



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**CHEMISTRY**

Paper 1 Multiple Choice

**0620/11**

**May/June 2013**

**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.

**DO NOT WRITE IN ANY BARCODES.**

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.

Electronic calculators may be used.

This document consists of **15** printed pages and **1** blank page.



- 1 The diagram shows a cup of tea.



Which row describes the water particles in the air above the cup compared with the water particles in the cup?

	moving faster	closer together
<b>A</b>	✓	✓
<b>B</b>	✓	x
<b>C</b>	x	✓
<b>D</b>	x	x

- 2 Crystals of sodium chloride were prepared by the following method.

- 1  $25.0\text{ cm}^3$  of dilute hydrochloric acid was accurately measured into a conical flask.
- 2 Aqueous sodium hydroxide was added until the solution was neutral. The volume of sodium hydroxide added was measured.
- 3 The solution was evaporated and the crystals washed with approximately  $15\text{ cm}^3$  of water.

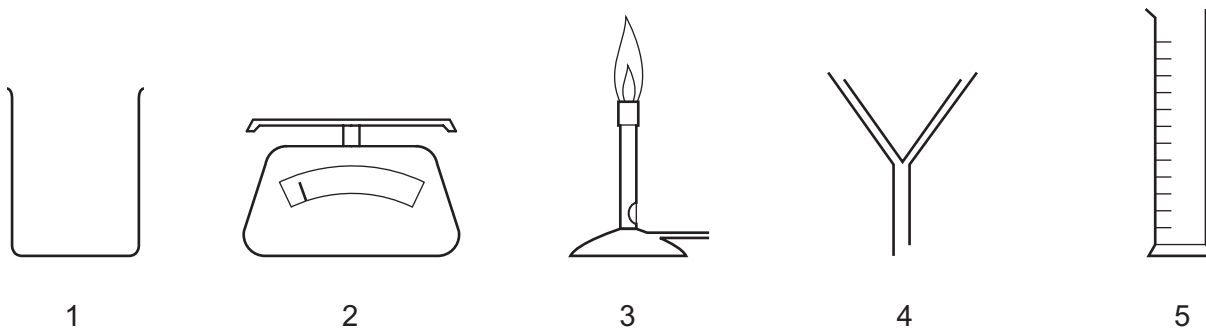
Which row shows the pieces of apparatus used to measure the  $25.0\text{ cm}^3$  of hydrochloric acid, the volume of aqueous sodium hydroxide and the  $15\text{ cm}^3$  of water?

	$25.0\text{ cm}^3$ of hydrochloric acid accurately	the volume of aqueous sodium hydroxide added	$15\text{ cm}^3$ of water approximately
<b>A</b>	burette	pipette	measuring cylinder
<b>B</b>	measuring cylinder	burette	pipette
<b>C</b>	pipette	burette	measuring cylinder
<b>D</b>	pipette	measuring cylinder	burette

- 3** Lead iodide is insoluble in water.

Lead iodide is made by adding aqueous lead nitrate to aqueous potassium iodide.

Which pieces of apparatus are needed to obtain solid lead iodide from 20 cm<sup>3</sup> of aqueous lead nitrate?



- A** 1, 2 and 4      **B** 1, 3 and 5      **C** 1, 4 and 5      **D** 2, 4 and 5

- 4** Element X is represented by  ${}^{27}_{13}\text{X}$ .

Which statement about element X is correct?

- A** An atom of X contains 13 protons and 13 neutrons.
- B** An atom of X contains 27 protons and 13 electrons.
- C** X forms an ion by gaining electrons.
- D** X is placed in Group III of the Periodic Table.

- 5** The positions of four elements are shown on the outline of the Periodic Table.

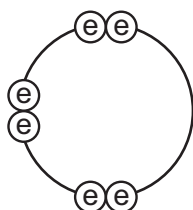
Which element forms a coloured oxide?


