Cambridge Assessment International Education

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.

[Turn over

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?

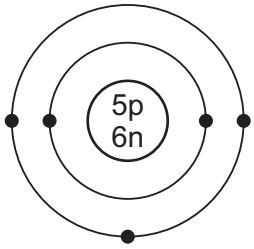
A air

B graphite

C oxygen

D water

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



key
● = electron
n = neutron
p = proton

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

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.

$$MgO + 2HCl \rightarrow MgCl_2 + H_2O$$

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

	HCl	$MgCl_2$	H_2O
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 $2Ca + Cl \rightarrow Ca_2Cl$

B $2Ca + Cl_2 \rightarrow Ca_2Cl_2$

C $Ca + Cl \rightarrow CaCl$

D $Ca + Cl_2 \rightarrow CaCl_2$

9 Calcium nitrate has the formula $Ca(NO_3)_2$.

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

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

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?

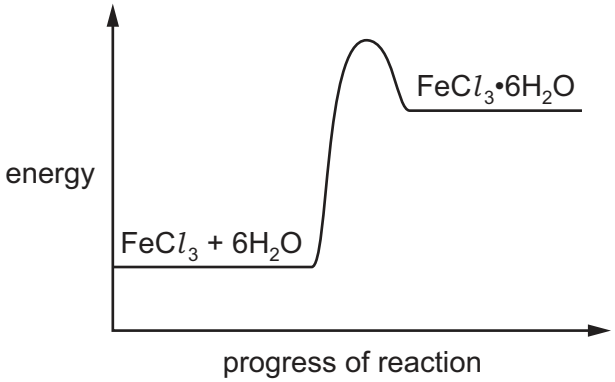
	fuel in a fuel cell	products formed
A	hydrogen	carbon dioxide and water
B	hydrogen	water only
C	petrol	carbon dioxide and water
D	petrol	water only

13 When water is added to anhydrous iron(III) chloride, $FeCl_3$, hydrated iron(III) chloride, $FeCl_3 \cdot 6H_2O$, is formed and energy is given out.

$$FeCl_3 + 6H_2O \rightleftharpoons FeCl_3 \cdot 6H_2O$$

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

A



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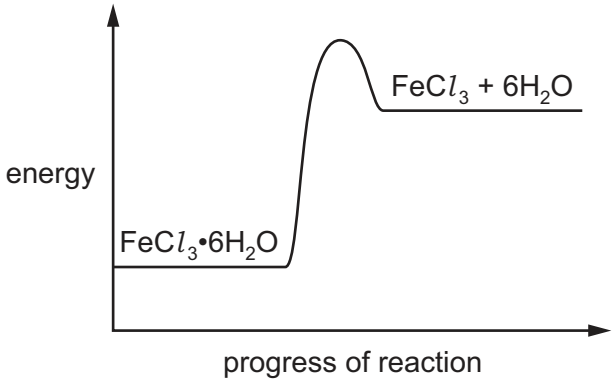
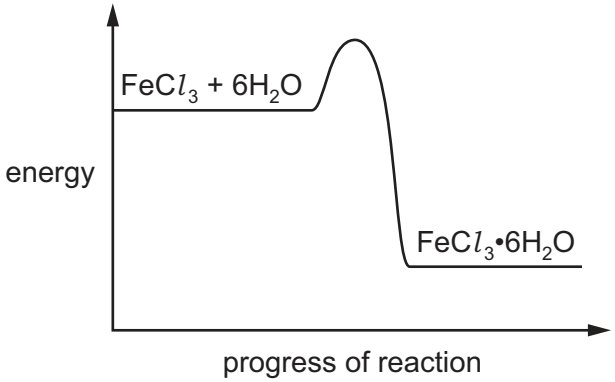


C



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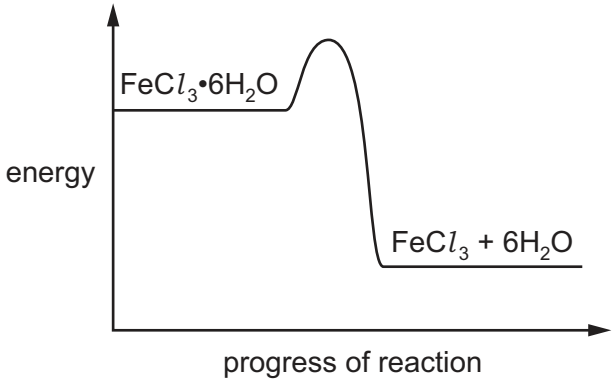


14 Which process is a chemical change?

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.

$$CH_3CH_2OH + 2CuO \rightarrow CH_3COOH + H_2O + 2Cu$$

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.

