 - **D** passed into water.
- 32 Which gas, present in pond water, decreases in concentration during eutrophication?
 - A carbon dioxide
 - **B** methane
 - C nitrogen
 - **D** oxygen
- 33 Methane is a greenhouse gas.

Which process releases methane into the air?

- A combustion of petrol
- B decay of vegetable matter
- C photosynthesis
- **D** volcanic activity

- 34 Carbon dioxide and carbon monoxide are both
 - A absorbed by sodium hydroxide.
 - B colourless.
 - **C** inflammable in air.
 - **D** lighter than air.
- 35 Which hydrocarbon will burn completely in oxygen to give equal numbers of moles of carbon dioxide and water?
 - A C_2H_6
- \mathbf{B} $\mathbf{C}_3\mathbf{H}_6$
- $\mathbf{C} \quad C_4 H_{10}$
- **D** C_5H_{12}
- **36** The diagram shows the breakdown of an alkane to ethene.



The ethene is then tested with aqueous bromine.

Which information about ethene is correct?

	solubility of ethene gas	action on aqueous bromine
Α	insoluble	decolourised
В	insoluble	no reaction
С	soluble	decolourised
D	soluble	no reaction

37 Carbohydrates, proteins, fats and *Terylene* are macromolecules.

Which element is found in only one of these macromolecules?

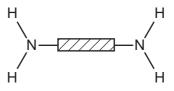
- A carbon
- **B** hydrogen
- C nitrogen
- **D** oxygen
- 38 Which structure is **not** an isomer of the structure shown?

$$\begin{array}{cccc} \mathbf{C} & \mathrm{CH_3}\mathrm{--CH_2}\mathrm{--CH_2}\mathrm{--CH_2}\\ & & \mathrm{CH_3} \end{array}$$

39 Alcohols can be oxidised to form another homologous series of compounds.

What would be the product of the oxidation of propanol?

40 A polymer X is hydrolysed and the two products are



What can be deduced about X?

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

and

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DATA SHEET
The Periodic Table of the Elements

	0	4 Helium	20 Ne Neon 10	40 Ar Argon	84 K rypton	36	131	Xenon Xenon 54	ı	Rn Radon 86		175 Lu Lutetium 71	,	ڐ	Lawrencium 103
	II/		19 F luorine	35.5 C1 Chlorine	80 Br Bromine	35	127	lodine 53		At Astatine 85		173 Yb Ytterbium 70	:	2	Nobelium 102
	IN		16 O Oxygen 8	32 S Sulphur	79 Se Selenium	34	128	le Tellurium 52	1	Po Polonium 84		169 Tm Thulium 69		₽	Mendelevium 101
	^		14 N Nitrogen 7	31 P Phosphorus 15	75 As usenic		122	SD Antimony 51	209	Bi Bismuth 83		167 Er Erbium 68	ı		Fermium 100
	N		12 C Carbon 6	28 Si Silicon	73 Ge Germanium	32	119	Sn ™ 50	207	Pb Lead 82		165 Ho Holmium 67	ı	Es	Einsteinium 99
	Ш		11 B Boron 5	27 A t Auminium 13	70 Ga Gallium	31	115	Indium 49	204	T l Thallium 81		162 Dy Dysprosium 66	1	ა	Californium 98
					65 Zn Zinc	30	112	Cadmium 48	201	Hg Mercury 80		159 Tb Terbium 65	i	&	Berkelium 97
					64 Cu Copper	29	108	Ag Silver	197	Au Gold		157 Gd Gadolinium 64		S	Curium 96
Group					59 Nickel	28	106	Palladium 46	195	Pt Platinum 78		152 Eu Europium 63		Am	Americium 95
Gr					59 Co	27	103	Kh Rhodium 45	192	Iridium 77		Sm Samarium 62	ı	Pr	Plutonium 94
		1 Hydrogen			56 Fe Iron	26	101	Ku Ruthenium 44	190	Osmium 76		Pm Promethium 61	;	d N	Neptunium 93
					55 Mn Manganese	25	ŀ	Technetium 43	186	Re Rhenium 75		Neodymium 60	238	>	Uranium 92
					52 Cr Chromium	24	96	Molybdenum 42	481	W Tungsten 74		Pr Praseodymium 59	ı	Ба	Protactinium 91
					51 Vanadium	23	63	Niobium 41	181	Tan Tantalum 73		140 Ce Cerium	232	卢	Thorium 90
					48 T	22	91	Zi rconium 40	178	Hafnium 72			nic mass	loqu	nic) number
					45 Sc Scandium	21	68 >	Y Yttrium 39	139	La Lanthanum 57 *	Actinium teges	d series series	a = relative atomic mass	X = atomic symbol	b = proton (atomic) number
	=		9 Be Beryllium 4	24 Mg Magnesium	40 Ca	20	8 (Strontium 38	137	Barium 56	226 Ra Radium 88	*58-71 Lanthanoid series		×	Φ
	_		7 L i Lithium	23 Na Sodium	39 K Potassium	19	82	Kubidium 37	133	Caesium 55	Fr Francium 87	*58-71 L	:	Key	Q

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

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