UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/13**

Paper 1 Multiple Choice **May/June 2011**

45 Minutes

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

8339598569

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.

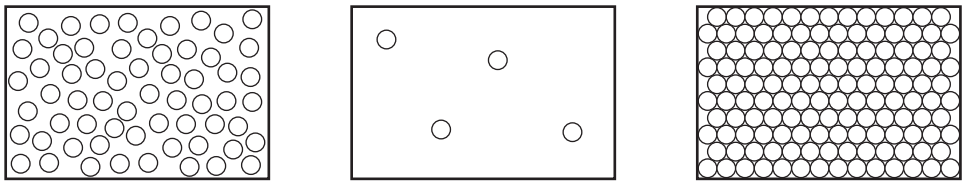
Read the instructions on the Answer Sheet very carefully.

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.
You may use a calculator.

This document consists of **16** printed pages.

© UCLES 2011

1 The diagrams show the arrangement of particles in three different physical states of substance X.



state 1 state 2 state 3

Which statement about the physical states of substance X is correct?

A Particles in state 1 vibrate about fixed positions.

B State 1 changes to state 2 by diffusion.

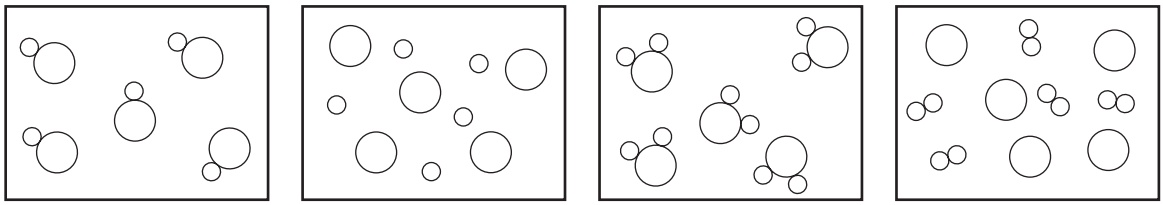
C State 2 changes directly to state 3 by condensation.

D The substance in stage 3 has a fixed volume.

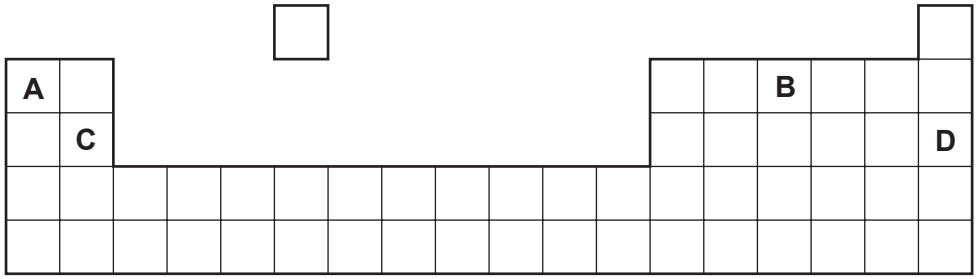
2 In the diagrams, circles of different sizes represent atoms of different elements.

Which diagram represents hydrogen chloride gas?

A **B** **C** **D**



3 The diagram shows part of the Periodic Table.



Which element is correctly matched with its electronic structure?

	electronic structure
A	2,8,1
B	2,4
C	2,8,2
D	2,8

© UCLES 2011

4 An aqueous solution is coloured.

Which method of separation would show that the solution contains ions of different colours?

A chromatography

B crystallisation

C distillation

D filtration

5 The table gives the solubility of four substances in ethanol and in water.

A mixture containing all four substances is added to ethanol, stirred and filtered.

The solid residue is added to water, stirred and filtered.

The filtrate is evaporated to dryness, leaving a white solid.

Which is the white solid?

