Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/12**

Paper 1 Multiple Choice (Core) **February/March 2021**

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.

[Turn over

1 In which changes do the particles move further apart?

$$\text{gas} \underset{\text{Y}}{\overset{\text{W}}{\rightleftharpoons}} \text{liquid} \underset{\text{Z}}{\overset{\text{X}}{\rightleftharpoons}} \text{solid}$$

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

2 Gases are separated from liquid air by fractional distillation.

The boiling points of four gases are shown.

Which gas is both monoatomic and a liquid at –200 °C?

	gas	boiling point / °C
A	argon	–186
B	helium	–269
C	neon	–246
D	nitrogen	–196

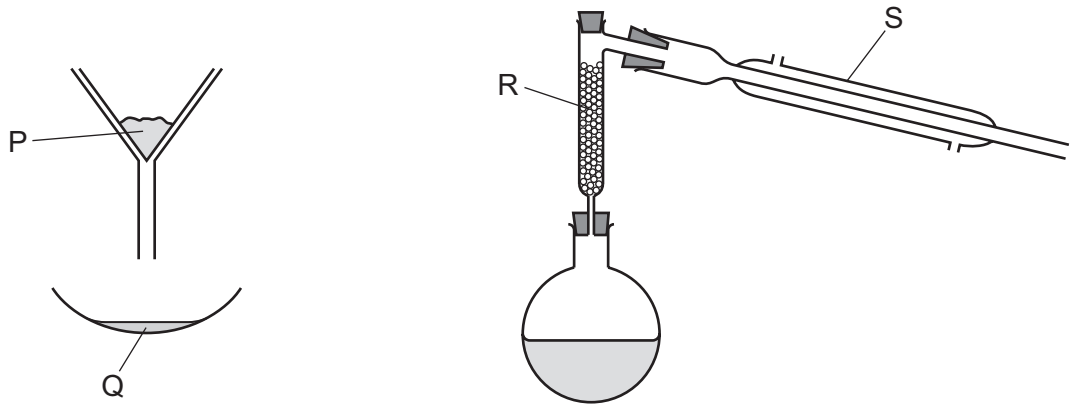
3 Impurities change the melting and boiling points of substances.

Sodium chloride is added to a sample of pure water.

How does the addition of sodium chloride affect the melting point and the boiling point of the water?

	melting point	boiling point
A	increases	increases
B	decreases	decreases
C	increases	decreases
D	decreases	increases

4 The apparatus used to separate a mixture of sand, methanol and ethanol is shown.



Which row identifies the labels on the diagrams?

	P	Q	R	S
A	filtrate	residue	condenser	fractionating column
B	filtrate	residue	fractionating column	condenser
C	residue	filtrate	condenser	fractionating column
D	residue	filtrate	fractionating column	condenser

5 A neutral atom, J, contains 45 neutrons and 35 electrons.

Which row is correct for atom J?

	proton number	nucleon number
A	35	45
B	35	80
C	45	45
D	45	80

6 Lithium and fluorine react to form lithium fluoride.

A student writes three statements about the reaction.

1 Lithium atoms lose an electron when they react.

2 Each fluoride ion has one more electron than a fluorine atom.

3 Lithium fluoride is a mixture of elements.

Which statements are correct?

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

[Turn over

7 Which definition of isotopes is correct?

A atoms of the same element that have the same number of electrons and nucleons

B atoms of the same element that have the same number of neutrons and protons

C atoms of the same element that have the same number of protons but a different number of electrons

D atoms of the same element that have the same number of protons but a different number of nucleons

8 In which molecule are all the outer shell electrons from each atom used to form covalent bonds?

A CH_4 **B** Cl_2 **C** H_2O **D** NH_3

9 What is the balanced chemical equation for the reaction between calcium and water?

A $Ca + H_2O \rightarrow CaOH + H_2$

B $Ca + H_2O \rightarrow Ca(OH)_2 + H_2$

C $Ca + 2H_2O \rightarrow CaOH + H_2$

D $Ca + 2H_2O \rightarrow Ca(OH)_2 + H_2$

10 A compound has the formula XF_2 and has a relative mass of 70.

What is element X?

