UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

**CHEMISTRY** **0620/13**

Paper 1 Multiple Choice **October/November 2012**

**45 Minutes**

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

* 1 7 7 3 7 2 5 0 2 1 *

**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.



IB12 11_0620_13/3RP
© UCLES 2012

**1** ‘Particles moving **very slowly** from an area of high concentration to an area of low concentration.’

Which process is being described above?

**A** a liquid being frozen

**B** a solid melting

**C** a substance diffusing through a liquid

**D** a substance diffusing through the air

**2** Solid W melts at exactly 54 °C and boils at exactly 302 °C.

Solid X, when dissolved in water and examined using paper chromatography, shows a blue colour and a red colour.

Which row is correct?

| | contains only one substance | contains more than one substance |
|---|---|---|
| **A** | W and X | – |
| **B** | W | X |
| **C** | X | W |
| **D** | – | W and X |

**3** Part of the instructions in an experiment reads as follows.

Quickly add 50 $cm^3$ of acid.

What is the best piece of apparatus to use?

**A** a burette

**B** a conical flask

**C** a measuring cylinder

**D** a pipette

© UCLES 2012

**4** The nucleon number of an isotope of rubidium is 85.

How many protons, neutrons and electrons are present in an atom of this isotope?

| | protons | neutrons | electrons |
|---|---|---|---|
| **A** | 37 | 48 | 37 |
| **B** | 37 | 48 | 39 |
| **C** | 39 | 46 | 37 |
| **D** | 39 | 46 | 39 |

**5** Which row gives the number of electrons in the outer electron shell of fluorine and of neon?

| | $^{19}_{9}F$ | $^{20}_{10}Ne$ |
|---|---|---|
| **A** | 7 | 8 |
| **B** | 7 | 10 |
| **C** | 9 | 8 |
| **D** | 9 | 10 |

**6** In the molecules $CH_4$, $HCl$ and $H_2O$, which atoms use **all** of their outer shell electrons in bonding?

**A** C and Cl **B** C and H **C** Cl and H **D** H and O

**7** The table shows the electronic structures of four atoms.

| atom | electronic structure |
|---|---|
| W | 2,1 |
| X | 2,7 |
| Y | 2,8,4 |
| Z | 2,8,8 |

Which two atoms combine to form an ionic compound?

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

© UCLES 2012

**8** A compound has the formula $CH_3CO_2H$.

How should the relative molecular mass, $M_r$, of this compound be calculated?

**A** 12 + 1 + 16

**B** 3(12 + 1) + 2(12 + 16) + 1

**C** (4 × 12) + (2 × 1) + 16

**D** (2 × 12) + (4 × 1) + (2 × 16)

**9** In separate experiments, electricity was passed through concentrated aqueous sodium chloride and molten lead bromide.

What would happen in **both** experiments?

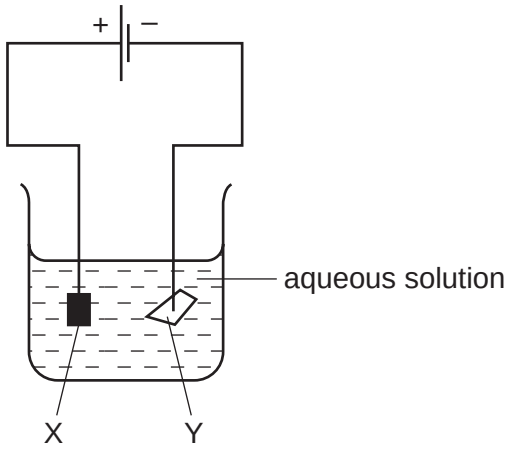
**A** A halogen would be formed at the anode.

**B** A metal would be formed at the cathode.

**C** Hydrogen would be formed at the anode.

**D** Hydrogen would be formed at the cathode.

**10** The diagram shows an electrolysis experiment using metals X and Y as electrodes.

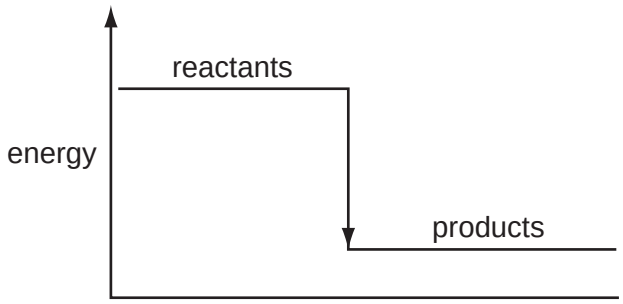



One of the metals becomes coated with copper.

