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)

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.

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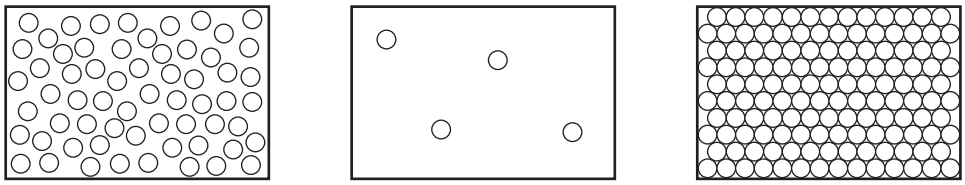
1 The diagrams show the arrangement of particles in three different physical states of substance X.



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.

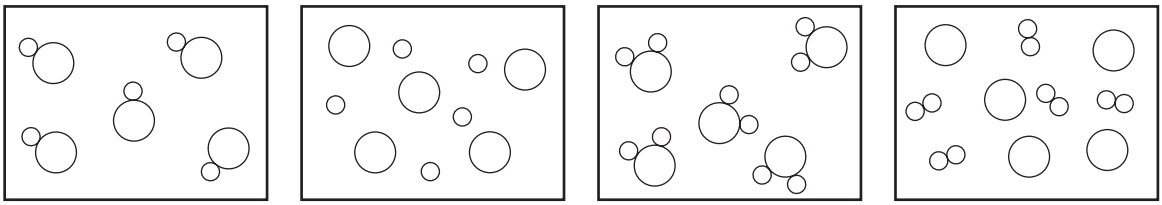
C State 2 changes directly to state 3 by condensation.

D The substance in stage 3 has a fixed volume.

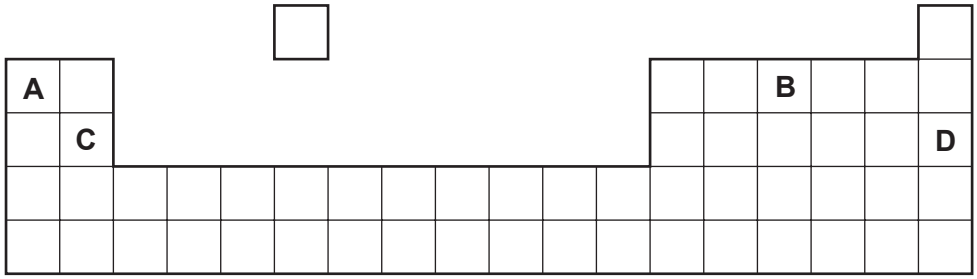
2 In the diagrams, circles of different sizes represent atoms of different elements.

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

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?

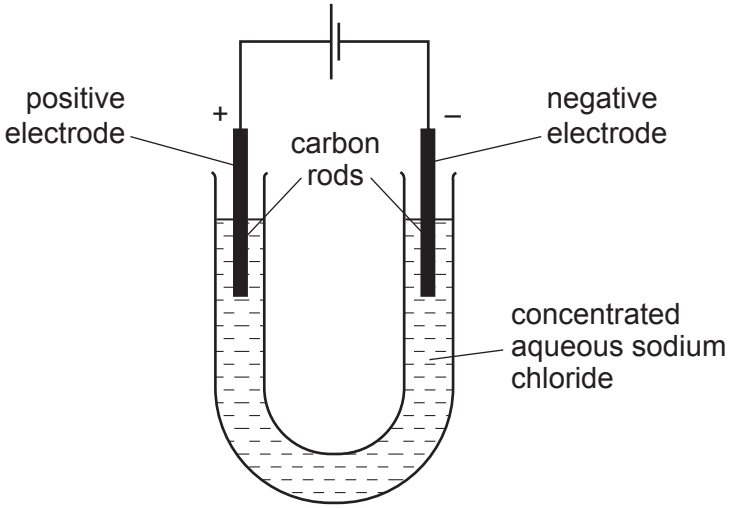
	solubility in	
	ethanol	water
A	insoluble	insoluble
B	insoluble	soluble
C	soluble	insoluble
D	soluble	soluble

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 $^{7}_{3}Li$.

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

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

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?

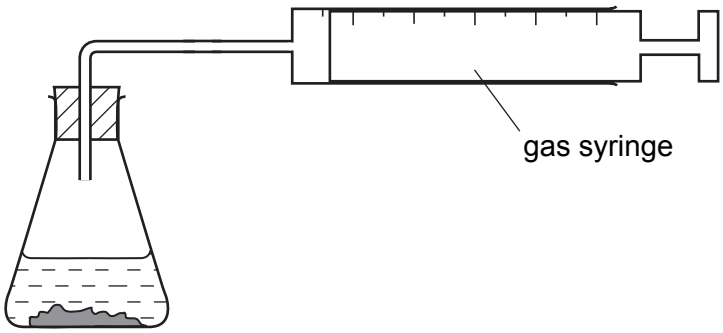
A P, Q and R only

B P, Q and S only

C Q, R and S only

D P, Q, R and S

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



For which two reactions would the apparatus be suitable?