A simplified periodic table with 18 columns and 4 rows. The columns are labeled with groups: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18. The rows are labeled with periods: 1, 2, 3, 4. The elements are represented by boxes. The boxes are arranged in a grid. The first row has 2 boxes (groups 1 and 2). The second row has 8 boxes (groups 1 to 8). The third row has 8 boxes (groups 1 to 8). The fourth row has 18 boxes (groups 1 to 18). The boxes are labeled with letters: A is in the box for group 3, period 4. B is in the box for group 2, period 2. C is in the box for group 18, period 2. D is in the box for group 5, period 3.

- 6 For which substance is the type of bonding **not** correct?

	substance	type of bonding		
		ionic	covalent	metallic
<b>A</b>	chlorine		✓	
<b>B</b>	potassium bromide	✓		
<b>C</b>	sodium			✓
<b>D</b>	sodium chloride		✓	

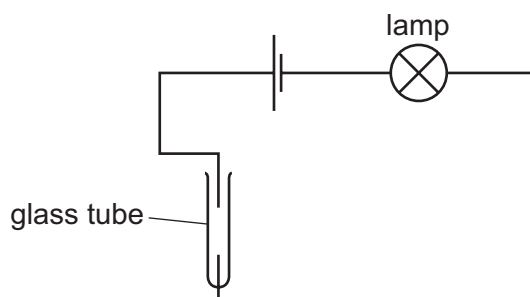
- 7 Element X has six electrons in its outer shell.



key  
 = electron

How could the element react?

- A** by gaining two electrons to form a positive ion  
**B** by losing six electrons to form a negative ion  
**C** by sharing two electrons with two electrons from another element to form two covalent bonds  
**D** by sharing two electrons with two electrons from another element to form four covalent bonds
- 8 The diagram shows an incomplete circuit.



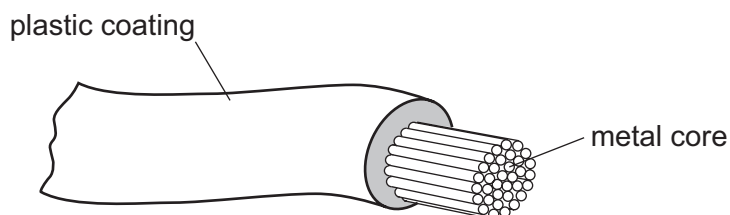
Which substance causes the lamp to light when added to the glass tube?

- A** aqueous sodium chloride  
**B** aqueous sugar  
**C** solid sodium chloride  
**D** solid sugar

- 9 A compound with the formula  $\text{XF}_2$  has a relative formula mass of 78.

What is element X?

- A argon
  - B calcium
  - C neon
  - D zirconium
- 10 What is the balanced chemical equation for the reaction between calcium and water?
- A  $\text{Ca} + \text{H}_2\text{O} \rightarrow \text{CaOH} + \text{H}_2$
  - B  $\text{Ca} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2$
  - C  $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{CaOH} + \text{H}_2$
  - D  $\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{H}_2$
- 11 The diagram shows an electrical cable.

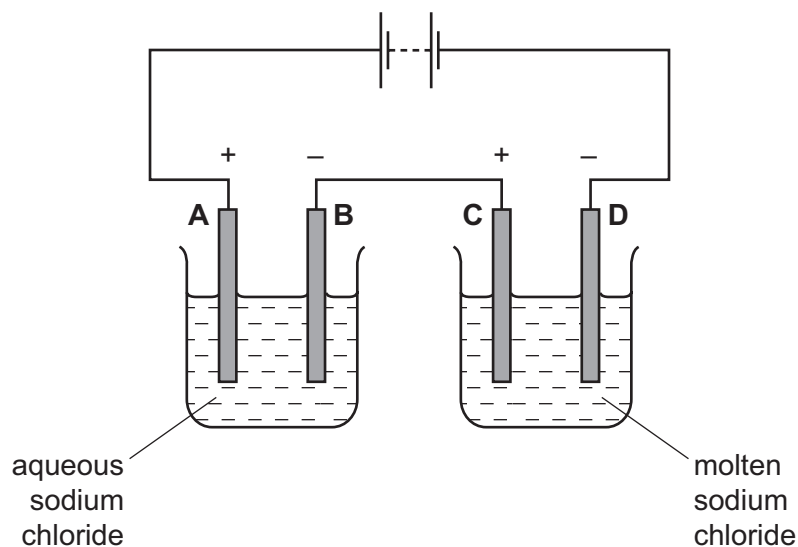


Which statement about the substances used is correct?

