**Cambridge Assessment International Education**
Cambridge International General Certificate of Secondary Education

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

Paper 1 Multiple Choice (Core) **May/June 2019**

**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, 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 syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level1/Level 2 Certificate.

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

**1** Which row describes the arrangement and motion of the particles in a liquid?

| | arrangement | motion |
|---|---|---|
| **A** | irregular and most particles touching | moving slowly |
| **B** | irregular spaces between all particles | moving slowly |
| **C** | regular and most particles touching | moving slowly |
| **D** | regular spaces between all particles | moving quickly |

**2** Which piece of apparatus is used to measure 24.8 $cm^3$ of gas produced during a reaction?

**A** beaker

**B** conical flask

**C** measuring cylinder

**D** pipette

**3** Calcium carbonate is insoluble in water. Sodium chloride is soluble in water.

Which sequence of steps is used to obtain a pure, dry sample of calcium carbonate from a mixture of calcium carbonate and aqueous sodium chloride?

**A** filter → dry the residue with filter paper → wash the residue with water

**B** filter → heat the filtrate to crystallising point → leave the filtrate to cool and crystallise

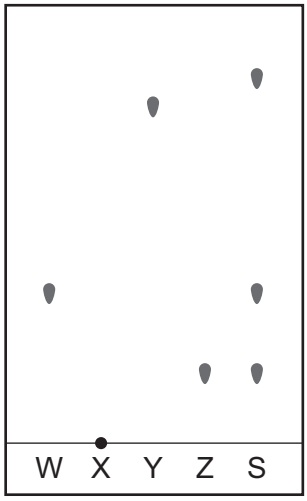
**C** filter → wash the filtrate with water → dry the filtrate

**D** filter → wash the residue with water→ dry the residue

**4** A student uses paper chromatography to identify the food dyes in a coloured sweet, S.

The student uses four known food dyes, W, X, Y, and Z, and ethanol as the solvent.

The chromatogram obtained is shown.




Which statements are correct?

1 S contains only two dyes.

2 X is insoluble in ethanol.

3 S contains Y and Z.

4 S contains W.

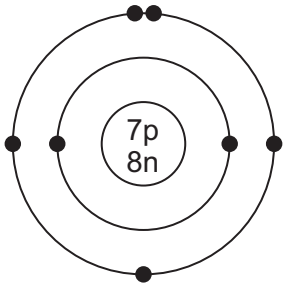
**A** 1, 2 and 4 only

**B** 2 and 3 only

**C** 2 and 4 only

**D** 4 only

**5** The structure of an atom is shown.




key
● = electron
n = neutron
p = proton

Which element is the atom an isotope of?

**A** nitrogen

**B** oxygen

**C** phosphorus

**D** titanium

**6** What happens when sodium atoms combine with chlorine atoms to form sodium chloride?

**A** Sodium atoms gain one electron and chlorine atoms lose one electron.

**B** Sodium atoms lose one electron and chlorine atoms gain one electron.

**C** Sodium atoms and chlorine atoms share one electron with each other.

**D** Sodium atoms and chlorine atoms share two electrons with each other.

**7** Which row describes the formation of single covalent bonds in methane?

| | | |
|---|---|---|
| **A** | atoms share a pair of electrons | both atoms gain a noble gas electronic structure |
| **B** | atoms share a pair of electrons | both atoms have the same number of electrons in their outer shell |
| **C** | electrons are transferred from one atom to another | both atoms gain a noble gas electronic structure |
| **D** | electrons are transferred from one atom to another | both atoms have the same number of electrons in their outer shell |

**8** Which statement about diamond is correct?

**A** It is a giant covalent structure consisting of carbon atoms and each atom is bonded to four other atoms.

**B** It is a giant covalent structure consisting of flat sheets of carbon atoms.

**C** It is a structure held together by ionic bonds and each ion is bonded to four other ions.

**D** It is a structure held together by ionic bonds and each ion is bonded to three other ions.

**9** The compound magnesium nitrate has the formula $Mg(NO_3)_2$.

What is the relative formula mass of magnesium nitrate?

**A** 86 **B** 134 **C** 148 **D** 172

**10** Which substance does **not** produce a gas at both electrodes during electrolysis?

**A** concentrated aqueous sodium chloride

**B** concentrated hydrochloric acid

**C** dilute sulfuric acid

**D** molten lead(II) bromide

**11** Which row describes the changes that occur when metals burn in oxygen?

| | temperature | metal is |
|---|---|---|
| **A** | decreases | oxidised |
| **B** | decreases | reduced |
| **C** | increases | oxidised |
| **D** | increases | reduced |

**12** Which process is a physical change?

**A** burning magnesium in air

**B** dissolving sodium chloride in water

**C** adding magnesium to hydrochloric acid

**D** heating green copper(II) carbonate until it turns black



**[Turn over**

**13** A student reacts strips of zinc with dilute sulfuric acid and measures the time taken to produce 100 $cm^3$ of hydrogen.