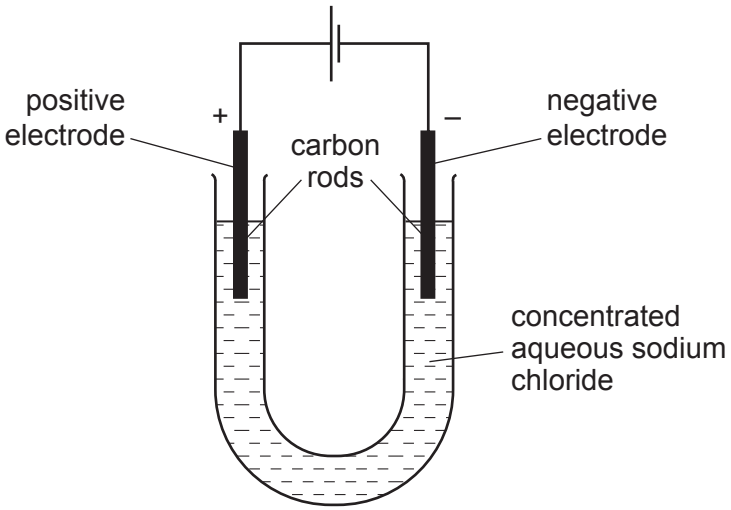
	solubility in	
	ethanol	water
A	insoluble	insoluble
B	insoluble	soluble
C	soluble	insoluble
D	soluble	soluble

6 Which two elements react together to form an ionic compound?

element	electronic structure
W	2,4
X	2,8
Y	2,8,1
Z	2,8,7

A W and X **B** X and Y **C** Y and Z **D** Z and W

7 Electricity is passed through concentrated aqueous sodium chloride, as shown.



What is the test for the gas formed at the positive electrode?

A bleaches damp litmus paper

B 'pops' with a lighted splint

C relights a glowing splint

D turns damp red litmus paper blue

8 Electricity from a power station passes through overhead cables to a substation and then to a school where it is used to electrolyse concentrated hydrochloric acid using inert electrodes.

Which substances are used for the overhead cables and for the electrodes?

	overhead cables	electrodes
A	aluminium	copper
B	aluminium	platinum
C	copper	platinum
D	platinum	aluminium

9 The nucleon number and proton number of the lithium atom are shown by the symbol $^{7}_{3}\mathrm{Li}$.

What is the correct symbol for the lithium ion in lithium chloride?

A $^{6}_{2}\mathrm{Li}^{-}$ **B** $^{6}_{3}\mathrm{Li}^{+}$ **C** $^{7}_{3}\mathrm{Li}^{+}$ **D** $^{7}_{3}\mathrm{Li}^{-}$

© UCLES 2011

10 Three processes are listed.

burning methane in air

radioactive decay of ^{235}U

reacting hydrogen with oxygen.

Which statements about these processes are correct?

1 Hydrogen and methane are being used as fuels.

2 All the processes involve oxidation.

3 All the processes are used to produce energy.

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

11 Which statement about the electrolysis of molten lead(II) bromide is correct?

A A colourless gas is seen at the cathode.

B A grey metal is seen at the anode.

C A red / brown gas is seen at the anode.

D A red / brown metal is seen at the cathode.

12 What is the relative molecular mass (M_r) of HNO_3?

A 5 **B** 31 **C** 32 **D** 63

13 The equation for the effect of heat on hydrated sodium carbonate is as shown.

$$Na_2CO_3.10H_2O(s) \rightleftharpoons Na_2CO_3(s) + 10H_2O(g)$$

Statements made by four students about the reaction are given.

P Anhydrous sodium carbonate is formed.

Q Steam is formed.

R There is a colour change from blue to white.

S The reaction is reversible.

Which students' statements are correct?

A P, Q and R only

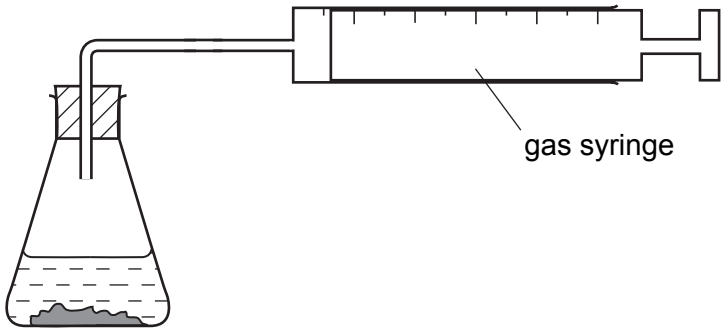
B P, Q and S only

C Q, R and S only

D P, Q, R and S

© UCLES 2011

14 The apparatus shown can be used to measure the rate of some chemical reactions.



For which two reactions would the apparatus be suitable?