- A The coating is plastic because it conducts electricity well.
- B The core is copper because it conducts electricity well.
- C The core is copper because it is cheap and strong.
- D The core is iron because it is cheap and strong.

12 The diagram shows an electrolysis circuit.

At which electrode is hydrogen formed?



13 Some white anhydrous copper(II) sulfate powder is put into a beaker of water and stirred.

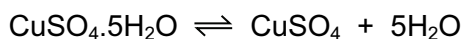
What would show that the process was exothermic?

- A A blue solution is formed.
- B The beaker feels cooler.
- C The beaker feels warmer.
- D The powder dissolves in the water.

14 Which substance does **not** require oxygen in order to produce energy?

- A coal
- B hydrogen
- C natural gas
- D  $^{235}\text{U}$

- 15 The equation shows the formation of anhydrous copper(II) sulfate from hydrated copper(II) sulfate.



Statements 1, 2 and 3 refer to this reaction.

- 1 Hydrated copper(II) sulfate is reduced to anhydrous copper(II) sulfate.
- 2 The (II) in the name copper(II) sulfate refers to the oxidation state of the metal.
- 3 The reaction is reversible.

Which statements are correct?

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

- 16 Calcium carbonate reacts with hydrochloric acid to form carbon dioxide.

Which changes would slow this reaction down?

- 1 decreasing the concentration of hydrochloric acid
- 2 decreasing the particle size of calcium carbonate
- 3 decreasing the temperature

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

- 17 The equations represent redox reactions.

In which equation is the underlined substance acting as a reducing agent?

- A** 3CO + Fe<sub>2</sub>O<sub>3</sub> → 2Fe + 3CO<sub>2</sub>
- B** CO<sub>2</sub> + C → 2CO
- C** CuO + H<sub>2</sub> → Cu + H<sub>2</sub>O
- D** CaO + H<sub>2</sub>O → Ca(OH)<sub>2</sub>

- 18 Ant stings hurt because of the methanoic acid produced by the ant.

Which substance could, **most safely**, be used to neutralise the acid?

	substance	pH
<b>A</b>	baking soda	8
<b>B</b>	car battery acid	1
<b>C</b>	lemon juice	3
<b>D</b>	oven cleaner	14

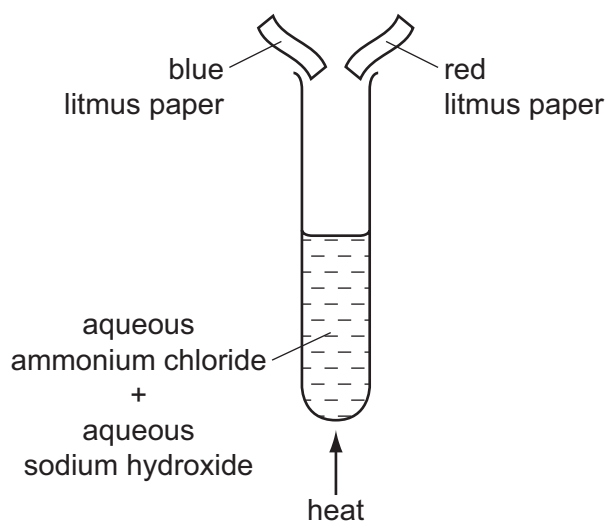
19 The diagram shows one period of the Periodic Table.

Li	Be	B	C	N	O	F	Ne
----	----	---	---	---	---	---	----

Which two elements form acidic oxides?