Which metal becomes coated and which aqueous solution is used?

| | metal | aqueous solution |
|---|---|---|
| **A** | X | $CrCl_3$ |
| **B** | X | $CuCl_2$ |
| **C** | Y | $CrCl_3$ |
| **D** | Y | $CuCl_2$ |

**11** A diagram for the energy change during an exothermic reaction is shown.




For which reactions would this be an appropriate diagram?

1 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

2 $2H_2 + O_2 \rightarrow 2H_2O$

3 $C + O_2 \rightarrow CO_2$

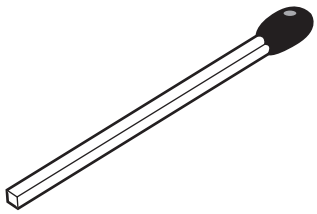
**A** none of them

**B** 1 and 2 only

**C** 2 and 3 only

**D** all of them

**12** The diagram shows a match.



By striking the match, a chemical reaction takes place.

Which statements about the chemical reaction are correct?

| | type of reaction | reason |
|---|---|---|
| **A** | endothermic | because energy is used to strike the match |
| **B** | endothermic | because energy is given out as the match burns |
| **C** | exothermic | because energy is used to strike the match |
| **D** | exothermic | because energy is given out as the match burns |

© UCLES 2012

**13** Solid copper(II) sulfate can exist in two different forms, anhydrous and hydrated.

One of these forms is blue and the other is white.

The change between these two forms is reversible.

$$\text{blue form} \rightleftharpoons \text{white form}$$

Which is the blue form and how is the change from the blue form to the white form brought about?

| | blue form | change to white form |
|---|---|---|
| **A** | anhydrous | add water |
| **B** | anhydrous | heat |
| **C** | hydrated | add water |
| **D** | hydrated | heat |

**14** Which statement describes what happens in the reaction shown?

$$2Mg + CO_2 \rightarrow 2MgO + C$$

**A** Carbon and magnesium are both oxidised.

**B** Carbon is oxidised and magnesium oxide is reduced.

**C** Magnesium is oxidised and carbon dioxide is reduced.

**D** Magnesium oxide and carbon dioxide are both reduced.

**15** Which change does **not** increase the speed of reaction between zinc and hydrochloric acid?

**A** adding a catalyst

**B** decreasing the particle size of the zinc

**C** decreasing the temperature

**D** using more concentrated acid

© UCLES 2012

**16** Salts X and Y are separately dissolved in water.

Samples of the solutions obtained are separately tested with dilute hydrochloric acid and with aqueous sodium hydroxide.

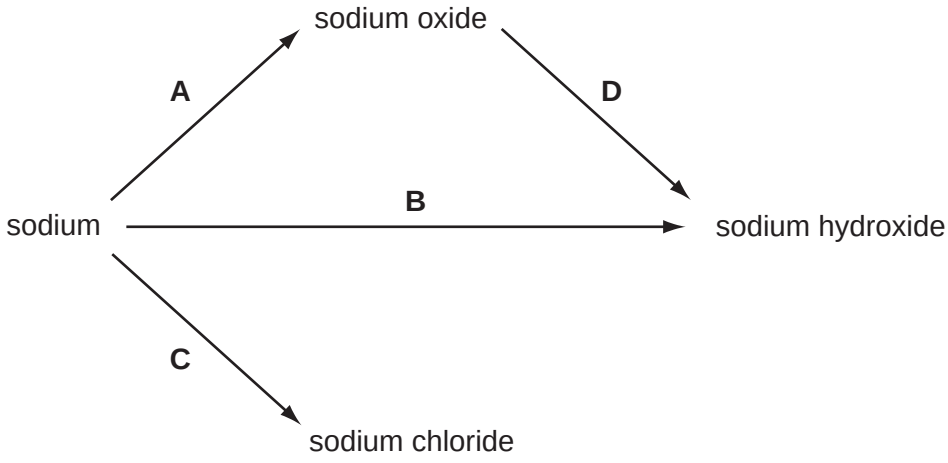
In two of the tests, a gaseous product is formed. No precipitate is formed in any of the tests.

What are salts X and Y?

| | X | Y |
|---|---|---|
| **A** | $AgNO_3$ | $BaSO_4$ |
| **B** | $BaSO_4$ | $Na_2CO_3$ |
| **C** | $Na_2CO_3$ | $NH_4Cl$ |
| **D** | $NH_4Cl$ | $AgNO_3$ |

**17** Some reactions involving sodium are shown.

Which reaction does **not** involve the formation of a base?




