Cambridge Assessment International Education

Cambridge IGCSE™ (9–1)

CHEMISTRY **0971/11**

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

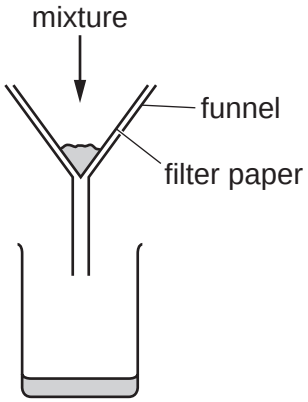
This document has **16** pages. Any blank pages are indicated.

[Turn over

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

	arrangement of particles	movement of particles
A	touching and regular	vibrating
B	touching and random	moving around each other
C	touching and regular	moving around each other
D	touching and random	moving very fast

2 A mixture is separated using the apparatus shown.



What is the mixture?

A aqueous copper(II) sulfate and aqueous sodium chloride

B aqueous copper(II) sulfate and copper

C copper and sulfur

D ethanol and ethanoic acid

3 Which statement about paper chromatography is correct?

A A solvent is needed to dissolve the paper.

B Paper chromatography separates mixtures of solvents.

C The solvent should cover the baseline.

D The baseline should be drawn in pencil.

4 Element X has 7 protons.

Element Y has 8 more protons than X.

Which statement about element Y is correct?

A Y has more electron shells than X.

B Y has more electrons in its outer shell than X.

C Y is in a different group of the Periodic Table from X.

D Y is in the same period of the Periodic Table as X.

5 A covalent molecule Q contains only six shared electrons.

What is Q?

A ammonia, NH_3

B chlorine, Cl_2

C methane, CH_4

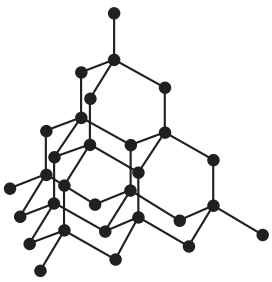
D water, H_2O

6 Which row describes how an ionic bond forms between a sodium atom and a chlorine atom?

	sodium atom	chlorine atom
A	two electrons are lost	two electrons are gained
B	one electron is gained	one electron is lost
C	two electrons are gained	two electrons are lost
D	one electron is lost	one electron is gained

7 Which diagram shows the structure of an alloy?

A



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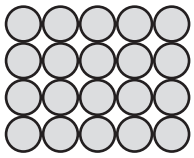

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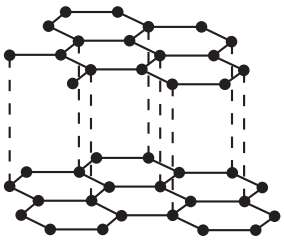

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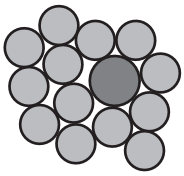


8 Methane burns in oxygen to produce carbon dioxide and water.

What is the balanced equation for this reaction?

A $CH_4 + 2O_2 \rightarrow 2CO_2 + 2H_2O$

B $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

C $CH_4 + 2O_2 \rightarrow CO_2 + H_2O$

D $CH_4 + O_2 \rightarrow CO_2 + 2H_2O$

9 What is the relative formula mass of magnesium nitrate, $Mg(NO_3)_2$?

A 74 **B** 86 **C** 134 **D** 148

10 In separate experiments, electricity was passed through concentrated aqueous sodium chloride and molten lead(II) bromide.

What would happen in **both** experiments?

A A halogen would be formed at the anode.

B A metal would be formed at the cathode.

C Hydrogen would be formed at the anode.

D Hydrogen would be formed at the cathode.

11 Steel core aluminium cables are used for overhead electricity cables.

Which statement explains why these cables are used?

A Aluminium conducts electricity only when it surrounds a steel core.

B Aluminium conducts electricity and the steel core makes the cable stronger.

C Steel conducts electricity and is surrounded by aluminium because aluminium is an insulator.

D Steel conducts electricity and is surrounded by aluminium to stop the steel from corroding.

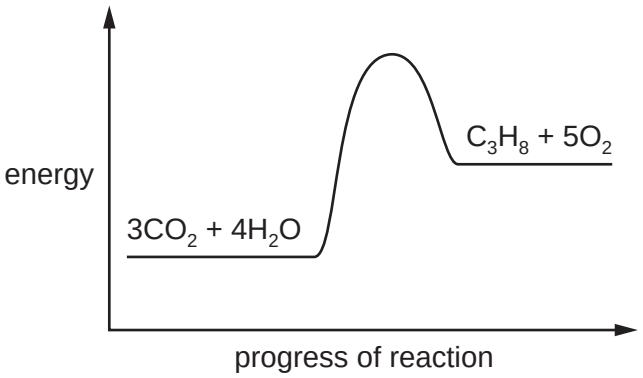
12 The complete combustion of propane is exothermic.

