



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

**CHEMISTRY**

Paper 1 Multiple Choice (Core)

**0620/12**

**February/March 2018**

**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.

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **13** printed pages and **3** blank pages.



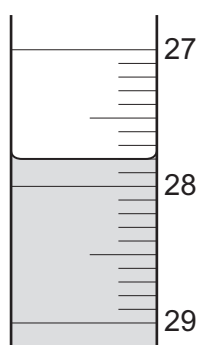
1 Four physical changes are listed.

- 1 condensation
- 2 evaporation
- 3 freezing
- 4 sublimation

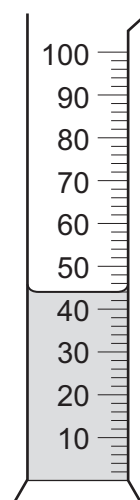
In which changes do the particles move further apart?

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

2 The diagram shows liquid in a burette and in a measuring cylinder.



burette



measuring cylinder

Which row shows the readings for the burette and the measuring cylinder?

|          | burette | measuring cylinder |
|----------|---------|--------------------|
| <b>A</b> | 27.8    | 42                 |
| <b>B</b> | 27.8    | 44                 |
| <b>C</b> | 28.2    | 42                 |
| <b>D</b> | 28.2    | 44                 |

- 3 Substance L melts at  $-7^{\circ}\text{C}$  and is a brown liquid at room temperature.

Which temperature is the boiling point of pure L?

- A  $-77^{\circ}\text{C}$
- B  $-7^{\circ}\text{C}$  to  $+7^{\circ}\text{C}$
- C  $59^{\circ}\text{C}$
- D  $107^{\circ}\text{C}$  to  $117^{\circ}\text{C}$

- 4 A student is given a mixture of barium sulfate, copper(II) sulfate and water.

The table shows information about barium sulfate and copper(II) sulfate.

| substance          | solubility in water | state at room temperature |
|--------------------|---------------------|---------------------------|
| barium sulfate     | insoluble           | solid                     |
| copper(II) sulfate | soluble             | solid                     |

How does the student obtain copper(II) sulfate crystals from the mixture?

- A crystallisation followed by distillation
  - B crystallisation followed by filtration
  - C distillation followed by crystallisation
  - D filtration followed by crystallisation
- 5 What is the nucleon number of an atom?
- A the number of electrons, neutrons and protons in the nucleus
  - B the number of neutrons and protons in the nucleus
  - C the number of neutrons in the nucleus
  - D the number of protons in the nucleus

- 6 Caesium, Cs, is an element in Group I of the Periodic Table.

When caesium reacts it forms a positive ion,  $\text{Cs}^+$ .

How is a caesium ion formed?

- A A caesium atom gains a proton.
- B A caesium atom gains an electron.
- C A caesium atom loses an electron.
- D A caesium atom shares an electron.

7 Which statement about graphite and diamond is correct?

- A Diamond has a high melting point but graphite does not.
- B Graphite and diamond both conduct electricity.
- C Graphite and diamond both have giant structures.
- D Graphite is ionic and diamond is covalent.

8 What is the definition of relative atomic mass,  $A_r$ ?

- A  $\left( \frac{\text{average mass of naturally occurring atoms of an element}}{\text{mass of one atom of } ^{12}\text{C}} \right) \times 12$
- B  $\left( \frac{\text{average mass of naturally occurring atoms of an element}}{\text{mass of one atom of } ^{12}\text{C} \times 12} \right)$
- C  $\left( \frac{\text{average mass of naturally occurring atoms of an element}}{\text{mass of one atom of } ^{12}\text{C}} \right)$
- D  $\left( \frac{\text{mass of one atom of } ^{12}\text{C}}{\text{average mass of naturally occurring atoms of an element}} \right)$

9 Which statement about electrolysis reactions is correct?

- A When concentrated aqueous sodium chloride is electrolysed, sodium forms at the cathode.
- B When concentrated hydrochloric acid is electrolysed, a green gas forms at the cathode.
- C When dilute sulfuric acid is electrolysed, a colourless gas forms at both electrodes.
- D When molten lead(II) bromide is electrolysed, lead forms at the anode.

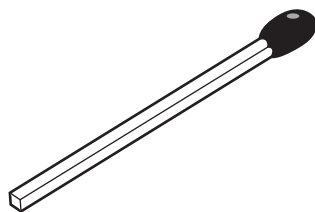
10 Statement 1 Hydrogen is used as a fuel.

Statement 2 When hydrogen burns in the air to form water, heat energy is produced.

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.

11 The diagram shows a match.



By striking the match, a chemical reaction takes place.

Which row describes the chemical reaction?

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

12 Magnesium carbonate was reacted with dilute hydrochloric acid in a conical flask.

The conical flask was placed on a balance and the mass of the conical flask and contents was recorded as the reaction proceeded.

During the reaction, carbon dioxide gas was produced.

The reaction was done at two different temperatures.