**18** Barium hydroxide is an alkali. It reacts with hydrochloric acid.

How does the pH of the hydrochloric acid change as an excess of aqueous barium hydroxide is added?

**A** The pH decreases from 14 and becomes constant at 7.

**B** The pH decreases from 14 to about 1.

**C** The pH increases from 1 and becomes constant at 7.

**D** The pH increases from 1 to about 14.

© UCLES 2012

**19** A compound is a salt if it

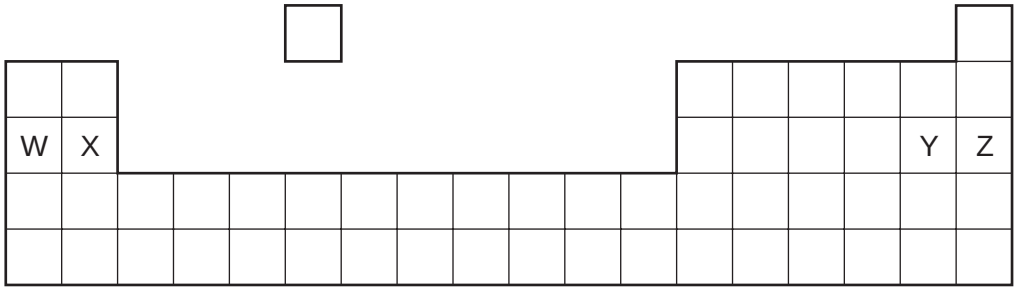
**A** can neutralise an acid.

**B** contains more than one element.

**C** dissolves in water.

**D** is formed when an acid reacts with a base.

**20** The diagram shows an outline of the Periodic Table.




Which ionic compound could be formed?

**A** $W^+Y^-$ **B** $W^+Z^-$ **C** $X^+Y^-$ **D** $X^+Z^-$

**21** Element X is in Group VII of the Periodic Table.

It reacts with aqueous potassium bromide as shown.

$$X_2 + 2KBr \rightarrow 2KX + Br_2$$

Which statements about X are correct?

| | relative atomic mass | reactivity |
|---|---|---|
| **A** | greater than that of bromine | less reactive than bromine |
| **B** | greater than that of bromine | more reactive than bromine |
| **C** | less than that of bromine | less reactive than bromine |
| **D** | less than that of bromine | more reactive than bromine |

© UCLES 2012

**22** The table gives information about four elements.

Which element is a transition metal?

| | colour of element | electrical conductivity of element | colour of oxide |
|---|---|---|---|
| **A** | black | high | colourless |
| **B** | colourless | low | white |
| **C** | grey | high | red |
| **D** | yellow | low | colourless |

**23** Why are weather balloons filled with helium rather than hydrogen?

**A** Helium is found in air.

**B** Helium is less dense than hydrogen.

**C** Helium is more dense than hydrogen.

**D** Helium is unreactive.

**24** The three statements below about aluminium are all correct.

1 Aluminium has an oxide ore.

2 Aluminium is extracted from its ore by electrolysis.

3 Aluminium is used to make cooking utensils.

In which of these statements can '**aluminium**' be replaced by '**iron**' and still be correct?

| | 1 | 2 | 3 |
|---|---|---|---|
| **A** | ✓ | ✓ | ✓ |
| **B** | ✓ | ✓ | ✗ |
| **C** | ✓ | ✗ | ✓ |
| **D** | ✗ | ✓ | ✓ |

**25** Statement 1: An aluminium alloy containing a small amount of copper is stronger than pure aluminium.

Statement 2: Alloys are made by mixing molten metals together and allowing them to cool.

Which of the following is true?

**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 not correct.

**D** Statement 2 is correct but statement 1 is not correct.

**26** Iron is extracted from its ore in a Blast Furnace.

Hematite, coke, limestone and hot air are added to the furnace.

Which explanation is **not** correct?

**A** Coke burns and produces a high temperature.

**B** Hematite is the ore containing the iron as iron oxide.

**C** Hot air provides the oxygen for the burning.

**D** Limestone reduces the iron oxide to iron.

**27** How does the reactivity of potassium compare with that of sodium and how does the reactivity of calcium compare with that of magnesium?

| | reactivity of potassium and sodium | reactivity of calcium and magnesium |
|---|---|---|
| **A** | K greater than Na | Ca greater than Mg |
| **B** | K greater than Na | Mg greater than Ca |
| **C** | Na greater than K | Ca greater than Mg |
| **D** | Na greater than K | Mg greater than Ca |

**28** Untreated water can spread diseases such as cholera.

What can be added to drinking water to reduce the spread of such diseases?

