



Cambridge IGCSE™

CHEMISTRY

0620/13

Paper 1 Multiple Choice (Core)

October/November 2023

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.



2

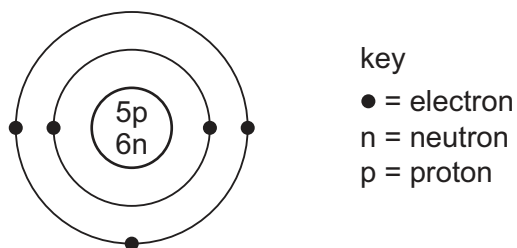
1 Which statement about solids, liquids or gases is correct?

- A** Solids are easy to compress.
- B** Liquids are easy to compress.
- C** Liquids expand to fill their container.
- D** Gases expand to fill their container.

2 Which substance is a mixture?

- A** air
- B** graphite
- C** oxygen
- D** water

3 The structure of an atom of element X is shown.



What is element X?

- A** boron
- B** carbon
- C** sodium
- D** sulfur

4 Sodium reacts with chlorine to form sodium chloride.

Which statements describe what happens to the sodium atoms in this reaction?

- 1 Sodium atoms form positive ions.
- 2 Sodium atoms form negative ions.
- 3 Sodium atoms gain electrons.
- 4 Sodium atoms lose electrons.

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

3

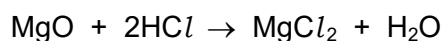
5 Which statement about ammonia is correct?

- A It conducts electricity when liquid.
- B It contains three covalent bonds.
- C It has a high boiling point.
- D It has a giant covalent structure.

6 Which row describes the structure and a use of graphite?

	structure	use
A	giant covalent	lubricant
B	giant covalent	cutting tools
C	simple molecular	lubricant
D	simple molecular	cutting tools

7 The equation represents the reaction between solid magnesium oxide and dilute hydrochloric acid to form magnesium chloride and water.



Which row shows the state symbols for hydrochloric acid, magnesium chloride and water?

	HCl	MgCl ₂	H ₂ O
A	(aq)	(aq)	(l)
B	(aq)	(l)	(l)
C	(l)	(aq)	(aq)
D	(l)	(l)	(aq)

8 What is the equation for the reaction between calcium and chlorine?

- A $2\text{Ca} + \text{Cl} \rightarrow \text{Ca}_2\text{Cl}$
- B $2\text{Ca} + \text{Cl}_2 \rightarrow \text{Ca}_2\text{Cl}_2$
- C $\text{Ca} + \text{Cl} \rightarrow \text{CaCl}$
- D $\text{Ca} + \text{Cl}_2 \rightarrow \text{CaCl}_2$

9 Calcium nitrate has the formula $\text{Ca}(\text{NO}_3)_2$.

What is the relative formula mass, M_r , of calcium nitrate?

- A 102
- B 150
- C 164
- D 204

4

- 10** Dilute sulfuric acid is electrolysed using platinum electrodes. The gases produced at each electrode are collected.

The gases are mixed together and ignited with a lighted splint.

What is formed during this reaction?

- A** hydrogen sulfide
 - B** sulfur dioxide
 - C** sulfuric acid
 - D** water
- 11** Electricity is passed through molten sodium chloride using inert electrodes.

What is observed at the electrodes?

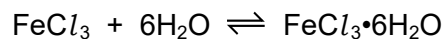
- A** A colourless gas is produced at the negative electrode.
 - B** A pale yellow-green gas is produced at the positive electrode.
 - C** A silver-coloured metal is produced at the positive electrode.
 - D** No change is observed because the electrodes are inert.
- 12** Fuel cells are used as energy sources in cars.

Which row gives a fuel used in a fuel cell and the products formed?