The experiment is repeated using different conditions.

The results are shown in the table.

| experiment | time to produce 100 $cm^3$ of hydrogen / s |
|---|---|
| 1 | 250 |
| 2 | 100 |

Which changes in conditions produce the results shown in experiment 2?

1 Add a catalyst.

2 Dilute the acid.

3 Use zinc powder.

4 Heat the acid.

**A** 1, 3 and 4 only

**B** 1 and 4 only

**C** 2 and 3 only

**D** 2 and 4 only

**14** When blue-green crystals of nickel(II) sulfate are heated, water is produced and a yellow solid remains. When water is added to the yellow solid, the blue-green colour returns.

Which process describes these changes?

**A** combustion

**B** corrosion

**C** neutralisation

**D** reversible reaction

**15** Zinc is formed when zinc oxide is heated with carbon.

$$\text{zinc oxide} + \text{carbon} \rightarrow \text{zinc} + \text{carbon monoxide}$$

Which substance is oxidised in this reaction?

**A** carbon

**B** carbon monoxide

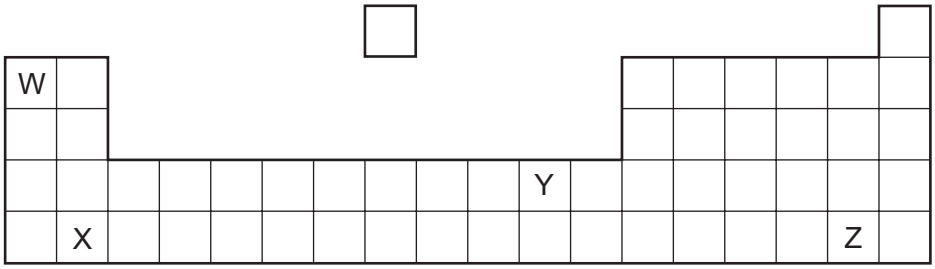
**C** zinc

**D** zinc oxide

**16** Which row shows the colours of litmus and methyl orange with solutions of acids and bases?

| | solution | litmus | methyl orange |
|---|---|---|---|
| **A** | acid | red | red |
| **B** | acid | blue | yellow |
| **C** | base | blue | red |
| **D** | base | red | yellow |

**17** The positions of elements W, X, Y and Z in the Periodic Table are shown.




Which elements form basic oxides?

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

**18** Copper(II) sulfate is made when copper(II) carbonate reacts with dilute sulfuric acid.

$$CuCO_3 + H_2SO_4 \rightarrow CuSO_4 + H_2O + CO_2$$

Pure copper(II) sulfate crystals are obtained.

Which reagent is in excess and how are the crystals obtained?

| | reagent in excess | how the crystals are obtained |
|---|---|---|
| **A** | copper(II) carbonate | filter and evaporate the solution to dryness |
| **B** | copper(II) carbonate | filter, evaporate to crystallising point and then cool |
| **C** | dilute sulfuric acid | evaporate the solution to dryness |
| **D** | dilute sulfuric acid | evaporate to crystallising point and then cool |

**19** Two separate tests are done on a solution of a compound, X.

The results are shown.

1 Adding aqueous ammonia forms a blue precipitate that dissolves in an excess of aqueous ammonia.

2 Adding dilute nitric acid and aqueous barium nitrate forms a white precipitate.

What is X?

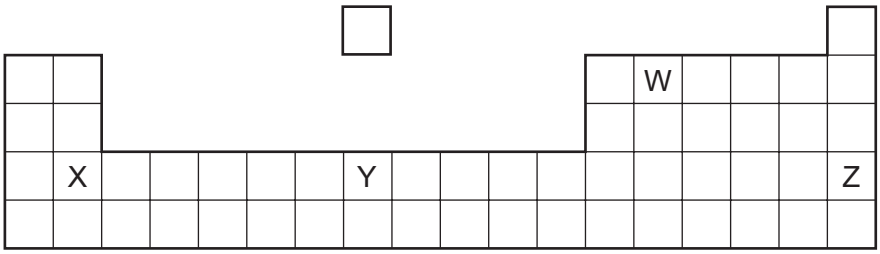
**A** chromium(III) chloride

**B** chromium(III) sulfate

**C** copper(II) chloride

**D** copper(II) sulfate

**20** Part of the Periodic Table is shown.




Which row describes W, X, Y and Z?