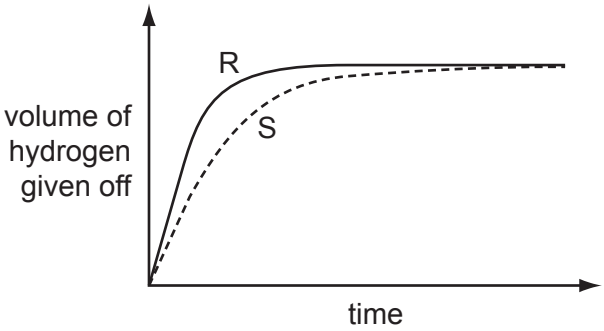
reaction 1	$AgNO_3(aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3(aq)$
reaction 2	$2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$
reaction 3	$MgO(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2O(l)$
reaction 4	$ZnCO_3(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + CO_2(g) + H_2O(l)$

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.

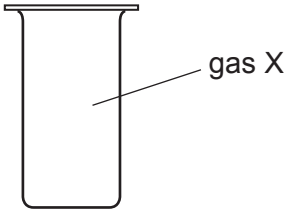
D The temperature in R is lower than in S.

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.

$$X_2 + 2Br^-(aq) \rightarrow 2X^-(aq) + Br_2$$

…1… …2… …3…

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

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.

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23 The diagram shows a section of the Periodic Table.

I	II	III	IV	V	VI	VII	0
V			W			X	
	Y				Z		

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

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	✗	✓	✗

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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.

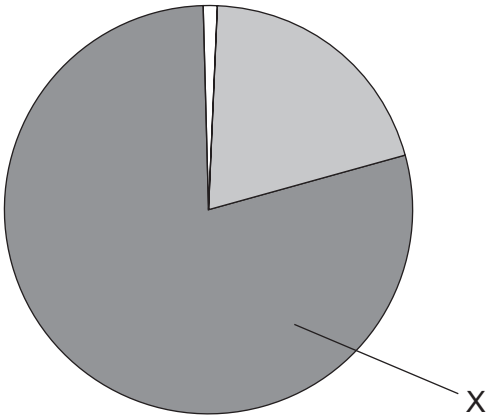
Gas ……1…… is produced by process ……3…… .

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

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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?

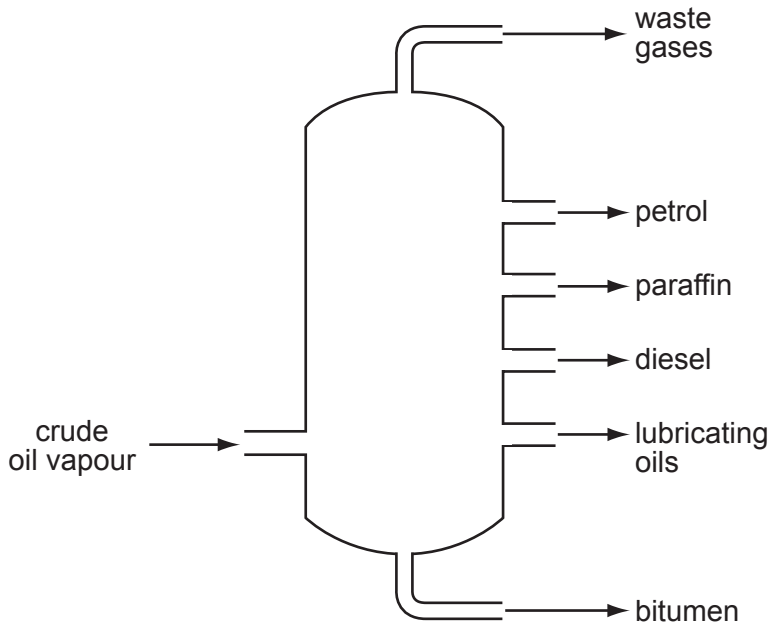
A light

B sugar

C yeast

D water

38 Which industrial process is shown in the diagram?



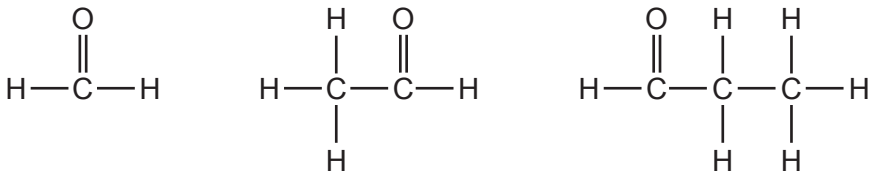
A cracking

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.

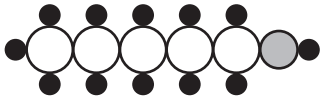
B They all contain the same functional group.

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?



key

= carbon

= oxygen

= hydrogen

A pentane

B pentanoic acid

C pentanol

D pentene

DATA SHEET
The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 **H** Hydrogen 1										4 **He** Helium 2
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
X
b

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.).

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