The equation for this reaction is shown.

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

Which energy level diagram represents the complete combustion of propane?

A



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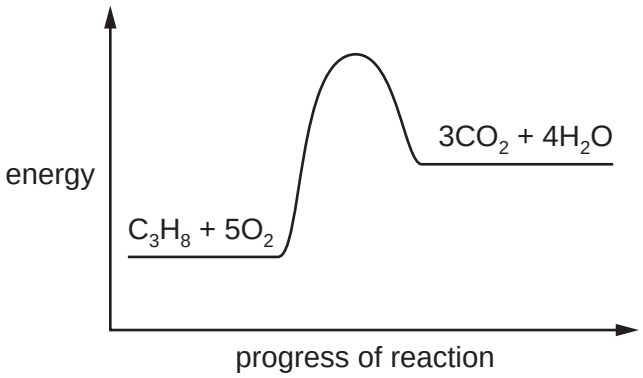

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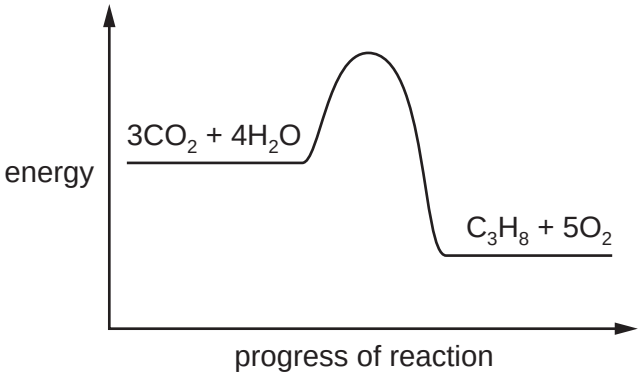

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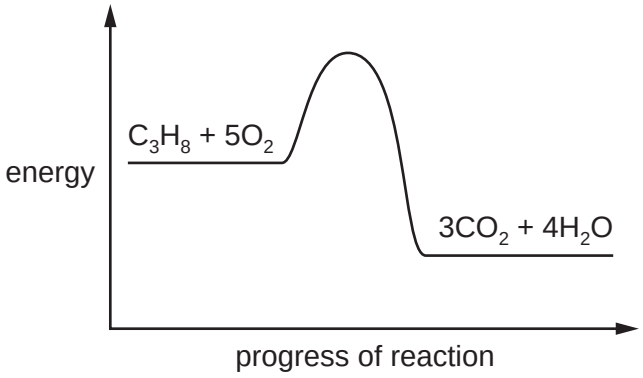


13 Which changes occur when hydrogen is burned in oxygen?

	energy change	product
A	endothermic	H_2O only
B	endothermic	H_2O and CO_2
C	exothermic	H_2O only
D	exothermic	H_2O and CO_2

14 When sulfur is heated it undergoes a .....1..... change as it melts.

Further heating causes the sulfur to undergo a .....2..... change and form sulfur dioxide.

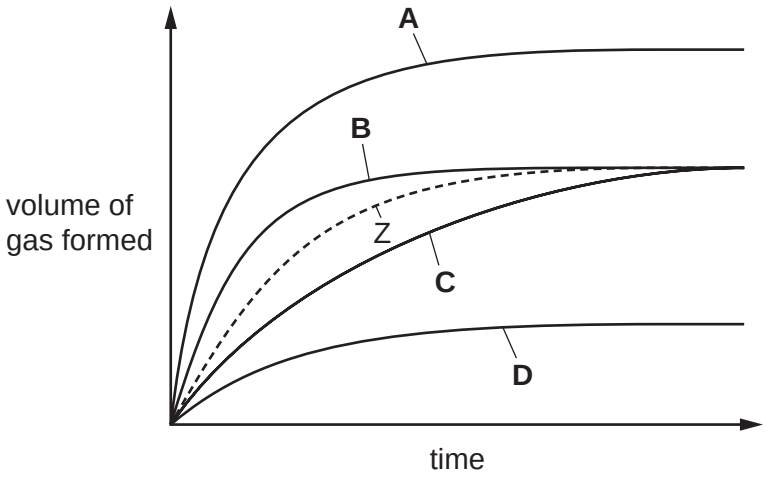
Which words complete gaps 1 and 2?

	1	2
A	chemical	chemical
B	chemical	physical
C	physical	chemical
D	physical	physical

15 Zinc reacts with an acid to form a gas. The volume of gas produced is measured at intervals. The results are shown as curve Z.

The reaction is repeated in the presence of a catalyst.

Which curve shows the results for the catalysed reaction?



16 Which statement is correct?

A When anhydrous copper(II) sulfate is heated its colour changes to a deeper blue.