| | metal | non-metal |
|---|---|---|
| **A** | X | W, Y and Z |
| **B** | X and Y | W and Z |
| **C** | W and Z | X and Y |
| **D** | W, Y and Z | X |

**21** Which statement about the properties of elements in Group I and in Group VII is correct?

**A** Bromine displaces iodine from an aqueous solution of potassium iodide.

**B** Chlorine, bromine and iodine are diatomic gases at room temperature.

**C** Lithium, sodium and potassium are soft non-metals.

**D** Lithium, sodium and potassium have an increasing number of electrons in their outer shells.

**22** Some information about four elements, P, Q, R and S, is shown.

| | melting point in °C | density in g / cm$^3$ | colour of chloride |
|---|---|---|---|
| P | 1247 | 7.43 | pink |
| Q | 1410 | 2.33 | white |
| R | 1910 | 6.11 | purple |
| S | 115 | 2.07 | red |

Which elements are transition elements?

**A** P and R **B** P and S **C** Q and R **D** R and S

**23** Gas G has 10 electrons. Gas H has eight more electrons than gas G. Both gases are monoatomic.

Which statement about G and H is correct?

**A** Both gases are in the same group of the Periodic Table.

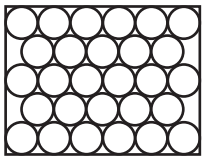
**B** Both gases are in the same period of the Periodic Table.

**C** Both gases are very reactive.

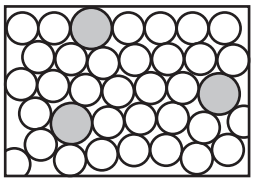
**D** Gas G has a higher atomic mass than gas H.

**24** The diagrams show the structure of two substances used to make electrical conductors.

X



Y



Which statement correctly describes X and Y?

**A** X is a pure metal and Y is a compound.

**B** X is a pure metal and Y is an alloy.

**C** X is a solid and Y is a liquid.

**D** X is harder and stronger than Y.

**25** Three metals, L, M and N, are added separately to dilute hydrochloric acid and cold water.

The results are shown.

| metal | reaction with hydrochloric acid | reaction with cold water |
|---|---|---|
| L | hydrogen forms | no reaction |
| M | hydrogen forms | hydrogen forms |
| N | no reaction | no reaction |

What is the order of reactivity of the metals?

| | least reactive → | | most reactive |
|---|---|---|---|
| **A** | L | N | M |
| **B** | M | L | N |
| **C** | N | L | M |
| **D** | N | M | L |

**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(III) oxide.

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

**D** Limestone reduces the iron(III) oxide to iron.

**27** Aluminium is used to make containers for storing food.

Which property makes it suitable for this use?

**A** conducts heat

**B** low density

**C** resists corrosion

**D** shiny surface

**28** Water can be treated by filtration then chlorination.

Which uses do **not** need water of this quality?

1 water for cooling in industry

2 water for washing clothes

3 water for drinking

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

**29** Which statement about acid rain is **not** correct?

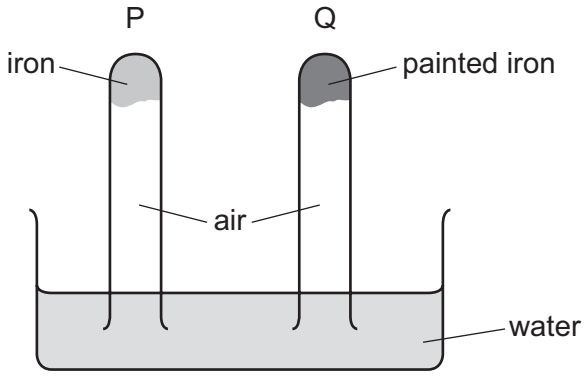
**A** It causes limestone buildings and statues to erode.