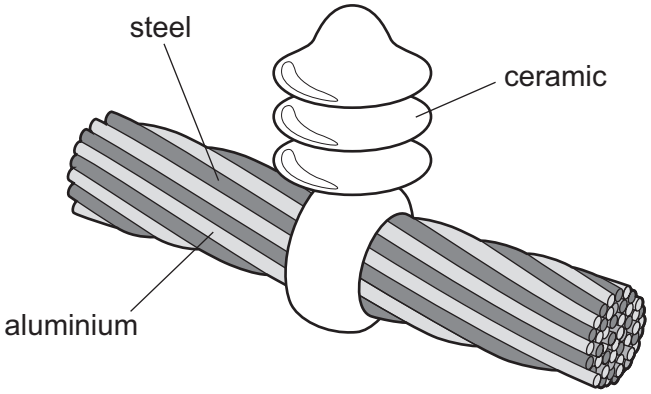
A gallium

B germanium

C sulfur

D ytterbium

11 The diagram shows a section of an overhead power cable.



Which statement explains why a particular substance is used?

A Aluminium has a low density and is a good conductor of electricity.

B Ceramic is a good conductor of electricity.

C Steel can rust in damp air.

D Steel is more dense than aluminium.

12 Three substances are electrolysed using inert electrodes.

Which substances produce hydrogen at the negative electrode?

1 concentrated hydrochloric acid

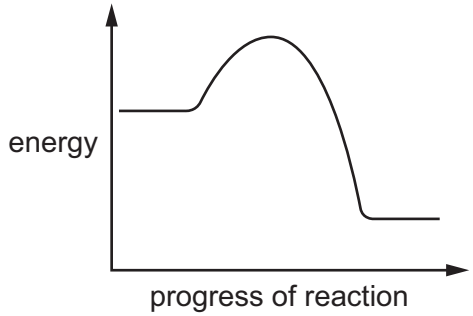
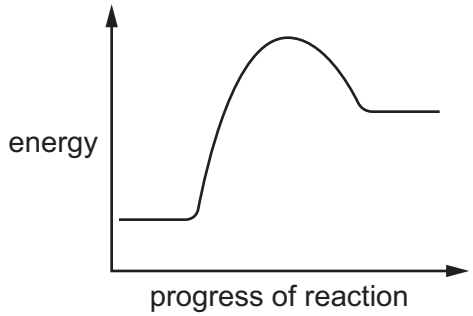
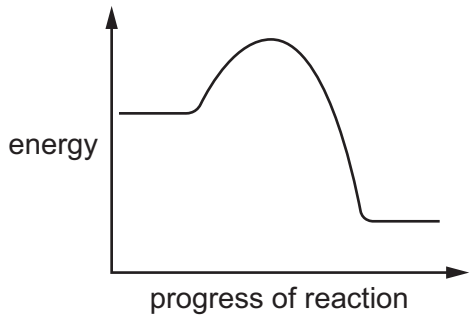
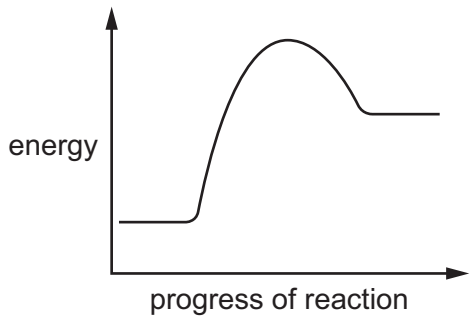
2 concentrated aqueous sodium chloride

3 dilute sulfuric acid

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

[Turn over

13 Which row describes an endothermic reaction?

	energy level diagram	energy transfer
A		energy is transferred from the surroundings to the reaction
B		energy is transferred from the surroundings to the reaction
C		energy is transferred from the reaction to the surroundings
D		energy is transferred from the reaction to the surroundings

14 Fuels release heat energy when they burn.

Which substances are used as fuels?