- A carbon and lithium
- B carbon and neon
- C carbon and nitrogen
- D nitrogen and neon

20 The diagram shows an experiment.



What happens to the pieces of litmus paper?

	blue litmus paper	red litmus paper
A	changes colour	changes colour
B	changes colour	no colour change
C	no colour change	changes colour
D	no colour change	no colour change



- 21** Two indicators, bromophenol blue and Congo red, show the following colours in acidic solutions and in alkaline solutions.

indicator	acid	alkali
bromophenol blue	yellow	blue
Congo red	violet	red

A few drops of each indicator are added to separate samples of a solution of pH 2.

What are the colours of the indicators in this solution?

	in a solution of pH 2	
	bromophenol blue is	Congo red is
<b>A</b>	blue	red
<b>B</b>	blue	violet
<b>C</b>	yellow	red
<b>D</b>	yellow	violet

- 22** Which property of elements increases across a period of the Periodic Table?

- A** metallic character
- B** number of electron shells
- C** number of outer shell electrons
- D** tendency to form positive ions

- 23** Which element is a transition metal?

	colour of chloride	melting point of element / °C
<b>A</b>	white	113
<b>B</b>	white	1495
<b>C</b>	yellow	113
<b>D</b>	yellow	1495

**24** Fluorine is at the top of Group VII in the Periodic Table.

Which row shows the properties of fluorine?

	colour	state at room temperature	reaction with aqueous potassium iodide
<b>A</b>	brown	gas	no reaction
<b>B</b>	brown	liquid	iodine displaced
<b>C</b>	yellow	gas	iodine displaced
<b>D</b>	yellow	liquid	no reaction

**25** Group I metals are also known as the Alkali Metals.

Which statement about the metals in Group I is **not** correct?

- A** In their reactions they lose electrons.
- B** Their atoms all have one electron in their outer shell.
- C** They form +1 ions in their reactions with non-metals.
- D** They form covalent compounds by sharing electrons.

**26** Which element is a metal?

	charge on element ion	electrical conductivity
<b>A</b>	negative	low
<b>B</b>	positive	high
<b>C</b>	negative	high
<b>D</b>	positive	low

**27** Which property makes aluminium ideal for making food containers?

- A** conducts electricity
- B** conducts heat
- C** mechanical strength
- D** resistance to corrosion

28 Which substance is **not** involved in the extraction of iron from hematite?

- A carbon
- B carbon monoxide
- C calcium carbonate
- D nitrogen

29 Pure metals conduct electricity and can be hammered into different shapes.

Why are metals sometimes used as alloys?

- A Alloys are cheaper than the metals they are made from.
- B Alloys are easier to hammer into different shapes.
- C Alloys are harder and keep their shape better.
- D Alloys conduct electricity better.

30 Below are some metals in decreasing order of reactivity.

magnesium

zinc

iron

copper

Titanium reacts with acid and cannot be extracted from its ore by heating with carbon.

Where should titanium be placed in this list?

- A below copper
- B between iron and copper
- C between magnesium and zinc
- D between zinc and iron

31 Water has been contaminated with sea-water.

Which substances can be removed by chlorination and filtration?

- A bacteria, sand and sodium chloride
- B bacteria and sand only
- C bacteria and sodium chloride only
- D sand and sodium chloride only

32 Iron rusts when it reacts with .....1.....

Rusting can be prevented by covering the iron with a more reactive metal, such as .....2.....

Which words correctly complete gaps 1 and 2?

	1	2
<b>A</b>	oxygen	copper
<b>B</b>	oxygen	magnesium
<b>C</b>	oxygen and water	copper
<b>D</b>	oxygen and water	magnesium

33 Nitrogen, phosphorus and potassium are essential elements for plant growth.

Which mixture provides all three essential elements?

	mixture	formula
<b>A</b>	ammonium phosphate + potassium chloride	$(\text{NH}_4)_3\text{PO}_4$ + $\text{KCl}$
<b>B</b>	ammonium phosphate + ammonium nitrate	$(\text{NH}_4)_3\text{PO}_4$ + $\text{NH}_4\text{NO}_3$
<b>C</b>	ammonium phosphate + ammonium chloride	$(\text{NH}_4)_3\text{PO}_4$ + $\text{NH}_4\text{Cl}$
<b>D</b>	ammonium nitrate + potassium chloride	$\text{NH}_4\text{NO}_3$ + $\text{KCl}$