**B** It is formed from the burning of compounds which contain sulfur.

**C** It is formed from the combustion of hydrogen as a fuel.

**D** It is formed from the oxides of nitrogen formed in car engines.

**30** The diagram shows an experiment to investigate how paint affects the rusting of iron.




What happens to the water level in tubes P and Q?

| | tube P | tube Q |
|---|---|---|
| **A** | falls | rises |
| **B** | no change | rises |
| **C** | rises | falls |
| **D** | rises | no change |

**31** Which gas is produced when ammonium chloride is warmed with aqueous sodium hydroxide?

**A** ammonia

**B** chlorine

**C** hydrogen

**D** nitrogen

**32** Which statement describes a disadvantage of sulfur dioxide?

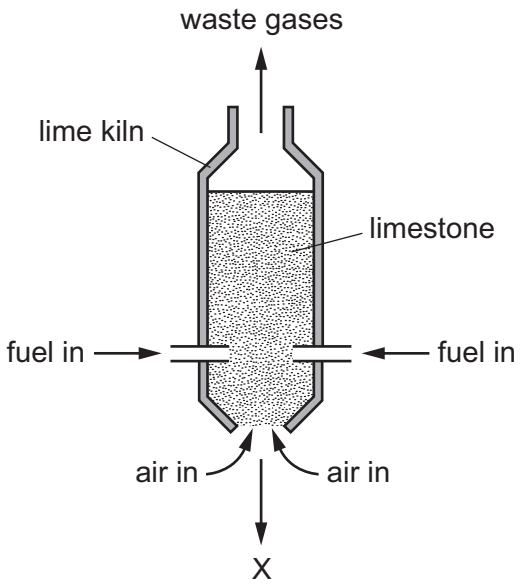
**A** It can be used as a bleach when making wood pulp.

**B** It can be used to kill bacteria in food.

**C** It can be used to manufacture sulfuric acid.

**D** It dissolves in water to form acid rain.

**33** The diagram represents a lime kiln used to heat limestone to a very high temperature.




What leaves the kiln at X?

**A** calcium carbonate

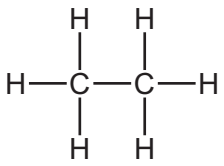
**B** calcium hydroxide

**C** calcium oxide

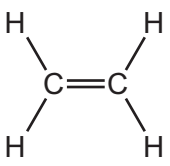
**D** calcium sulfate

**34** The structures of four compounds are shown.

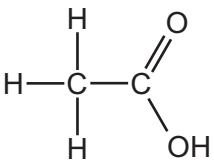
1



2



3



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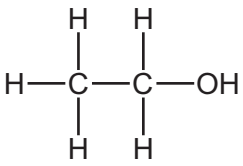
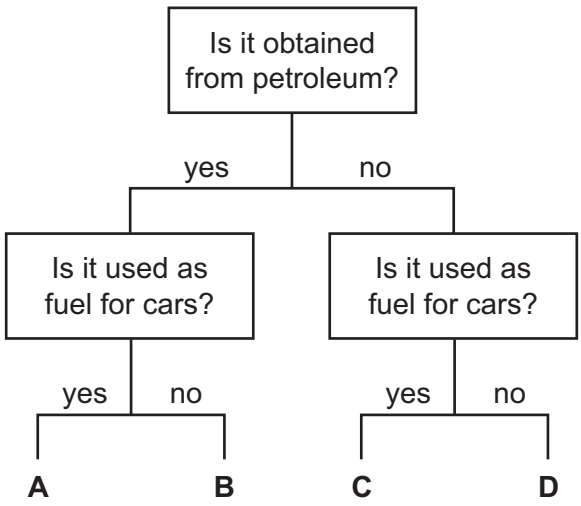


Which row gives the names of the compounds?

| | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| **A** | ethene | ethane | ethanol | ethanoic acid |
| **B** | ethane | ethene | ethanoic acid | ethanol |
| **C** | ethene | ethane | ethanoic acid | ethanol |
| **D** | ethane | ethene | ethanol | ethanoic acid |

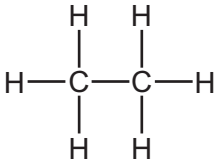
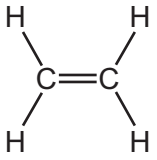
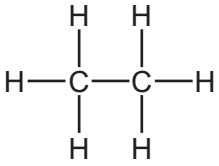
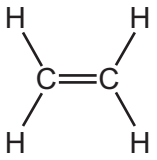
**35** Which fuel could be gasoline?



**36** A hydrocarbon W burns to form carbon dioxide and water.

W decolourises bromine water.

