



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

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CHEMISTRY

0620/12

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)

* 5 5 7 1 6 4 1 4 0 6 *

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.

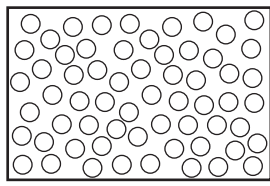
A copy of the Periodic Table is printed on page 16.

You may use a calculator.

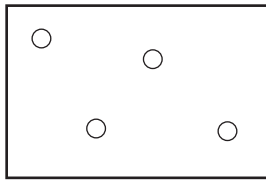
This document consists of **16** printed pages.



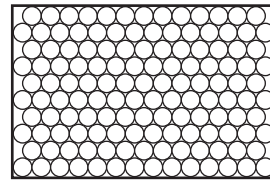
- 1 The diagrams show the arrangement of particles in three different physical states of substance X.



state 1



state 2

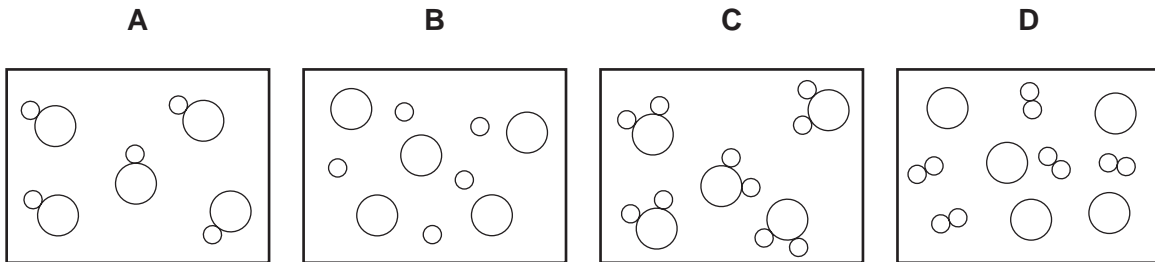


state 3

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?



- 3 The diagram shows part of the Periodic Table.

A										B											
	C																	D			

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?

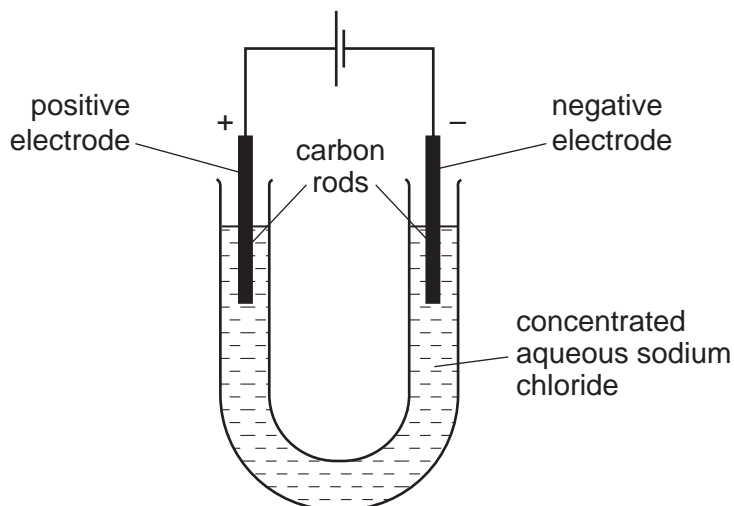
	solubility in	
	ethanol	water
A	insoluble	insoluble
B	insoluble	soluble
C	soluble	insoluble
D	soluble	soluble

- 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 ${}^7_3\text{Li}$.

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

- A ${}^6_2\text{Li}^-$
- B ${}^6_3\text{Li}^+$
- C ${}^7_3\text{Li}^+$
- D ${}^7_3\text{Li}^-$

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

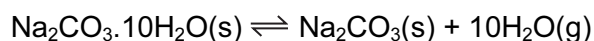
11 Which statement about the electrolysis of molten lead(II) bromide is correct?

- 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.



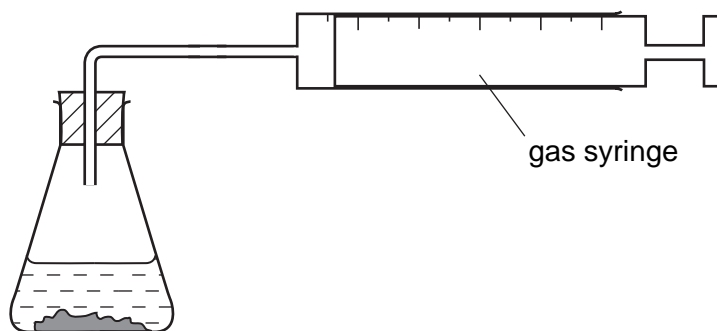
Statements made by four students about the reaction are given.

- 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?