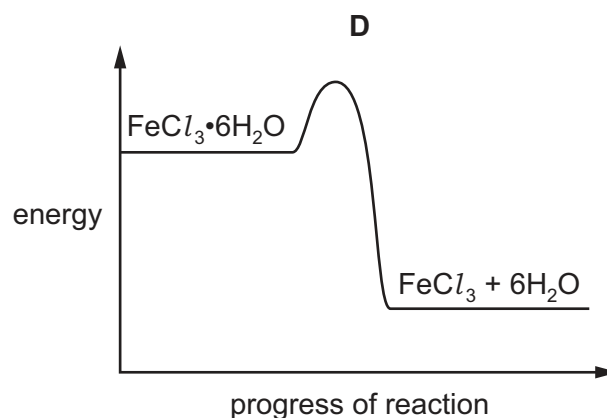
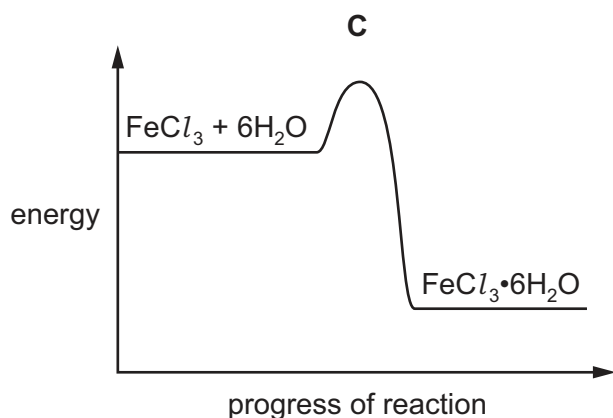
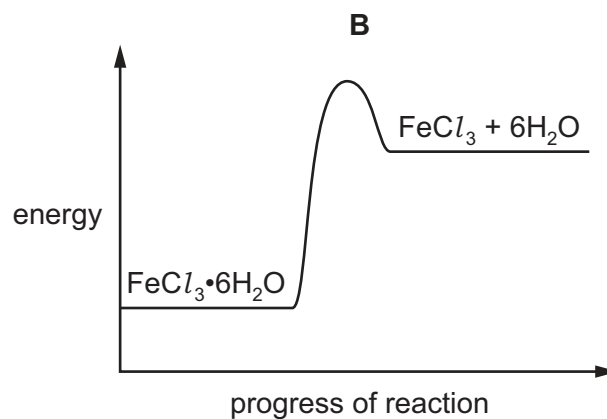
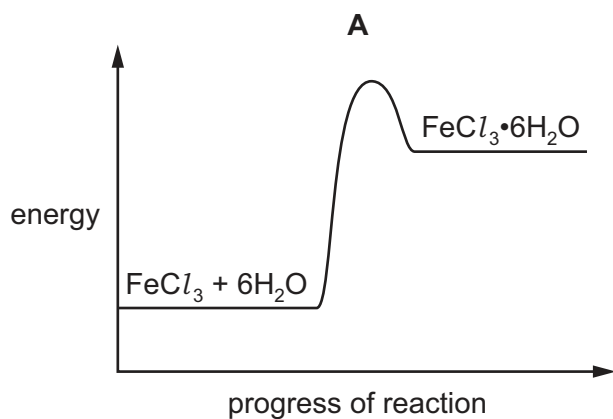
	fuel in a fuel cell	products formed
A	hydrogen	carbon dioxide and water
B	hydrogen	water only
C	petrol	carbon dioxide and water
D	petrol	water only

5

- 13 When water is added to anhydrous iron(III) chloride, FeCl_3 , hydrated iron(III) chloride, $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$, is formed and energy is given out.



Which reaction pathway diagram represents the formation of anhydrous iron(III) chloride in the **reverse** reaction?



- 14 Which process is a chemical change?
- A** burning carbon in air
 - B** dissolving copper(II) sulfate crystals in water
 - C** evaporating ethanol
 - D** freezing water

- 15** Anhydrous cobalt(II) chloride is blue and turns pink when water is added.

How is this reaction reversed?

- A** adding dilute acid
- B** filtering
- C** heating
- D** cooling

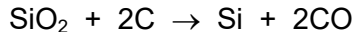
- 16** Ethanol can be turned into ethanoic acid by passing it over hot copper(II) oxide.



What is this type of reaction?

- A** precipitation
- B** redox
- C** thermal decomposition
- D** neutralisation

- 17** When heated strongly, silicon(IV) oxide reacts with carbon.



Which term describes what happens to silicon(IV) oxide?

- A** thermal decomposition
- B** neutralisation
- C** oxidation
- D** reduction

- 18** Information about four solutions, P, Q, R and S, is listed.

Solution P reacts with ammonium chloride to form ammonia.

Solution Q reacts with sodium carbonate to form carbon dioxide.

Solution R contains a high concentration of OH^- ions.

Solution S turns litmus red.

Which solutions are alkaline?

- A** P and Q
- B** P and R
- C** Q and S
- D** R and S

19 Which oxides are basic?

- 1 calcium oxide
- 2 sodium oxide
- 3 iron(II) oxide

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

20 Which row describes the changes across a period of the Periodic Table, from left to right?

	number of outer-shell electrons	metallic character
A	decreases	decreases
B	decreases	increases
C	increases	increases
D	increases	decreases

21 Which row shows properties of an element that is in the same group of the Periodic Table as lithium?

	electrical conductivity	density in g / cm ³
A	high	0.97
B	high	8.93
C	low	0.07
D	low	3.12

22 Which row describes how the properties of Group I elements change as the group is descended?

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

23 The elements in Group VII include chlorine, bromine and iodine.

Which statements are correct?

- 1 Iodine is more dense than chlorine.
- 2 Iodine displaces chlorine from a solution containing chloride ions.
- 3 Bromine is a diatomic non-metal.
- 4 Chlorine gas is darker in colour than bromine vapour.