**A** carbon monoxide

**B** chlorine

**C** nitrogen monoxide

**D** sulfur

© UCLES 2012

**29** Statement 1: The burning of fossil fuels containing sulfur is a cause of 'acid rain'.

Statement 2: Acid rain contains sulfur dioxide which is formed when sulfur compounds burn in the air.

Which of the following is true?

**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.

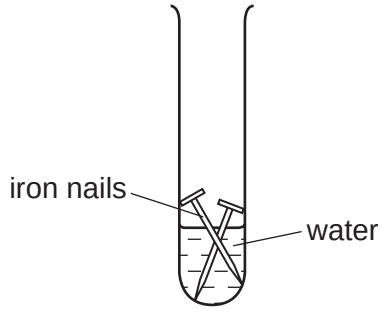
**D** Statement 2 is correct but statement 1 is incorrect.

**30** Argon is a noble gas used to fill light bulbs.

What is the approximate percentage of argon in air?

**A** 1 %  **B** 20 %  **C** 79 %  **D** 99 %

**31** The experiment shown was set up to investigate the rusting of iron.




Rusting occurs in this experiment because of the presence of

**A** hydrogen and oxygen.

**B** nitrogen and oxygen.

**C** nitrogen and water.

**D** oxygen and water.

**32** What are X and Y in the reaction shown?

ammonium chloride + solution X $\rightarrow$ alkaline gas Y

| | X | Y |
|---|---|---|
| **A** | hydrochloric acid | ammonia |
| **B** | hydrochloric acid | chlorine |
| **C** | sodium hydroxide | ammonia |
| **D** | sodium hydroxide | chlorine |

**33** Which process does **not** produce carbon dioxide?

**A** combustion of petrol

**B** reaction between an acid and a metal hydroxide

**C** reaction between an acid and a carbonate

**D** respiration

**34** Two industrial processes that involve heating are

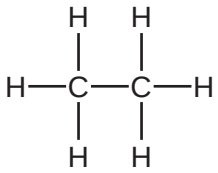
- extracting iron from its ore using a blast furnace,
- making lime.

In which of these processes is calcium carbonate used?

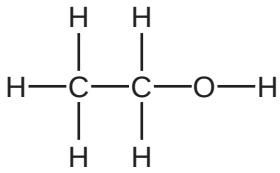
| | extracting iron | making lime |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

**35** Which structure shows a carboxylic acid?

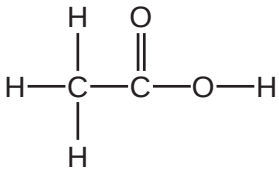
**A**



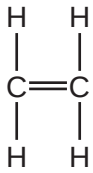
**B**



**C**



**D**



**36** Which method is used to obtain petrol from petroleum?

**A** crystallisation

**B** diffusion

**C** filtration

**D** fractional distillation

© UCLES 2012

**37** Which group of compounds is part of a homologous series?

**A** $CH_4$, $C_2H_4$, $C_3H_8$

**B** $C_3H_6$, $C_3H_8$, $C_3H_7OH$

**C** $CH_3OH$, $C_2H_5OH$, $C_3H_7OH$

**D** $CH_3CO_2H$, $CH_3CH_2OH$, $HCO_2H$

**38** Bitumen is a substance obtained from the fractional distillation of petroleum.

Which row describes its boiling point and the size of its molecules?

| | boiling point | size of molecules |
|---|---|---|
| **A** | high | large |
| **B** | high | small |
| **C** | low | large |
| **D** | low | small |

**39** A hydrocarbon A is cracked to make B and hydrogen.

Compound C is formed by the addition polymerisation of B.

To which homologous series do A, B and C belong?

| | alkene | alkane |
|---|---|---|
| **A** | A | B and C |
| **B** | B | A and C |
| **C** | C | A and B |
| **D** | – | A and C |

**40** Which statement about ethanol is **not** correct?

**A** It can be used as a fuel.

**B** It can be used as a solvent.

**C** It is formed by reaction between steam and ethane.

**D** Its functional group is –OH.

**BLANK PAGE**

**BLANK PAGE**

**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 † | | | | | | | | | | | | | | | |

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

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 2012