



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY

0620/13

Paper 1 Multiple Choice (Core)

October/November 2017

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 **16** printed pages.



- 1 Which statement about liquids and gases is correct?
- A 1 cm³ of gas contains more particles than 1 cm³ of liquid.
 - B A given mass of liquid has a fixed volume at room temperature.
 - C Particles in a liquid can easily be forced closer together.
 - D Particles in a liquid have fixed positions.
- 2 Which method is used to obtain copper(II) sulfate crystals from an aqueous solution of copper(II) sulfate?
- A chromatography
 - B condensation
 - C evaporation
 - D filtration
- 3 25 cm³ of an alkali are added to 20 cm³ of an acid. The temperature change is measured.
- Which apparatus is **not** needed in the experiment?
- A 25 cm³ measuring cylinder
 - B 100 cm³ beaker
 - C balance
 - D thermometer
- 4 A sample of liquid X turns blue cobalt(II) chloride paper pink. The sample boils at 102 °C.
- Which statements are correct?
- 1 X contains water.
 - 2 X is impure water.
 - 3 X freezes above 0 °C.
- A 1, 2 and 3 B 1 and 2 only C 1 and 3 only D 2 and 3 only

- 5 Substance Y is added to an excess of hot water.

A blue solution forms and a brown solid remains.

The brown solid is filtered off and dried.

The brown solid conducts electricity.

What is Y?

- A** a compound which contains a metal
B a mixture which contains a metal
C a pure substance which is a metal
D a pure substance which is a non-metal
- 6 Which row gives the number of protons, electrons and neutrons found in an atom of zinc?

	protons	electrons	neutrons
A	30	30	35
B	30	35	35
C	35	30	30
D	35	35	30

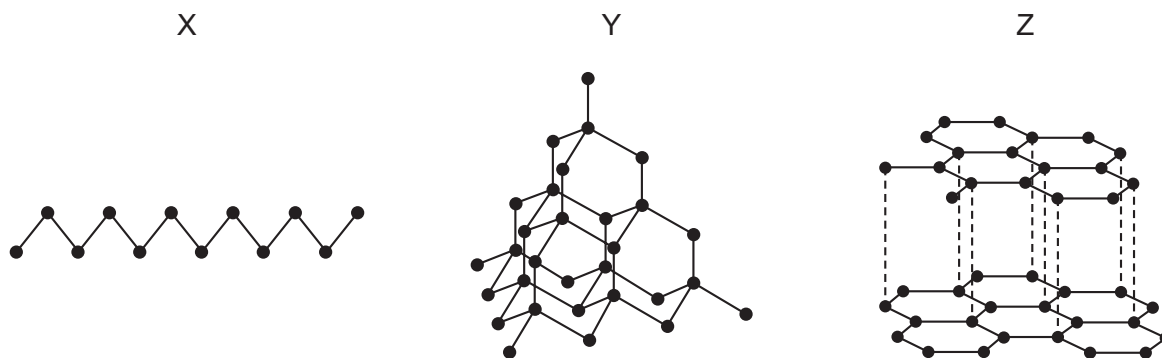
- 7 Four statements about atoms and ions are shown.

- 1 F^- has more electrons than Na^+ .
- 2 Mg^{2+} has the same number of electrons as Na^+ .
- 3 Na^+ has more electrons than Li^+ .
- 4 An atom of P has more outer shell electrons than an atom of N.

Which statements are correct?

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

- 8** The diagrams, X, Y and Z, show part of a polymer and two giant covalent structures.



Which of X, Y or Z could be used as a cutting tool and which of X, Y or Z could be used to reduce friction?

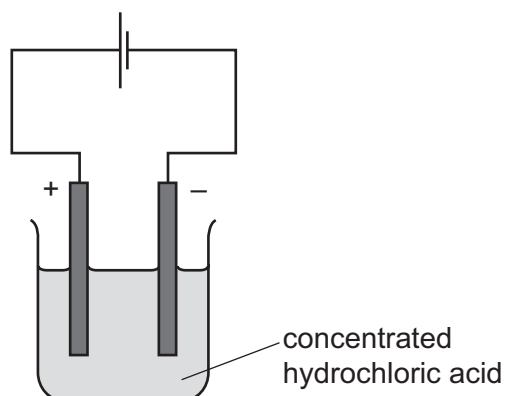
	cutting tool	reduce friction
A	X	Y
B	Y	Z
C	Z	X
D	Z	Y

- 9** A compound with the formula XO_2 has a relative formula mass of 64.

