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)

5136071969

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 Level1/Level 2 Certificate.

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

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1 Which statement about liquids and gases is correct?

A 1 cm^3 of gas contains more particles than 1 cm^3 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 cm^3 of an alkali are added to 20 cm^3 of an acid. The temperature change is measured.

Which apparatus is **not** needed in the experiment?

A 25 cm^3 measuring cylinder

B 100 cm^3 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

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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

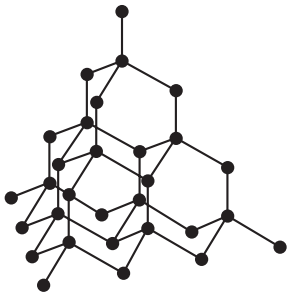
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8 The diagrams, X, Y and Z, show part of a polymer and two giant covalent structures.

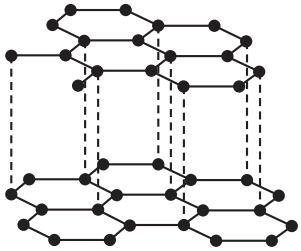
X



Y



Z



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

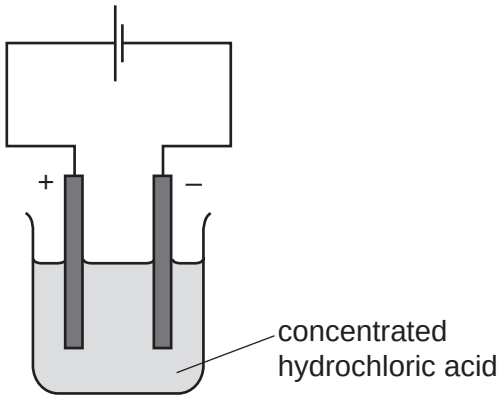
B copper

C gadolinium

D sulfur

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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 is .....1..... .
- During the electrolysis of hydrochloric acid, energy is .....2..... .

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

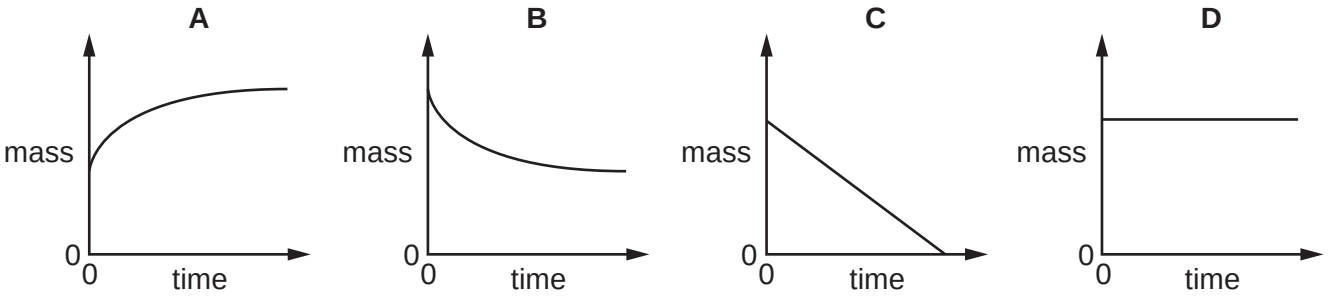
C reaction of sodium with water

D thermal decomposition of limestone

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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?

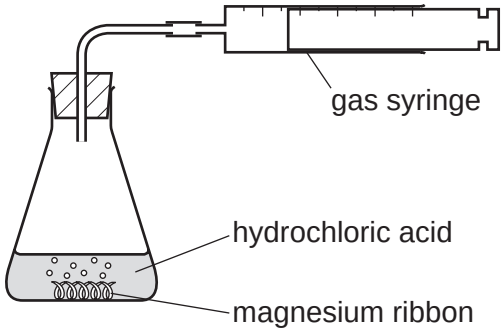
	the blue copper(II) sulfate is	reactions
A	a mixture	can be reversed
B	a mixture	cannot be reversed
C	hydrated	can be reversed
D	hydrated	cannot be reversed

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

$$Mg + 2HCl \rightarrow MgCl_2 + H_2$$

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.

P $2\underline{NaNO_2} + O_2 \rightarrow 2NaNO_3$

Q $2\underline{Hg}O \rightarrow 2Hg + O_2$

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

	P	Q
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

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.

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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.

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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.

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[Turn over

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?

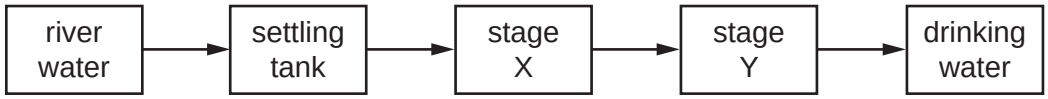
	most reactive →		least reactive
A	P	Q	R
B	P	R	Q
C	Q	P	R
D	R	P	Q

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

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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 for .....1..... and is prevented from rusting by .....2..... .

Stainless steel does not rust. It is produced by .....3..... iron with another metal.

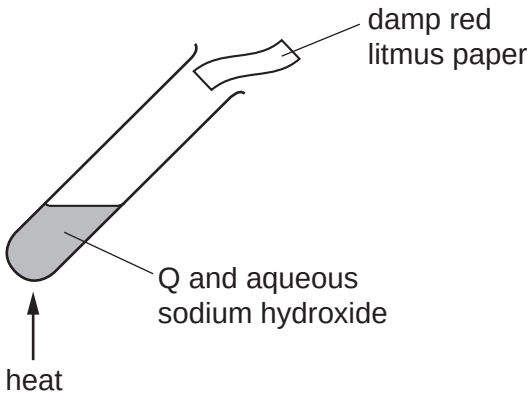
Which words complete gaps 1, 2 and 3?

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

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[Turn over

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.

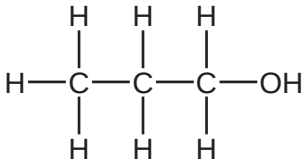
Substance X is a white solid that reacts with water, giving out heat. Substance Y is a colourless gas.

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

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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 $CO + H_2$

B $CO + H_2O$

C $CO_2 + H_2$

D $CO_2 + H_2O$

37 X, Y and Z are three hydrocarbons.

X $CH_2=CH_2$ Y $CH_3–CH=CH_2$ Z $CH_3–CH_2–CH=CH_2$

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	✗
C–H	✓
C–O	✓
C=O	✓
O–H	✓

What type of compound is X?

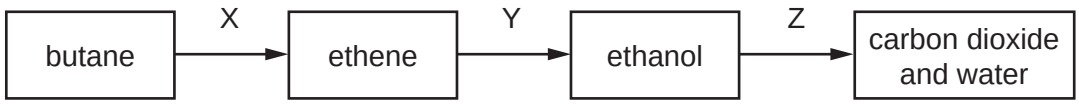
A a carboxylic acid

B an alcohol

C an alkane

D an alkene

39 The diagram shows a reaction sequence.

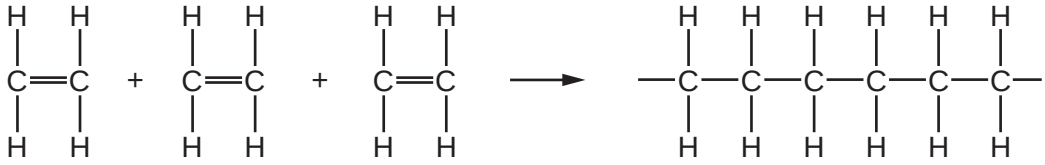


Which row names the processes X, Y and Z?

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

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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											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.).