B When hydrated copper(II) sulfate is heated its colour changes to a deeper blue.

C When water is added to blue cobalt(II) chloride paper it turns pink.

D When water is added to pink cobalt(II) chloride paper it turns blue.

17 Three separate experiments are carried out on an aqueous solution of S.

The results are shown.

1 Magnesium does not react with the solution.

2 A gas is given off when ammonium sulfate is heated with the solution.

3 Methyl orange turns yellow when added to the solution.

What is S?

A hydrochloric acid

B sodium hydroxide

C sodium chloride

D sulfur dioxide

18 Element X forms an oxide, XO, that neutralises sulfuric acid.

Which row describes X and XO?

	element X	nature of oxide, XO
A	metal	acidic
B	metal	basic
C	non-metal	acidic
D	non-metal	basic

19 Copper(II) sulfate is prepared by adding excess copper(II) oxide to warm dilute sulfuric acid.

Which purification methods are used to obtain pure solid copper(II) sulfate from the reaction mixture?

1 crystallisation

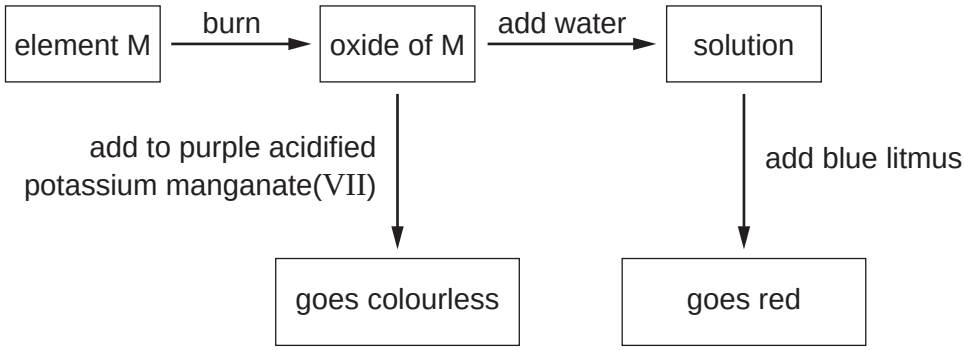
2 filtration

3 chromatography

4 distillation

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

20 Some reactions of element M are shown.



What is element M?

A carbon

B iron

C magnesium

D sulfur

21 Element X is in Group II of the Periodic Table.

Which statements about X are correct?

1 X is a metal.

2 X has two electrons in its outer shell.

3 X is a liquid at room temperature.

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

22 Why is helium used to fill balloons?

A Helium is monoatomic.

B Helium is in Group VIII of the Periodic Table.

C Helium has a full outer electron shell.

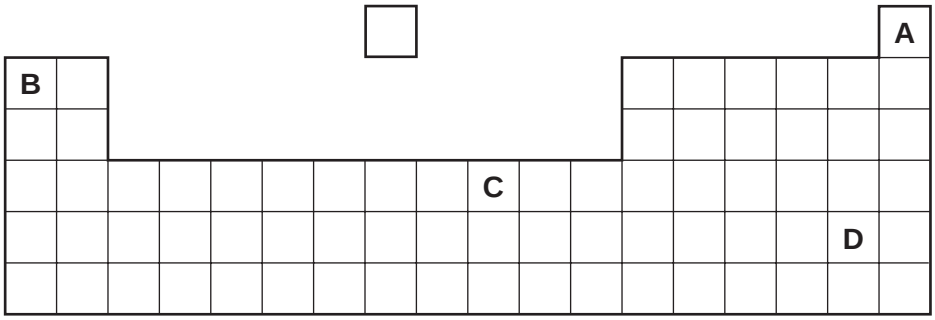
D Helium is less dense than air.

23 Which row describes the trend in properties of the elements in Group I as the group is descended?

	melting point	reactivity with water
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

24 An element melts at 1455 °C, has a density of 8.90 g / cm^3 and forms a green chloride.

Where in the Periodic Table is this element found?



25 Some properties of metal J are listed.

- J does not react with cold water.
- J reacts with dilute hydrochloric acid.
- No reaction occurs when the oxide of J is heated with carbon.

What is J?