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

24 Cobalt is a transition element.

What is a property of cobalt?

- A** It can form coloured compounds.
- B** It is a poor electrical conductor.
- C** It has a low density.
- D** It has a low melting point.

25 Which statements about brass are correct?

- 1 It is an alloy of zinc and copper.
- 2 It is a compound of zinc and copper.
- 3 It is a mixture of zinc and copper.

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

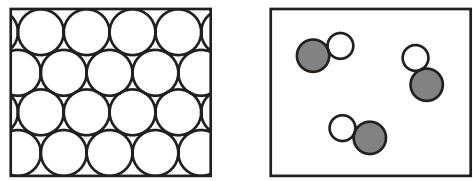
26 Aluminium is used to make containers for storing food.

Which property makes it suitable for this use?

- A** conducts heat
- B** low density
- C** resists corrosion
- D** shiny surface

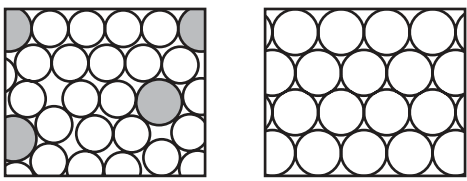
27 Which pair of diagrams represents both a pure metal and an alloy?

A



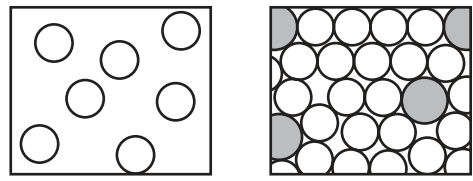
pure metal alloy

B



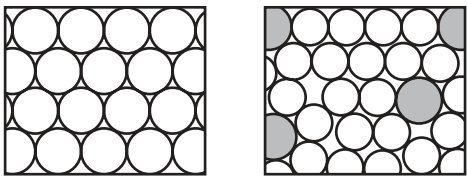
pure metal alloy

C



pure metal alloy

D



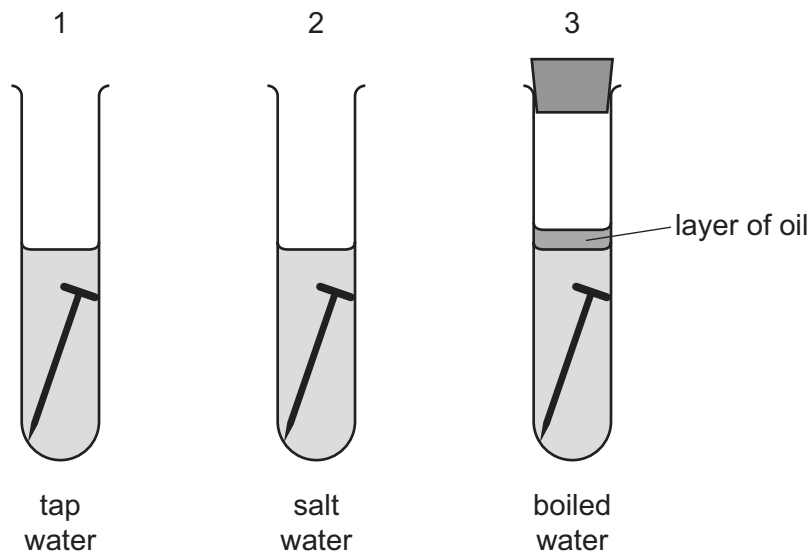
pure metal alloy

28 A metal M is between sodium and magnesium in the reactivity series.

Which reactions occur with M and its oxide?

	M reacts with steam	M can be extracted by heating its oxide with carbon
A	no	no
B	no	yes
C	yes	no
D	yes	yes

29 The diagrams show experiments to investigate rusting of iron nails.



In which test-tubes do the nails rust?

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

30 Some uses of water are listed.

- 1 for drinking
- 2 in chemical reactions
- 3 in swimming pools
- 4 in washing

For which uses is it necessary to chlorinate the water?

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

31 Two tests are done on an NPK fertiliser.

test 1 flame test

test 2 heat with aqueous sodium hydroxide and aluminium foil

Which observations are made?

	test 1	test 2
A	green flame	gas evolved which turns red litmus blue
B	green flame	gas evolved which turns blue litmus red
C	lilac flame	gas evolved which turns red litmus blue
D	lilac flame	gas evolved which turns blue litmus red

32 The gases from the engine of a car contain oxides of nitrogen.

How are these oxides formed?

- A** Nitrogen reacts with carbon dioxide.
- B** Nitrogen reacts with carbon monoxide.
- C** Nitrogen reacts with oxygen.
- D** Nitrogen reacts with petrol.

33 Which statements explain why plastics should be recycled?

- 1 They do not decompose when added to land fill.
- 2 They pollute rivers and oceans, harming wildlife.
- 3 They can produce toxic gases when burned.