34 Which information about carbon dioxide and methane is correct?

		carbon dioxide	methane
<b>A</b>	formed when vegetation decomposes	✓	✗
<b>B</b>	greenhouse gas	✓	✓
<b>C</b>	present in unpolluted air	✗	✗
<b>D</b>	produced during respiration	✗	✓

key  
✓ = true  
✗ = false

35 The list shows four methods that were suggested for the formation of carbon dioxide.

- 1 action of an alkali on a carbonate
- 2 action of heat on a carbonate
- 3 complete combustion of methane
- 4 reaction of a carbonate with oxygen

Which methods would result in the production of carbon dioxide?

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

36 Organic compounds may have names ending in -ane, -ene, -ol or -oic acid.

How many of these endings indicate the compounds contain double bonds in their molecules?

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

37 The table shows the boiling points of four members of the homologous series of alcohols.

compound		boiling point / °C
name	formula	
methanol	CH <sub>3</sub> OH	65
ethanol	C <sub>2</sub> H <sub>5</sub> OH	78
propanol	C <sub>3</sub> H <sub>7</sub> OH	X
butanol	C <sub>4</sub> H <sub>9</sub> OH	117

What is the value of X?

- A** 55 °C      **B** 82 °C      **C** 98 °C      **D** 115 °C

- 38 The table shows some fractions that are obtained from petroleum by fractional distillation, together with some of their uses.

fraction	use
refinery gas	cooking
gasoline	fuel for cars
1	making chemicals
2	jet fuel
3	fuel for ships
bitumen	making roads

Which row correctly identifies fractions 1, 2 and 3?

	1	2	3
<b>A</b>	diesel oil	fuel oil	lubricating fraction
<b>B</b>	fuel oil	diesel oil	kerosene
<b>C</b>	kerosene	naphtha	diesel oil
<b>D</b>	naphtha	kerosene	fuel oil

- 39 Which columns describe the hydrocarbons ethane and ethene?

	1	2	3	4
state at room temperature	gas	gas	liquid	liquid
reaction with oxygen	burns	burns	burns	burns
reaction with aqueous bromine	no reaction	decolourises bromine	no reaction	decolourises bromine

- A** 1 (ethane) and 2 (ethene)  
**B** 1 (ethane) and 4 (ethene)  
**C** 2 (ethene) and 3 (ethane)  
**D** 3 (ethane) and 4 (ethene)

- 40 Which of the statements about ethanol are correct?

- 1 Ethanol can be formed by an addition reaction.
- 2 Ethanol can be formed by fermentation.
- 3 When ethanol burns in air, it forms carbon dioxide and water.

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



**DATA SHEET**  
**The Periodic Table of the Elements**

Group																		
I	II											III	IV	V	VI	VII	0	
		<div>1 H Hydrogen</div>																
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	101 Ru Ruthenium 44	101 Rh Rhodium 45	103 Pd Palladium 46	106 Ag Silver 47	108 Cd Cadmium 48	112 In Indium 49	115 Sn Tin 50	119 Sb Antimony 51	122 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																
58-71 Lanthanoid series																		
90-103 Actinoid series																		
<div><div>a</div><div>X</div><div>b</div></div> <div>a = relative atomic mass X = atomic symbol b = proton (atomic) number</div>																		
Key																		
	175 Lu Lutetium 71																	
	173 Yb Ytterbium 70																	
	169 Tm Thulium 69																	
	167 Er Erbium 68																	
	165 Ho Holmium 67																	
	162 Dy Dysprosium 66																	
	159 Tb Terbium 65																	
	157 Gd Gadolinium 64																	
	152 Eu Europium 63																	
	150 Sm Samarium 62																	
	144 Nd Neodymium 60																	
	141 Pr Praseodymium 59																	
	140 Ce Cerium 58																	
	238 U Uranium 92																	
	238 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																	

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

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

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

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