Which row is correct?

|          | change in mass | temperature at which the mass changed more quickly |
|----------|----------------|----------------------------------------------------|
| <b>A</b> | decrease       | higher temperature                                 |
| <b>B</b> | decrease       | lower temperature                                  |
| <b>C</b> | increase       | higher temperature                                 |
| <b>D</b> | increase       | lower temperature                                  |

- 13 Separate samples of anhydrous copper(II) sulfate and hydrated copper(II) sulfate are heated.



Which row shows the correct colour changes?

|          | anhydrous copper(II) sulfate | hydrated copper(II) sulfate |
|----------|------------------------------|-----------------------------|
| <b>A</b> | blue to white                | white to blue               |
| <b>B</b> | no change                    | blue to white               |
| <b>C</b> | white to blue                | blue to white               |
| <b>D</b> | white to blue                | no change                   |

- 14 In which equation does oxidation of the underlined substance occur?

- A**  $2\text{CuO} + \text{C} \rightarrow \text{CO}_2 + \underline{2\text{Cu}}$
- B**  $\text{Fe}_2\text{O}_3 + \underline{3\text{CO}} \rightarrow 2\text{Fe} + 3\text{CO}_2$
- C**  $2\text{Mg} + \text{O}_2 \rightarrow \underline{2\text{MgO}}$
- D**  $\underline{\text{MnO}_2} + 4\text{HCl} \rightarrow \text{MnCl}_2 + 2\text{H}_2\text{O} + \text{Cl}_2$

- 15 Which property is shown by the alkali sodium hydroxide?

- A** It has a pH less than pH 7.
- B** It produces a gas when it is warmed with ammonium chloride.
- C** It turns blue litmus red.
- D** It turns Universal Indicator green.

- 16 A solution of compound Z gives a light blue precipitate with aqueous ammonia. The precipitate dissolves in an excess of ammonia.

A flame test is done on compound Z.

What is the colour of the flame?

- A** blue-green
- B** lilac
- C** red
- D** yellow

17 Carbon, copper, magnesium, sodium and sulfur can all form oxides.

How many of these elements form acidic oxides?

- A 1                      B 2                      C 3                      D 4

18 Which method is used to make the salt copper(II) sulfate?

- A dilute acid + alkali  
B dilute acid + carbonate  
C dilute acid + metal  
D dilute acid + non-metal oxide

19 The Periodic Table lists all the known elements.

Elements are arranged in order of ..... 1 ..... number.

The melting points of Group I elements ..... 2 ..... down the group.

The melting points of Group VII elements ..... 3 ..... down the group.

Which words correctly complete gaps 1, 2 and 3?

|   | 1       | 2        | 3        |
|---|---------|----------|----------|
| A | nucleon | decrease | increase |
| B | nucleon | increase | decrease |
| C | proton  | decrease | increase |
| D | proton  | increase | decrease |

20 Which statements about Group I and Group VII elements are correct?

- 1 In Group I, lithium is more reactive than potassium.  
2 In Group VII, chlorine is more reactive than fluorine.

|   | statement 1 | statement 2 |
|---|-------------|-------------|
| A | ✓           | ✓           |
| B | ✓           | ✗           |
| C | ✗           | ✓           |
| D | ✗           | ✗           |

- 21** Which statement describes transition elements?
- A** They have high densities and high melting points.  
**B** They have high densities and low melting points.  
**C** They have low densities and high melting points.  
**D** They have low densities and low melting points.
- 22** Which trend occurs across the period from sodium to argon?
- A** a change from metal to non-metal  
**B** an increase in melting point  
**C** a more violent reaction with water  
**D** an increase in electrical conductivity
- 23** Why is argon used in lamps?
- A** Argon forms molecules when electricity is passed through it.  
**B** Argon is inert and so does not react with the hot filament.  
**C** Argon is less dense than air.  
**D** Argon produces light when it burns.
- 24** Metals W, X, Y and Z are reacted with dilute hydrochloric acid.

The oxides of metals W, X, Y and Z are heated with carbon.

The results are shown.

| reaction                         | W              | X                 | Y                  | Z                 |
|----------------------------------|----------------|-------------------|--------------------|-------------------|
| metal + dilute hydrochloric acid | fizzing        | fizzing           | violent<br>fizzing | no<br>reaction    |
| metal oxide + carbon + heat      | no<br>reaction | metal<br>produced | no<br>reaction     | metal<br>produced |

What is the order of reactivity of the metals?

|          | most<br>reactive |  |   |  | least<br>reactive |
|----------|------------------|-------------------------------------------------------------------------------------|---|--|-------------------|
| <b>A</b> | Y                | W                                                                                   | X |  | Z                 |
| <b>B</b> | Y                | X                                                                                   | W |  | Z                 |
| <b>C</b> | Z                | W                                                                                   | X |  | Y                 |
| <b>D</b> | Z                | X                                                                                   | W |  | Y                 |

**25** Iron is extracted from  $\text{Fe}_2\text{O}_3$  by reduction with carbon.

Aluminium is difficult to extract from  $\text{Al}_2\text{O}_3$ . The process requires electrolysis.