reaction 1 $AgNO_3(aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3(aq)$

reaction 2 $2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$

reaction 3 $MgO(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2O(l)$

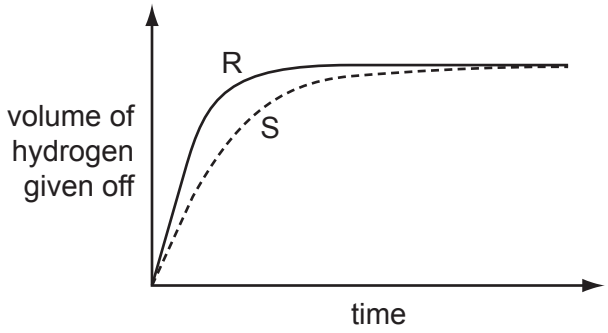
reaction 4 $ZnCO_3(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + CO_2(g) + H_2O(l)$

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

15 A student investigates the rate of reaction between magnesium and excess sulfuric acid.

The volume of hydrogen given off in the reaction is measured over time.

The graph shows the results of two experiments, R and S.



Which change in conditions would cause the difference between R and S?

A A catalyst is added in S.

B The acid is more concentrated in R than in S.

C The magnesium is less finely powdered in R than in S.

D The temperature in R is lower than in S.

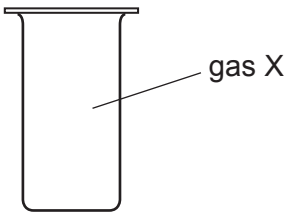
© UCLES 2011

16 Butane, ethanol and hydrogen are fuels.

Which substances produce **both** carbon dioxide and water when used as a fuel?

	butane	ethanol	hydrogen
A	✓	✓	✓
B	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✗

17 X is a monatomic gas.



Which statement about X is correct?

A X burns in air.

B X is coloured.

C X is unreactive.

D X will displace iodine from potassium iodide.

18 The equation shows the reaction between a halogen and aqueous bromide ions.

$$\underset{\ldots 1\ldots}{X_2} + \underset{\ldots 2\ldots}{2Br^-(aq)} \rightarrow 2X^-(aq) + \underset{\ldots 3\ldots}{Br_2}$$

Which words correctly complete gaps 1, 2 and 3?

	1	2	3
A	chlorine	brown	colourless
B	chlorine	colourless	brown
C	iodine	brown	colourless
D	iodine	colourless	brown

© UCLES 2011

19 Carbon dioxide is an acidic oxide that reacts with aqueous calcium hydroxide.

Which type of reaction takes place?

A decomposition

B fermentation

C neutralisation

D oxidation

20 A solution contains barium ions and silver ions.

What could the anion be?

A chloride only

B nitrate only

C sulfate only

D chloride or nitrate or sulfate

21 A mixture containing two anions was tested and the results are shown below.

test	result
dilute nitric acid added	effervescence of a gas which turned limewater milky
dilute nitric acid added, followed by aqueous silver nitrate	yellow precipitate formed

Which anions were present?

A carbonate and chloride

B carbonate and iodide

C sulfate and chloride

D sulfate and iodide

22 Which is **not** a typical property of an acid?

A They react with alkalis producing water.

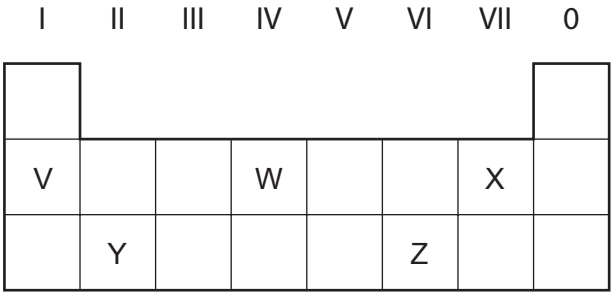
B They react with all metals producing hydrogen.

C They react with carbonates producing carbon dioxide.

D They turn litmus paper red.