1 argon

2 butane

3 hydrogen

4 methane

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

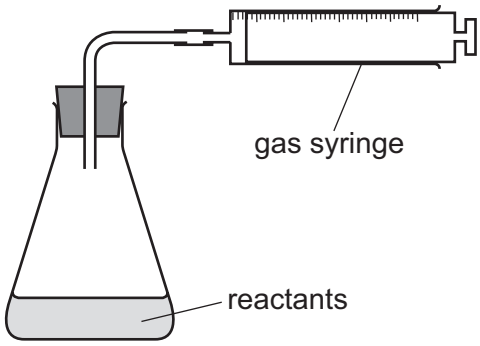
15 When zinc carbonate is mixed with dilute hydrochloric acid a change, M, takes place.

When carbon is heated with copper(II) oxide a change, N, takes place.

Which row describes changes M and N?

	M	N
A	chemical	chemical
B	chemical	physical
C	physical	chemical
D	physical	physical

16 The apparatus shown is used to measure the rate of a reaction.



Which equation represents a reaction where the rate can be measured using this apparatus?

A $Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$

B $HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$

C $Fe(s) + CuSO_4(aq) \rightarrow Cu(s) + FeSO_4(aq)$

D $2Na(s) + Br_2(l) \rightarrow 2NaBr(s)$

[Turn over

17 P is a hydrated metal salt with a blue colour. When P is heated, water is given off, leaving solid Q.

R is a hydrated metal salt with a pink colour. When R is heated, water is given off, leaving solid S.

Which row gives the name of P and the colour of S?

	name of P	colour of S
A	hydrated cobalt(II) chloride	blue
B	hydrated cobalt(II) chloride	white
C	hydrated copper(II) sulfate	blue
D	hydrated copper(II) sulfate	white

18 Which property is shown by the alkali sodium hydroxide?

A It has a pH less than pH 7.

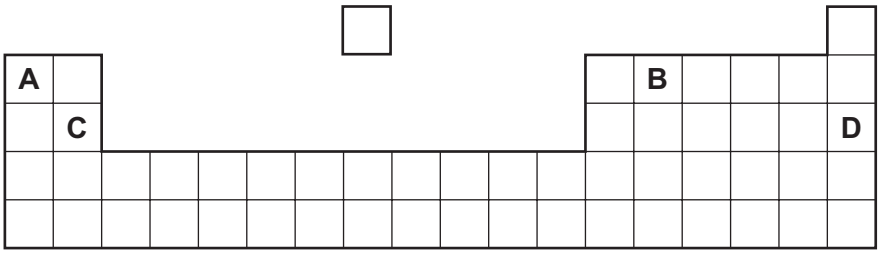
B It produces a gas when it is warmed with ammonium chloride.

C It turns blue litmus red.

D It turns universal indicator green.

19 Part of the Periodic Table is shown.

Which element forms an acidic oxide?



20 When aqueous sodium hydroxide is added to a solution of a metal ion, a grey-green precipitate forms, which dissolves in excess to form a dark green solution.

What is the identity of the metal ion?

A chromium(III)

B iron(II)

C iron(III)

D copper(II)

21 Which statements describe the Periodic Table?

1 The elements are arranged in order of their nucleon number.

2 The elements are arranged in order of their proton number.

3 It is used to predict the properties of elements.

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

22 Which row shows how the properties of the Group I elements change on descending the group?

	density	melting point	reactivity
A	decreases	increases	increases
B	decreases	increases	decreases
C	increases	decreases	increases
D	increases	decreases	decreases

23 Copper is a transition element.

Two compounds of copper are copper(II) oxide and copper(II) carbonate.

Which row describes the two compounds?

	copper(II) oxide	colour of copper(II) carbonate
A	acidic	green
B	acidic	white
C	basic	green
D	basic	white

24 The metal beryllium does not react with cold water.

It reacts with hydrochloric acid but cannot be extracted from its ore by using carbon.

Where is beryllium placed in the reactivity series?

magnesium
A
zinc
B
iron
C
copper
D

[Turn over

25 Pure iron is a soft metal.

When mixed with small amounts of tungsten it produces a hard alloy called tungsten steel.