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

34 Unwanted vegetation is sometimes placed in a bin where it decomposes. The compost formed is used to fertilise soils.

Which gas is likely to be present in a higher percentage inside the bin than in the air outside the bin?

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

35 Ethene reacts with steam and with bromine in two separate reactions.

What are the products of these two reactions?

- A** ethanoic acid and bromoethane
- B** ethanoic acid and dibromoethane
- C** ethanol and bromoethane
- D** ethanol and dibromoethane

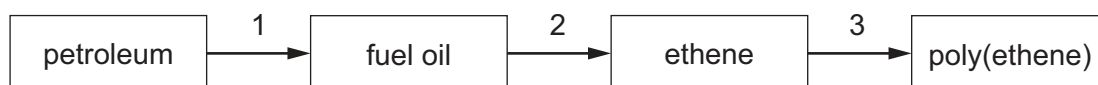
36 Four types of reactions are listed.

- 1 substitution
- 2 combustion
- 3 polymerisation
- 4 addition

Which reactions will ethane undergo?

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

37 The flow diagram shows how poly(ethene) may be made from petroleum.

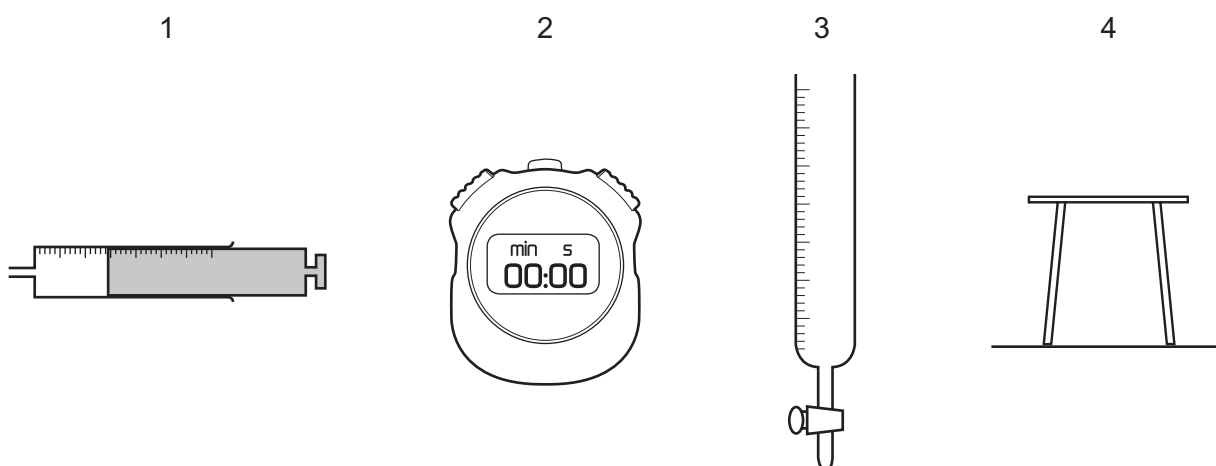


What are stages 1, 2 and 3?

	1	2	3
A	cracking	polymerisation	fractional distillation
B	cracking	fractional distillation	polymerisation
C	fractional distillation	cracking	polymerisation
D	fractional distillation	polymerisation	cracking

38 Magnesium reacts with dilute hydrochloric acid to produce hydrogen gas.

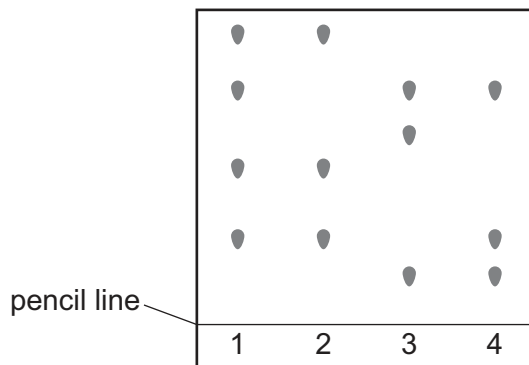
Which pieces of apparatus are needed to determine the rate of this reaction?



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

13

39 The chromatograms of four different dyes are shown.



How many different colours are present in the four dyes?

- A** 4 **B** 5 **C** 6 **D** 13

40 The results of some tests on an aqueous solution of substance X are listed.

- 1 A cream precipitate is produced when adding aqueous silver nitrate.
- 2 Adding aqueous sodium hydroxide produces a green precipitate which dissolves in excess alkali.
- 3 Adding aqueous ammonia produces a green precipitate which is insoluble in excess ammonia.

What is substance X?

- A** chromium(III) bromide
B chromium(III) chloride
C iron(II) bromide
D iron(II) chloride

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Group

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	euporium	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
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	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	—

lanthanoids

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