© UCLES 2011

23 The diagram shows a section of the Periodic Table.



Which elements will conduct electricity at room temperature?

A V, W and X **B** V, Y and W **C** W, X and Z **D** Y and Z

24 Water from a reservoir flows to the water works where purification processes 1 takes place followed by process 2.

What are purification processes 1 and 2?

	purification process 1	purification process 2
A	chlorination	filtration
B	filtration	chlorination
C	fractional distillation	filtration
D	filtration	fractional distillation

25 The properties of a metal are important in deciding its use.

Which row lists a property that is **not** correct for the use given?

	use of the metal	metal property needed
A	aluminium in aircraft wings	low density
B	aluminium in food containers	resists corrosion
C	mild steel in car bodies	high density
D	stainless steel in cutlery	does not rust

© UCLES 2011

26 Brass is an alloy of copper and zinc.

Which statement is correct?

A Brass can be represented by a chemical formula.

B Brass is formed by a chemical reaction between copper and zinc.

C The alloy will dissolve completely in dilute hydrochloric acid.

D The zinc in the alloy will dissolve in dilute hydrochloric acid.

27 Which statement is correct for the element of proton number 19?

A It is a gas that dissolves in water.

B It is a hard metal that is not very reactive with water.

C It is a non-metal that burns quickly in air.

D It is a soft metal that is highly reactive with water.

28 Which row describes the conditions used to make steel from the iron produced by a blast furnace?

	calcium oxide (lime)	oxygen	heat
A	✓	✓	✓
B	✓	✓	✗
C	✗	✓	✓
D	✗	✓	✗

© UCLES 2011

29 The table shows the results of adding three metals, P, Q and R, to dilute hydrochloric acid and to water.

metal	dilute hydrochloric acid	water
P	hydrogen produced	hydrogen produced
Q	no reaction	no reaction
R	hydrogen produced	no reaction

What is the order of reactivity of the metals?

	most reactive ⟶		least reactive
A	P	R	Q
B	P	Q	R
C	R	Q	P
D	R	P	Q

30 Which substance is a metal?

	electrical conductivity (solid)	electrical conductivity (molten)
A	high	high
B	high	low
C	low	high
D	low	low

31 Greenhouse gases may contribute to climate change.

Two of these gases are emitted into the atmosphere as a result of processes within animals.

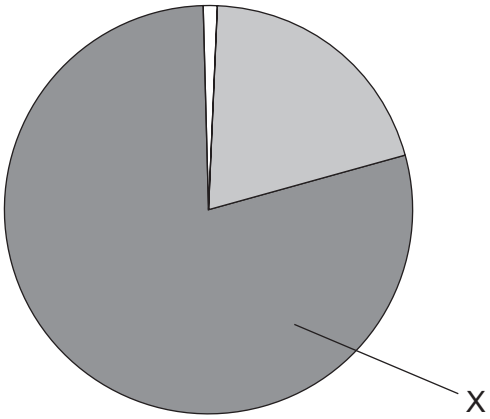
Gas ……1…… is produced by process ……3…… .

Gas ……2…… is produced by process ……4…… .

Which words correctly complete gaps 1, 2, 3 and 4?

	1	2	3	4
A	CO	C_2H_6	digestion	respiration
B	CO	C_2H_6	respiration	digestion
C	CO_2	CH_4	digestion	respiration
D	CO_2	CH_4	respiration	digestion

32 The diagram shows the composition by volume of air.



What is X?

A argon

B carbon dioxide

C nitrogen

D oxygen

33 The table gives the composition of the atmosphere of four newly discovered planets.

planet	composition of atmosphere
W	argon, carbon dioxide and oxygen
X	argon, nitrogen and oxygen
Y	argon, carbon dioxide and methane
Z	methane, nitrogen and oxygen

On which planets is the greenhouse effect likely to occur?

A W only

B W, X and Z

C W and Y only

D W, Y and Z

© UCLES 2011

34 Which two substances, when reacted together, would form a salt that contains two of the essential elements provided by fertilisers?

A potassium hydroxide and nitric acid

B potassium hydroxide and sulfuric acid

C sodium hydroxide and nitric acid

D sodium hydroxide and sulfuric acid

35 Statement 1: Alloying iron with other materials to form stainless steel prevents iron from rusting by excluding oxygen.