$$SiO_2 + 2C \rightarrow Si + 2CO$$

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

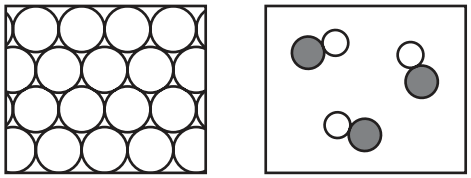
B low density

C resists corrosion

D shiny surface

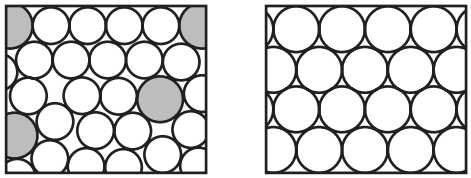
27 Which pair of diagrams represents both a pure metal and an alloy?

A



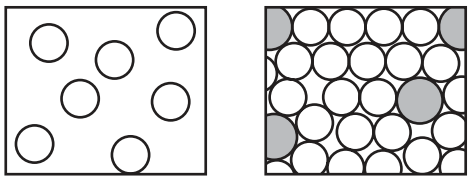
pure metal alloy

B



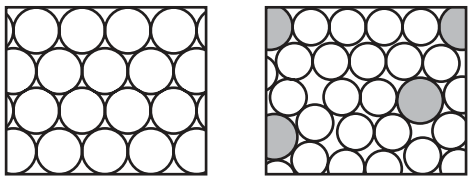
pure metal alloy

C



pure metal alloy

D



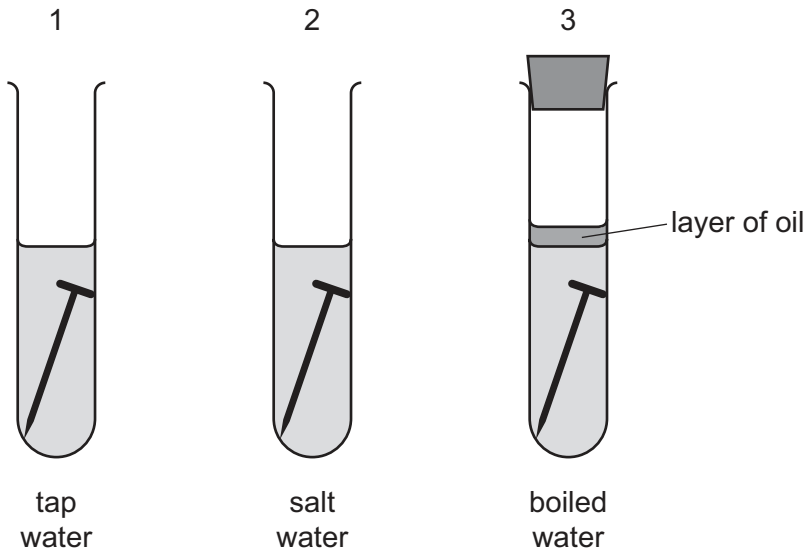
pure metal alloy

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

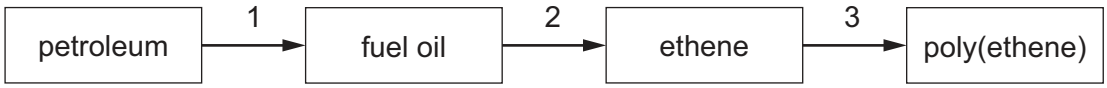
3 polymerisation

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.



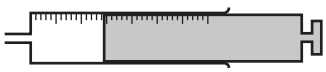
What are stages 1, 2 and 3?

	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?

1



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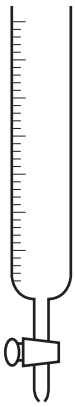
3



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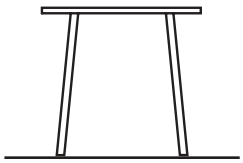
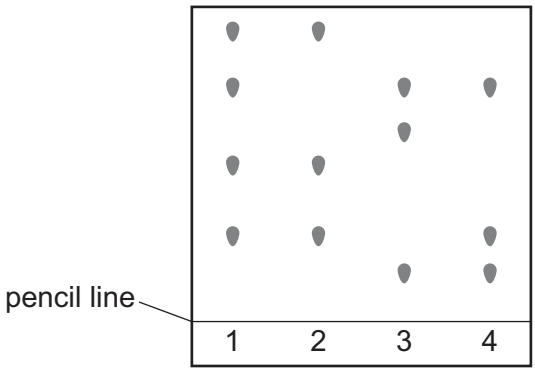


A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

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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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 –	113 Nh nihonium –	114 Fl flerovium –	115 Mc moscovium –	116 Lv livermorium –	117 Ts tennessine –	118 Og oganesson –

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.).