A copper

B iron

C magnesium

D sodium

26 Iron from a blast furnace is treated with oxygen and with calcium oxide to make steel.

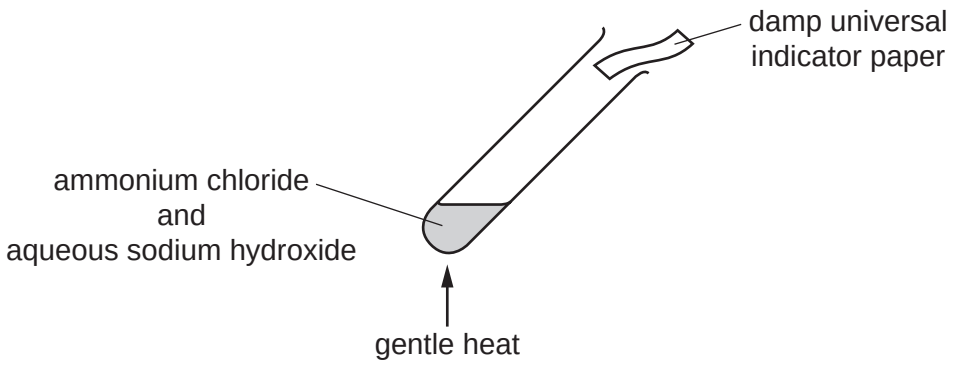
Which substances in the iron are removed?

	oxygen removes	calcium oxide removes
A	carbon	acidic oxides
B	carbon	basic oxides
C	iron	acidic oxides
D	iron	basic oxides

27 Which row describes a use of the metal and explains why it is used?

	metal	use	reason
A	aluminium	food containers	good conductor of electricity
B	aluminium	aircraft wings	high density
C	copper	cooking utensils	good conductor of heat
D	copper	electricity cables	good electrical insulator

28 Ammonium chloride is heated with aqueous sodium hydroxide.



A gas is produced which turns damp universal indicator paper blue.

Which gas has been produced?

A ammonia

B hydrogen

C oxygen

D sulfur dioxide

29 Which two gases make up approximately 99% of clean, dry air?

A carbon dioxide and nitrogen

B carbon dioxide and oxygen

C nitrogen and oxygen

D argon and nitrogen

30 A student writes three statements about potassium nitrate, KNO_3.

1 The relative formula mass of KNO_3 is 101.

2 Potassium nitrate contains the three essential elements for plant growth.

3 Potassium nitrate could be used as a fertiliser.

Which statements are correct?

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

31 Which row describes the uses of sulfur and sulfur dioxide?

	sulfur	sulfur dioxide
A	extraction of aluminium	food preservative
B	extraction of aluminium	manufacture of cement
C	manufacture of sulfuric acid	food preservative
D	manufacture of sulfuric acid	manufacture of cement

32 A white solid Z reacts with dilute hydrochloric acid to produce a gas.

The same gas is produced when compound Z is heated strongly.

What is Z?

A calcium

B calcium carbonate

C calcium hydroxide

D calcium oxide

33 Some information about compound L is listed.

1 L is an organic compound which contains four hydrogen atoms.

2 L is soluble in water.

3 An aqueous solution of L reacts with copper(II) carbonate to produce a gas.

What is L?

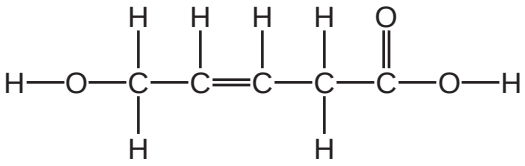
A methane

B ethene

C ethanoic acid

D ethanol

34 The structure of an organic molecule is shown.



Which functional groups does this molecule contain?

	alcohol	alkene	carboxylic acid
A	no	no	no
B	no	yes	yes
C	yes	no	yes
D	yes	yes	yes

35 Which compounds belong to the same homologous series?

A ethane and propane

B ethanoic acid and ethanol

C methane and ethene

D propene and ethanoic acid

36 Which statement about alkanes is correct?

A They burn in oxygen.

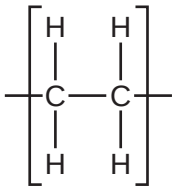
B They contain carbon, hydrogen and oxygen atoms.

C They contain double bonds.

D They contain ionic bonds.

37 Which structure represents poly(ethene)?

A



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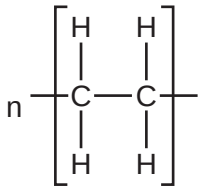

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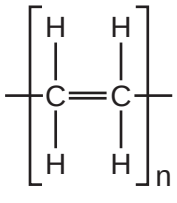

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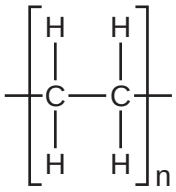

38 P, Q, R and S are four organic compounds.

P is an unsaturated hydrocarbon.

Q burns but otherwise is unreactive.

R contains a C–C single bond and a C=C double bond.

S undergoes addition polymerisation.

Which compounds are alkenes?

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

39 Which statement about petroleum fractions is correct?

A All petroleum fractions are used as fuels.

B Gas oil is used to make bottled gas for heating.

C Hydrocarbons in diesel have higher boiling points than hydrocarbons in gasoline.

D Molecules in kerosene are larger than molecules in fuel oil.

40 Which substance is a natural polymer?

A ethene

B *Terylene*

C nylon

D protein

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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.).