UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CHEMISTRY **0620/13**

Paper 1 Multiple Choice **May/June 2013**

45 Minutes

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

3600035500

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
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

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

1 25.0 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.

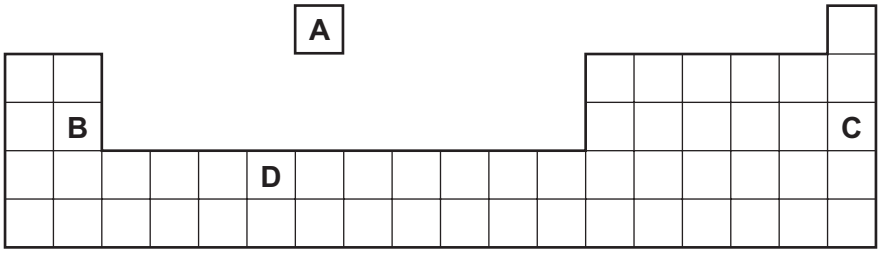
3 The solution was evaporated and the crystals washed with approximately 15 cm^3 of water.

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

	25.0 cm^3 of hydrochloric acid accurately	the volume of aqueous sodium hydroxide added	15 cm^3 of water approximately
A	burette	pipette	measuring cylinder
B	measuring cylinder	burette	pipette
C	pipette	burette	measuring cylinder
D	pipette	measuring cylinder	burette

3 The positions of four elements are shown on the outline of the Periodic Table.

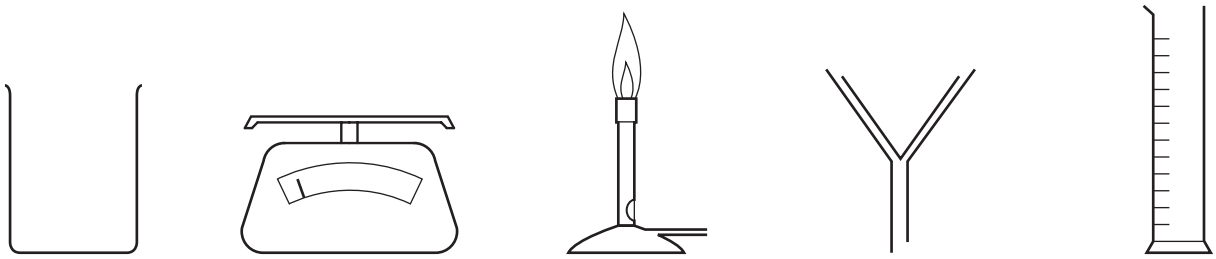
Which element forms a coloured oxide?



4 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^3 of aqueous lead nitrate?



1 2 3 4 5

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

5 Element X is represented by $^{27}_{13}X$.

Which statement about element X is correct?

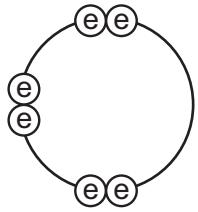
A An atom of X contains 13 protons and 13 neutrons.

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.

6 Element X has six electrons in its outer shell.



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

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

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

8 A compound with the formula XF_2 has a relative formula mass of 78.

What is element X?

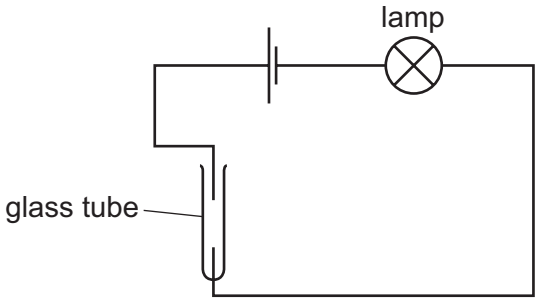
A argon

B calcium

C neon

D zirconium

9 The diagram shows an incomplete circuit.



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

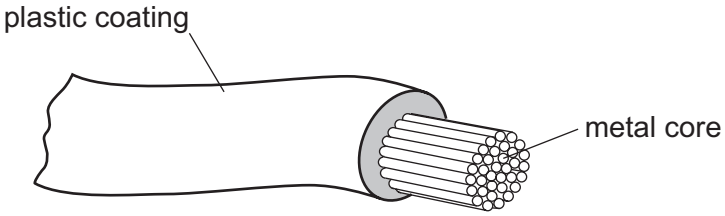
A aqueous sodium chloride

B aqueous sugar

C solid sodium chloride

D solid sugar

10 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.

11 What is the balanced chemical equation for the reaction between calcium and water?

A $Ca + H_2O \rightarrow CaOH + H_2$

B $Ca + H_2O \rightarrow Ca(OH)_2 + H_2$

C $Ca + 2H_2O \rightarrow CaOH + H_2$

D $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

12 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.