Statement 2: Painting, oiling and electroplating are all methods of preventing iron from rusting.

Which is correct?

A Both statements are correct and statement 2 explains statement 1.

B Both statements are correct but statement 2 does not explain statement 1.

C Statement 1 is correct but statement 2 is incorrect.

D Statement 2 is correct but statement 1 is incorrect.

36 What is the main constituent of natural gas?

A carbon dioxide

B ethane

C hydrogen

D methane

37 What is **not** essential for the formation of ethanol by fermentation?

A light

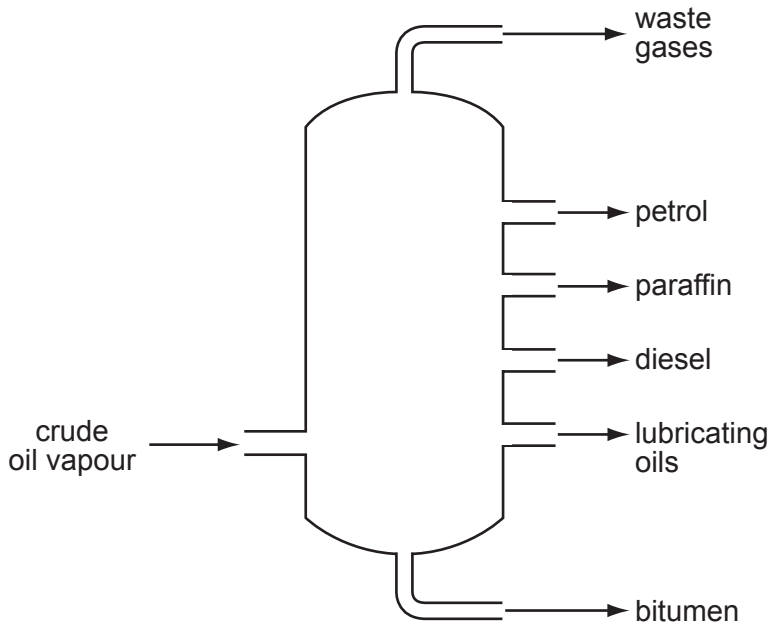
B sugar

C yeast

D water

© UCLES 2011

38 Which industrial process is shown in the diagram?



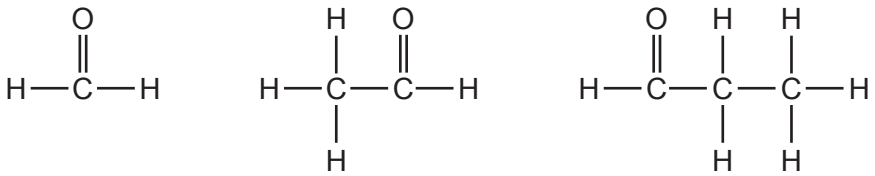
A cracking

B fermentation

C fractional distillation

D polymerisation

39 The diagram shows the structures of three compounds.



Why do these three compounds belong to the same homologous series?

A They all contain carbon, hydrogen and oxygen.

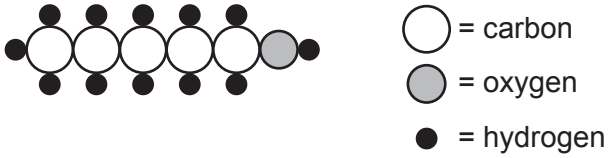
B They all contain the same functional group.

C They are all carbon based molecules.

D They are all flammable liquids.

40 Compounds containing five carbon atoms in a molecule may have names beginning with ‘pent…’.

What is the name of the compound shown?



A pentane

B pentanoic acid

C pentanol

D pentene

© UCLES 2011

DATA SHEET
The Periodic Table of the Elements

Group																	
I	II									III	IV	V	VI	VII	0		
															4 He Helium 2		
					1 H Hydrogen 1												
7 Li Lithium 3	9 Be Beryllium 4									11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10		
23 Na Sodium 11	24 Mg Magnesium 12									27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18		
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

*	140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
†	232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

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

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

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

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2011