What is X?

- A** cadmium
B copper
C gadolinium
D sulfur

10 The electrolysis of concentrated hydrochloric acid using platinum electrodes is shown.



What is observed at each electrode at the start of the electrolysis?

	positive electrode	negative electrode
A	colourless gas	colourless gas
B	colourless gas	green gas
C	green gas	colourless gas
D	green gas	green gas

11 Two chemical processes are described.

- During the combustion of kerosene, energy is1..... .
- During the electrolysis of hydrochloric acid, energy is2..... .

Which words complete gaps 1 and 2?

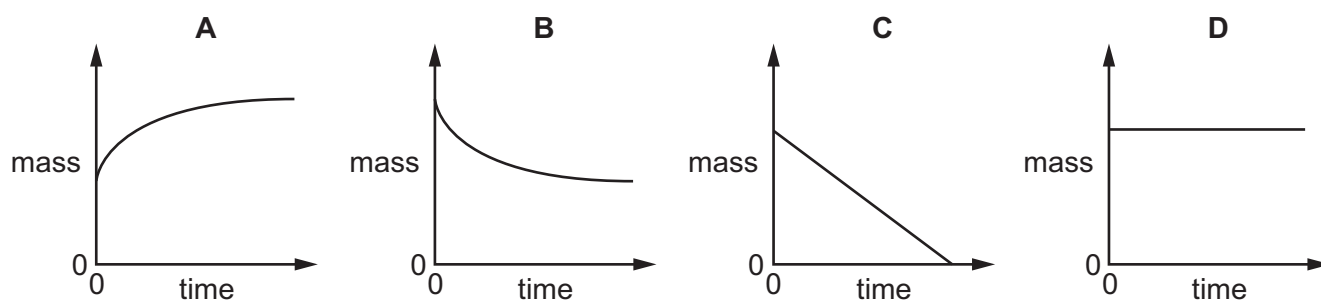
	1	2
A	given out	given out
B	given out	taken in
C	taken in	given out
D	taken in	taken in

12 Which reaction is endothermic?

- A** neutralisation of an acid by an alkali
- B** reaction of hydrogen with oxygen
- C** reaction of sodium with water
- D** thermal decomposition of limestone

13 The mass of a beaker and its contents is plotted against time.

Which graph represents what happens when sodium carbonate reacts with an excess of dilute hydrochloric acid in an open beaker?



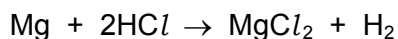
14 When blue copper(II) sulfate is heated, a white solid and water are formed.

The white solid turns blue and gives out heat when water is added to it.

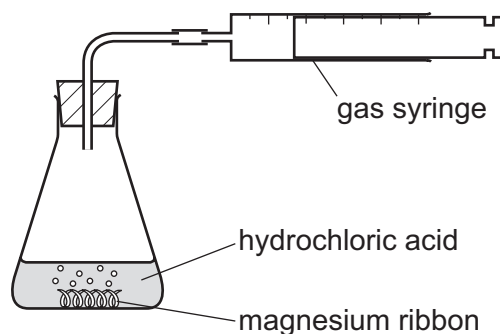
Which terms describe the blue copper(II) sulfate and the reactions?

	the blue copper(II) sulfate is	reactions
A	a mixture	can be reversed
B	a mixture	cannot be reversed
C	hydrated	can be reversed
D	hydrated	cannot be reversed

- 15 The equation for the reaction between magnesium and hydrochloric acid is shown.

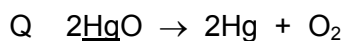
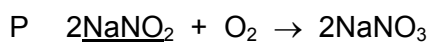


The rate of this reaction is studied using the apparatus shown.



Which change increases the rate of reaction?

- A lowering the temperature of the acid
 - B using a larger volume of the same hydrochloric acid
 - C using less concentrated hydrochloric acid
 - D using the same mass of magnesium powder
- 16 The equations for two reactions P and Q are given.



In which of these reactions does oxidation of the underlined substance occur?

	P	Q
A	✓	✓
B	✓	x
C	x	✓
D	x	x

- 17 What is **not** a typical characteristic of acids?