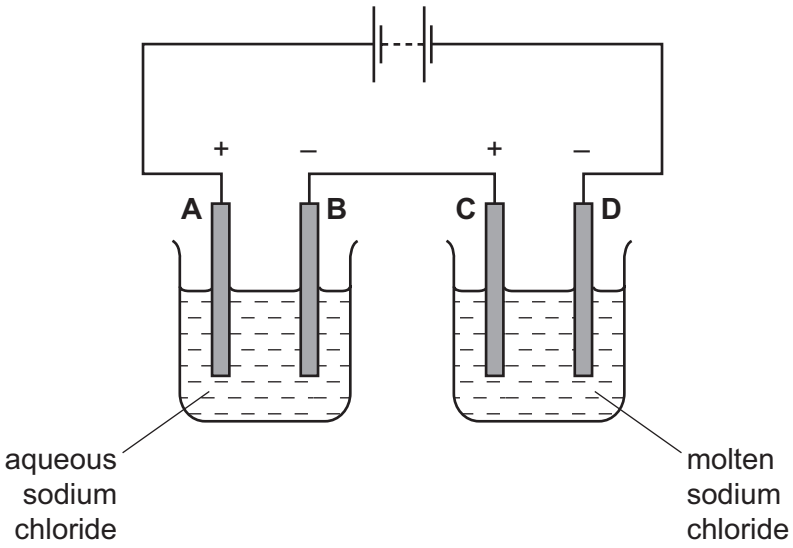
B The beaker feels cooler.

C The beaker feels warmer.

D The powder dissolves in the water.

13 The diagram shows an electrolysis circuit.

At which electrode is hydrogen formed?



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

A coal

B hydrogen

C natural gas

D ^{235}U

15 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

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

$$CuSO_4.5H_2O \rightleftharpoons CuSO_4 + 5H_2O$$

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

17 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
A	baking soda	8
B	car battery acid	1
C	lemon juice	3
D	oven cleaner	14

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

A $3\underline{CO} + Fe_2O_3 \rightarrow 2Fe + 3CO_2$

B $\underline{CO_2} + C \rightarrow 2CO$

C $\underline{CuO} + H_2 \rightarrow Cu + H_2O$

D $\underline{CaO} + H_2O \rightarrow Ca(OH)_2$

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

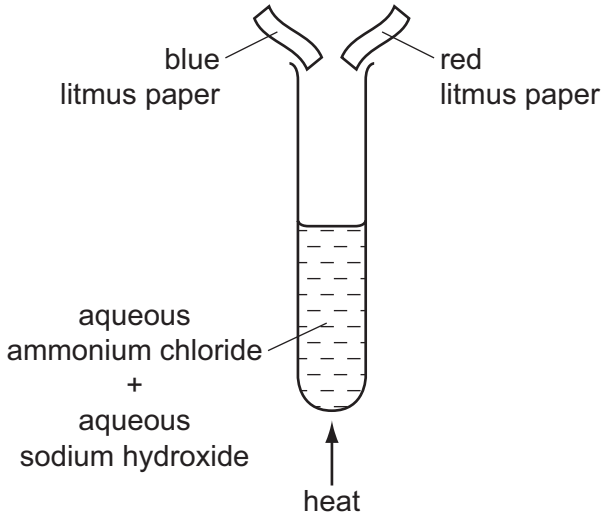
indicator	acid	alkali
bromophenol blue	yellow	blue
Congo red	violet	red

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
A	blue	red
B	blue	violet
C	yellow	red
D	yellow	violet

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 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

22 Which element is a transition metal?

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

23 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

24 Which property makes aluminium ideal for making food containers?

A conducts electricity

B conducts heat

C mechanical strength

D resistance to corrosion

25 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
A	brown	gas	no reaction
B	brown	liquid	iodine displaced
C	yellow	gas	iodine displaced
D	yellow	liquid	no reaction

26 Which element is a metal?

	charge on element ion	electrical conductivity
A	negative	low
B	positive	high
C	negative	high
D	positive	low

27 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.

28 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

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

A carbon

B carbon monoxide

C calcium carbonate

D nitrogen

30 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.

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 Which information about carbon dioxide and methane is correct?

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

key

✓ = true

✗ = false

33 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
A	oxygen	copper
B	oxygen	magnesium
C	oxygen and water	copper
D	oxygen and water	magnesium

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

Which mixture provides all three essential elements?

	mixture	formula
A	ammonium phosphate + potassium chloride	$(NH_4)_3PO_4$ + KCl
B	ammonium phosphate + ammonium nitrate	$(NH_4)_3PO_4$ + NH_4NO_3
C	ammonium phosphate + ammonium chloride	$(NH_4)_3PO_4$ + NH_4Cl
D	ammonium nitrate + potassium chloride	NH_4NO_3 + KCl

35 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

36 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

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

compound		boiling point / °C
name	formula	
methanol	CH_3OH	65
ethanol	C_2H_5OH	78
propanol	C_3H_7OH	X
butanol	C_4H_9OH	117

What is the value of X?

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

38 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)

39 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
A	diesel oil	fuel oil	lubricating fraction
B	fuel oil	diesel oil	kerosene
C	kerosene	naphtha	diesel oil
D	naphtha	kerosene	fuel oil

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

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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												
										11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10		
7 Li Lithium 3	9 Be Beryllium 4									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		
23 Na Sodium 11	24 Mg Magnesium 12									70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36		
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	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
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	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
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						
	226 Ra Radium 88	227 Ac Actinium †															

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.).