Starting with the most reactive, which order of reactivity is correct?

**A**  $\text{Al} \rightarrow \text{C} \rightarrow \text{Fe}$

**B**  $\text{Al} \rightarrow \text{Fe} \rightarrow \text{C}$

**C**  $\text{Fe} \rightarrow \text{Al} \rightarrow \text{C}$

**D**  $\text{Fe} \rightarrow \text{C} \rightarrow \text{Al}$

**26** Which two properties are physical properties of **all** pure metals?

|          | property 1                    | property 2             |
|----------|-------------------------------|------------------------|
| <b>A</b> | brittle                       | poor conductor of heat |
| <b>B</b> | good conductor of electricity | malleable              |
| <b>C</b> | good conductor of heat        | low melting point      |
| <b>D</b> | malleable                     | low density            |

**27** Which statement about the uses of aluminium, copper and iron is correct?

**A** Aluminium is used for aircraft manufacture because it has a high density.

**B** Aluminium is used for food containers because it is a good conductor of electricity.

**C** Copper is used for cooking utensils because it is a good conductor of heat.

**D** Stainless steel is used for car bodies because it corrodes easily.

**28** The list gives four experiments done with calcium carbonate.

- 1 acid added
- 2 alkali added
- 3 heated strongly
- 4 water added

Which experiments produced carbon dioxide?

**A** 1 and 2

**B** 1 and 3

**C** 2 and 3

**D** 2 and 4

29 Water must be purified before it is suitable for use in the home.

Which processes are used to remove solid impurities and to kill bacteria?

|          | to remove<br>solid impurities | to kill<br>bacteria |
|----------|-------------------------------|---------------------|
| <b>A</b> | chlorination                  | chlorination        |
| <b>B</b> | chlorination                  | filtration          |
| <b>C</b> | filtration                    | chlorination        |
| <b>D</b> | filtration                    | filtration          |

30 Which gas is **not** present in clean air?

- A** argon
- B** carbon dioxide
- C** carbon monoxide
- D** water vapour

31 Which pair of compounds would make an NPK fertiliser?

- A** ammonium sulfate and potassium phosphate
- B** calcium hydroxide and ammonium nitrate
- C** calcium phosphate and potassium chloride
- D** potassium nitrate and ammonium sulfate

32 Which pollutant gas is produced by the decomposition of vegetation?

- A** carbon monoxide
- B** methane
- C** nitrogen dioxide
- D** sulfur dioxide

33 Sulfur burns to make sulfur dioxide.

Which row describes a source of sulfur and a use of sulfur dioxide?

|          | source of sulfur     | use of sulfur dioxide |
|----------|----------------------|-----------------------|
| <b>A</b> | the air              | food preservative     |
| <b>B</b> | the air              | water treatment       |
| <b>C</b> | underground deposits | food preservative     |
| <b>D</b> | underground deposits | water treatment       |

34 The diagram shows the pH values of the soil in two parts of a garden, X and Y.

|             |             |
|-------------|-------------|
| X<br>pH 7.0 | Y<br>pH 5.5 |
|-------------|-------------|

Lime is used to neutralise the soil in one part of the garden.

To which part of the garden should the lime be added and why?

|          | part of the garden | because lime is |
|----------|--------------------|-----------------|
| <b>A</b> | X                  | acidic          |
| <b>B</b> | X                  | basic           |
| <b>C</b> | Y                  | acidic          |
| <b>D</b> | Y                  | basic           |

35 Which substance is **not** used as a fuel?

- A** ethanol
- B** hydrogen
- C** methane
- D** oxygen

36 Which formula represents an alkene?

- A** CH<sub>4</sub>
- B** C<sub>2</sub>H<sub>4</sub>
- C** C<sub>2</sub>H<sub>6</sub>
- D** C<sub>2</sub>H<sub>5</sub>OH

37 Three chemical reactions are shown.

- 1 catalytic addition of steam to ethene
- 2 combustion of ethanol
- 3 fermentation of glucose

In which of the reactions does the relative molecular mass of the carbon-containing compound decrease?

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

38 How is ethanol produced by fermentation?

- A** using anaerobic conditions at 30 °C  
**B** using anaerobic conditions at 450 °C  
**C** using steam at 30 °C  
**D** using steam at 450 °C

39 A compound has the formula  $\text{CH}_3\text{COOH}$ .

What is **not** a property of this compound?

- A** It has a smell like vinegar.  
**B** It reacts with acids to form salts.  
**C** It reacts with magnesium to produce hydrogen.  
**D** It turns blue litmus red.

40 Which statement about polymers is correct?

- A** Polymers are formed by breaking down monomers.  
**B** Polymers can be natural or synthetic.  
**C** Polymers contain atoms of only one element.  
**D** Polymers have a giant ionic structure.

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The Periodic Table of Elements

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

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

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