- A They react with alkalis producing water.
- B They react with **all** metals producing hydrogen.
- C They react with carbonates producing carbon dioxide.
- D They turn blue litmus paper red.

18 Which oxide produces a solution with a pH between pH 1 and pH 7 when reacted with water?

- A calcium oxide
- B carbon dioxide
- C potassium oxide
- D sodium oxide

19 Three solids, P, Q and R, all react with dilute sulfuric acid to produce zinc sulfate.

P and R produce gases during the reaction.

The gas produced when P reacts will not burn. The gas produced when R reacts will burn.

What are P, Q and R?

	P	Q	R
A	zinc	zinc hydroxide	zinc carbonate
B	zinc carbonate	zinc	zinc oxide
C	zinc carbonate	zinc hydroxide	zinc
D	zinc oxide	zinc carbonate	zinc

20 Which ion forms a green precipitate with aqueous sodium hydroxide that dissolves in an excess of aqueous sodium hydroxide?

- A Ca^{2+}
- B Cr^{3+}
- C Cu^{2+}
- D Fe^{2+}

21 A period of the Periodic Table is shown.

group	I	II	III	IV	V	VI	VII	VIII
element	R	S	T	V	W	X	Y	Z

The letters are not their chemical symbols.

Which statement is correct?

- A Element R does not conduct electricity.
- B Elements R and Y react together to form an ionic compound.
- C Element Z exists as a diatomic molecule.
- D Element Z reacts with element T.

22 Some properties of element X are shown.

melting point in °C	98
boiling point in °C	883
reaction with cold water	gives off H ₂ gas
reaction when heated with oxygen	burns to give a white solid

In which part of the Periodic Table is X found?

- A** Group I
- B** Group VII
- C** Group VIII
- D** transition elements

23 The table gives some properties of an element.

melting point in °C	3422
appearance of the element	grey
appearance of the chloride of the element	dark blue
density in g / cm ³	19.2
electrical conductivity when solid	good

Which other property would you expect this element to have?

- A** acts as a catalyst
- B** brittle
- C** forms an acidic oxide
- D** highly reactive with water

24 Why is argon gas used to fill electric lamps?

- A** It conducts electricity.
- B** It glows when heated.
- C** It is less dense than air.
- D** It is not reactive.

25 What is a property of **all** metals?

- A conduct electricity
- B hard
- C low melting points
- D react with water

26 What is the reducing agent in the large-scale extraction of iron from iron ore?

- A air
- B carbon monoxide
- C hematite
- D limestone

27 Some reactions of three metals are listed in the table.

metal	metal reacts with dilute hydrochloric acid	metal oxide is reduced by carbon
P	yes	no
Q	yes	yes
R	no	yes

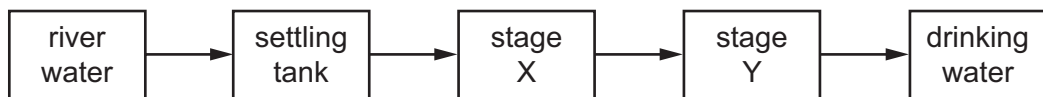
What is the order of reactivity of the metals?

	most reactive	→	least reactive
A	P	Q	R
B	P	R	Q
C	Q	P	R
D	R	P	Q

28 Which uses of the metals shown are both correct?

	aluminium	stainless steel
A	aircraft bodies	car bodies
B	car bodies	aircraft bodies
C	chemical plant	food containers
D	food containers	cutlery

- 29 The flow chart shows stages in the treatment of river water to produce drinking water.



What occurs at stages X and Y?

	X	Y
A	distillation	chlorination
B	distillation	filtration
C	filtration	chlorination
D	filtration	distillation

- 30 What is produced by the incomplete combustion of methane?

- A** carbon monoxide
- B** hydrogen
- C** lead compounds
- D** sulfur dioxide

- 31 Iron is a metal that rusts in the presence of oxygen and water.

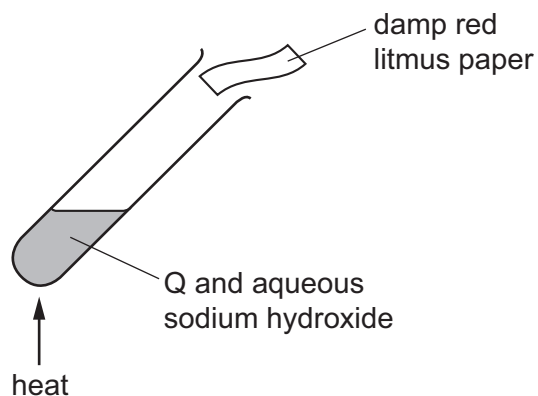
Mild steel is used for1..... and is prevented from rusting by2..... .