What is the name of W and what is its structure?

| | name of W | structure of W |
|---|---|---|
| **A** | ethane |  |
| **B** | ethane |  |
| **C** | ethene |  |
| **D** | ethene |  |

**37** Which statements about homologous series are correct?

1 All members have similar chemical properties.

2 All members have the same molecular mass.

3 Ethane and ethene are members of the same homologous series.

4 Ethane and propane are members of the same homologous series.

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

**38** Which statements about ethanol are correct?

1 It can be made by fermentation.

2 It is an unsaturated compound.

3 It burns in air and can be used as a fuel.

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

**39** Which statement about aqueous ethanoic acid is correct?

**A** It reacts with metal carbonates to form salts, hydrogen and water.

**B** It reacts with metal oxides to form salts and oxygen.

**C** It reacts with reactive metals to form salts and hydrogen.

**D** It turns damp red litmus paper blue.

**40** Which substances are synthetic polymers?

1 *Terylene*

2 nylon

3 protein

4 poly(ethene)

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

## The Periodic Table of Elements

| Group | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| I | II | | | | | | | | | | | III | IV | V | VI | VII | VIII |
| | | | | | | | 1 H hydrogen 1 | | | | | | | | | | 2 He helium 4 |
| 3 Li lithium 7 | 4 Be beryllium 9 | | | | | | | | | | | 5 B boron 11 | 6 C carbon 12 | 7 N nitrogen 14 | 8 O oxygen 16 | 9 F fluorine 19 | 10 Ne neon 20 |
| 11 Na sodium 23 | 12 Mg magnesium 24 | | | | | | | | | | | 13 Al aluminium 27 | 14 Si silicon 28 | 15 P phosphorus 31 | 16 S sulfur 32 | 17 Cl chlorine 35.5 | 18 Ar argon 40 |
| 19 K potassium 39 | 20 Ca calcium 40 | 21 Sc scandium 45 | 22 Ti titanium 48 | 23 V vanadium 51 | 24 Cr chromium 52 | 25 Mn manganese 55 | 26 Fe iron 56 | 27 Co cobalt 59 | 28 Ni nickel 59 | 29 Cu copper 64 | 30 Zn zinc 65 | 31 Ga gallium 70 | 32 Ge germanium 73 | 33 As arsenic 75 | 34 Se selenium 79 | 35 Br bromine 80 | 36 Kr krypton 84 |
| 37 Rb rubidium 85 | 38 Sr strontium 88 | 39 Y yttrium 89 | 40 Zr zirconium 91 | 41 Nb niobium 93 | 42 Mo molybdenum 96 | 43 Tc technetium – | 44 Ru ruthenium 101 | 45 Rh rhodium 103 | 46 Pd palladium 106 | 47 Ag silver 108 | 48 Cd cadmium 112 | 49 In indium 115 | 50 Sn tin 119 | 51 Sb antimony 122 | 52 Te tellurium 128 | 53 I iodine 127 | 54 Xe xenon 131 |
| 55 Cs caesium 133 | 56 Ba barium 137 | 57–71 lanthanoids | 72 Hf hafnium 178 | 73 Ta tantalum 181 | 74 W tungsten 184 | 75 Re rhenium 186 | 76 Os osmium 190 | 77 Ir iridium 192 | 78 Pt platinum 195 | 79 Au gold 197 | 80 Hg mercury 201 | 81 Tl thallium 204 | 82 Pb lead 207 | 83 Bi bismuth 209 | 84 Po polonium – | 85 At astatine – | 86 Rn radon – |
| 87 Fr francium – | 88 Ra radium – | 89–103 actinoids | 104 Rf rutherfordium – | 105 Db dubnium – | 106 Sg seaborgium – | 107 Bh bohrium – | 108 Hs hassium – | 109 Mt meitnerium – | 110 Ds darmstadtium – | 111 Rg roentgenium – | 112 Cn copernicium – | | 114 Fl flerovium – | | 116 Lv livermorium – | | |

**Key**

atomic number
atomic symbol
name
relative atomic mass

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| lanthanoids | 57 La lanthanum 139 | 58 Ce cerium 140 | 59 Pr praseodymium 141 | 60 Nd neodymium 144 | 61 Pm promethium – | 62 Sm samarium 150 | 63 Eu europium 152 | 64 Gd gadolinium 157 | 65 Tb terbium 159 | 66 Dy dysprosium 163 | 67 Ho holmium 165 | 68 Er erbium 167 | 69 Tm thulium 169 | 70 Yb ytterbium 173 | 71 Lu lutetium 175 |
| actinoids | 89 Ac actinium – | 90 Th thorium 232 | 91 Pa protactinium 231 | 92 U uranium 238 | 93 Np neptunium – | 94 Pu plutonium – | 95 Am americium – | 96 Cm curium – | 97 Bk berkelium – | 98 Cf californium – | 99 Es einsteinium – | 100 Fm fermium – | 101 Md mendelevium – | 102 No nobelium – | 103 Lr lawrencium – |

The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure (r.t.p.).