Which statements are correct?

1 Pure iron is a transition element.

2 The particles in pure iron are arranged in ordered layers.

3 Tungsten steel is a compound.

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

26 Which row describes magnesium?

	electrical conductivity	reacts with dilute acid
A	low	no
B	low	yes
C	high	no
D	high	yes

27 Four equations are shown.

1 $C + O_2 \rightarrow CO_2$

2 $CaCO_3 \rightarrow CaO + CO_2$

3 $SiO_2 + 2CO \rightarrow Si + 2CO_2$

4 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

Which equations represent reactions that take place during the extraction of iron from hematite?

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

28 Copper is used to make saucepans.

Which properties of copper make it suitable for this use?

1 Copper has a relatively high melting point.

2 Copper has a low density.

3 Copper is a good conductor of electricity.

4 Copper is a good conductor of heat.

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

29 Which pollutants are responsible for the erosion of buildings and statues?

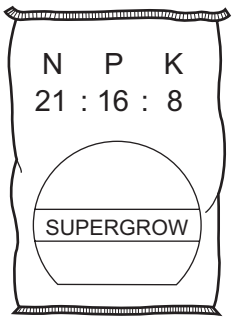
1 carbon monoxide

2 oxides of nitrogen

3 sulfur dioxide

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

30 Which combination of chemical compounds can be used to produce the fertiliser shown?



A $(NH_4)_3PO_4$, KCl

B NH_4NO_3, $Ca_3(PO_4)_2$

C NH_4NO_3, $CO(NH_2)_2$

D NH_4NO_3, K_2SO_4, $(NH_4)_2SO_4$

31 X is produced when petrol burns completely in air.

What is X?

A argon

B carbon dioxide

C carbon monoxide

D hydrogen

32 Which substance is used as a bleach in the manufacture of paper?

A carbon dioxide

B nitrogen dioxide

C silicon dioxide

D sulfur dioxide

[Turn over

33 What is an industrial use of calcium carbonate?

A cracking of hydrocarbons

B manufacture of aluminium

C manufacture of cement

D purification of water

34 Which product is formed when calcium carbonate undergoes thermal decomposition?

A calcium

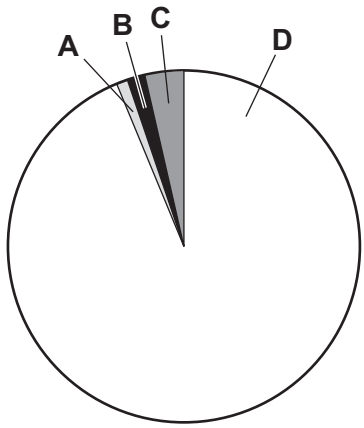
B calcium hydroxide

C calcium oxide

D calcium silicate

35 The pie chart represents the composition of natural gas.

Which sector represents methane?



36 Which fraction, obtained from petroleum, is used for jet fuel?

A bitumen

B gasoline

C kerosene

D naphtha

37 The formula of a hydrocarbon is C_xH_y.

The equation for its complete combustion is shown.

$$C_xH_y + 8O_2 \rightarrow 5CO_2 + 6H_2O$$

What are the values of x and y?

	x	y
A	5	6
B	5	12
C	6	5
D	12	5

38 Pentane is an alkane and pentene is an alkene.

What is observed when bromine water is added to a sample of each compound?

	pentane	pentene
A	becomes colourless	becomes colourless
B	becomes colourless	remains unchanged
C	remains unchanged	becomes colourless
D	remains unchanged	remains unchanged

39 Molecule 1 undergoes a process to make molecule 2.

$$\text{molecule 1} \xrightarrow{\text{process}} \text{molecule 2}$$

Which row describes the molecules and the process?

	molecule 1	process	molecule 2
A	monomer	cracking	polymer
B	monomer	polymerisation	polymer
C	small molecule	polymerisation	monomer
D	small molecule	cracking	monomer

[Turn over

40 Which substance has long-chain molecules and is a constituent of food?

A carbohydrate

B nylon

C poly(ethene)

D *Terylene*

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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.).