Stainless steel does not rust. It is produced by3..... iron with another metal.

Which words complete gaps 1, 2 and 3?

	1	2	3
A	car bodies	greasing	covering
B	car bodies	painting	mixing
C	cutlery	greasing	covering
D	cutlery	painting	mixing

32 Compound Q is heated with aqueous sodium hydroxide.



The damp red litmus paper turns blue.

What is Q?

- A ammonium chloride
- B copper(II) chloride
- C iron(III) chloride
- D sodium chloride

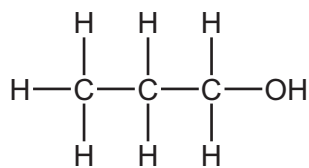
33 Some marble chips (calcium carbonate) are heated strongly and substances X and Y are formed.

Substance X is a white solid that reacts with water, giving out heat. Substance Y is a colourless gas.

What are substances X and Y?

	X	Y
A	calcium chloride	oxygen
B	calcium hydroxide	carbon dioxide
C	calcium oxide	carbon dioxide
D	calcium sulfate	oxygen

34 The structure of compound R is shown.



What is R?

- A** propane
- B** propanoic acid
- C** propanol
- D** propene

35 Fuel oil and naphtha are two fractions obtained from petroleum.

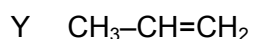
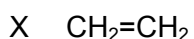
What are the major uses of these fractions?

	fuel oil	naphtha
A	jet fuel	making chemicals
B	jet fuel	making roads
C	ship fuel	making chemicals
D	ship fuel	making roads

36 What are the products of the complete combustion of ethanol?

- A** $\text{CO} + \text{H}_2$
- B** $\text{CO} + \text{H}_2\text{O}$
- C** $\text{CO}_2 + \text{H}_2$
- D** $\text{CO}_2 + \text{H}_2\text{O}$

37 X, Y and Z are three hydrocarbons.



What do compounds X, Y and Z have in common?

- 1 They are all alkenes.
- 2 They are all part of the same homologous series.
- 3 They all have the same boiling point.

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

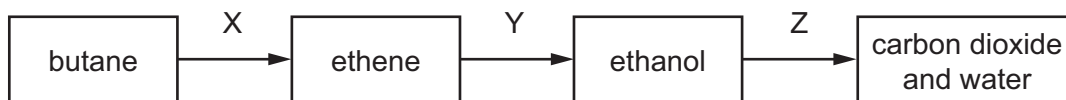
38 The table shows bonds that are present and bonds that are not present in compound X.

bond	
C–C	✓
C=C	x
C–H	✓
C–O	✓
C=O	✓
O–H	✓

What type of compound is X?

- A a carboxylic acid
- B an alcohol
- C an alkane
- D an alkene

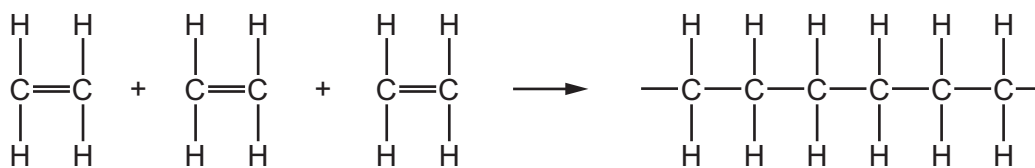
39 The diagram shows a reaction sequence.



Which row names the processes X, Y and Z?

	X	Y	Z
A	cracking	fermentation	respiration
B	cracking	hydration	combustion
C	distillation	fermentation	respiration
D	distillation	hydration	combustion

40 Molecules of a substance react together as shown.



Which type of reaction has taken place?

- A** cracking
- B** oxidation
- C** polymerisation
- D** reduction

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The Periodic Table of Elements

Group																																																																																																							
I	II	1 H hydrogen 1										III	IV	V	VI	VII	VIII																																																																																						
3 Li lithium 7		4 Be beryllium 9		Key atomic number atomic symbol name relative atomic mass										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 —						—																							

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
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 —

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).