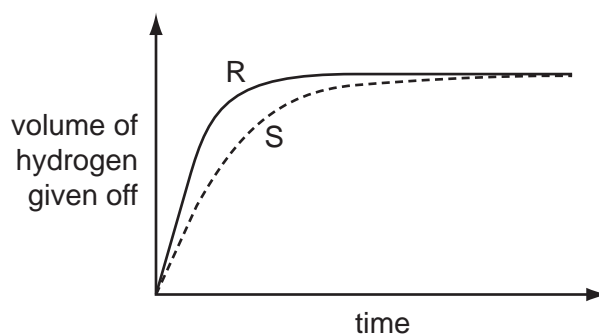
- reaction 1 $\text{AgNO}_3(\text{aq}) + \text{HCl}(\text{aq}) \rightarrow \text{AgCl}(\text{s}) + \text{HNO}_3(\text{aq})$
 reaction 2 $2\text{H}_2\text{O}_2(\text{aq}) \rightarrow 2\text{H}_2\text{O}(\text{l}) + \text{O}_2(\text{g})$
 reaction 3 $\text{MgO}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{MgCl}_2(\text{aq}) + \text{H}_2\text{O}(\text{l})$
 reaction 4 $\text{ZnCO}_3(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{ZnCl}_2(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$

- 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?

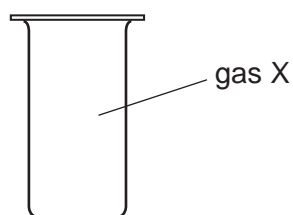
- A** A catalyst is added in S.
B The acid is more concentrated in R than in S.
C The magnesium is less finely powdered in R than in S.
D The temperature in R is lower than in S.

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	✓	✓	x
C	✓	x	✓
D	x	✓	x

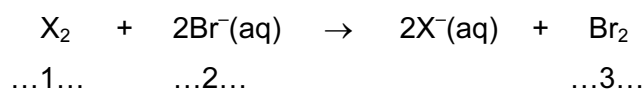
17 X is a monatomic gas.



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.



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.

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	✓	✓	x
C	x	✓	✓
D	x	✓	x

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

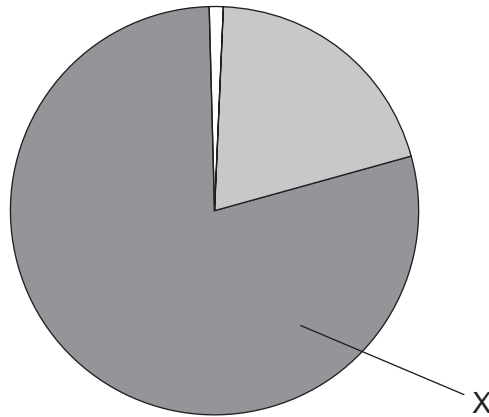
Gas1..... is produced by process3..... .

Gas2..... is produced by process4..... .

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

	1	2	3	4
A	CO	C ₂ H ₆	digestion	respiration
B	CO	C ₂ H 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.

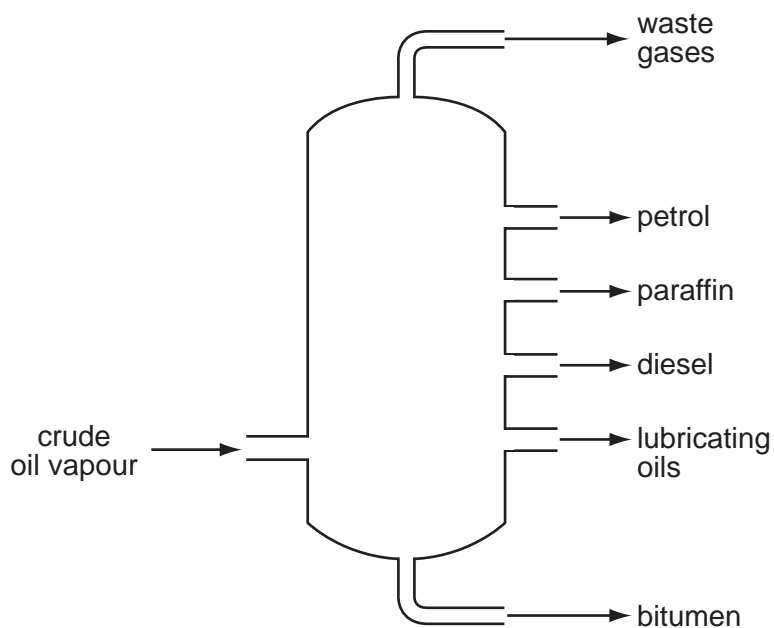
planet	composition of atmosphere
W	argon, carbon dioxide and oxygen
X	argon, nitrogen and oxygen
Y	argon, carbon dioxide and methane
Z	methane, nitrogen and oxygen

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

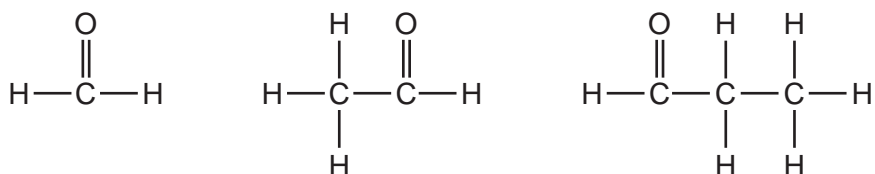
- 34 Which two substances, when reacted together, would form a salt that contains essential elements provided by fertilisers?
- A potassium hydroxide and nitric acid
 - B potassium hydroxide and sulfuric acid
 - C sodium hydroxide and nitric acid
 - D sodium hydroxide and sulfuric acid
- 35 Statement 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

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

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

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

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