



Cambridge IGCSE™

CHEMISTRY**0620/13**

Paper 1 Multiple Choice (Core)

October/November 2020**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. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Blank pages are indicated.



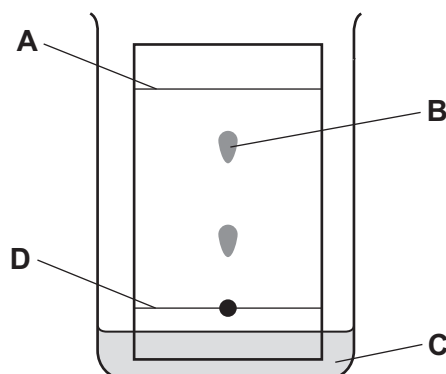
- 1 'The movement of a substance **very slowly** from an area of high concentration to an area of low concentration.'

Which process is being described?

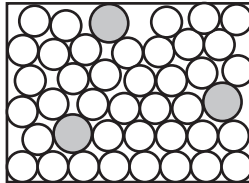
- A a liquid being frozen
 - B a solid melting
 - C a substance diffusing through a liquid
 - D a substance diffusing through the air
- 2 When a dark grey solid element is heated, it changes directly into a purple gas.

Which word describes this change?

- A boiling
 - B evaporation
 - C melting
 - D sublimation
- 3 Nickel(II) sulfate is a green solid that is soluble in water.
- Which method is used to obtain a pure sample of nickel(II) sulfate crystals from a mixture of nickel(II) sulfate and sand?
- A Heat the mixture with water and distil it to give nickel(II) sulfate.
 - B Heat the mixture with water and leave it to crystallise.
 - C Heat the mixture with water and filter off the nickel(II) sulfate.
 - D Heat the mixture with water, filter and allow the solution to crystallise.
- 4 In the chromatography experiment shown, which label represents the solvent front?



- 5 What is the meaning of the term *nucleon number*?
- A the number of neutrons in the nucleus of an atom
- B the number of protons in the nucleus of an atom
- C the total number of protons and electrons in the nucleus of an atom
- D the total number of protons and neutrons in the nucleus of an atom
- 6 The diagram represents the structure of a solid.



What could the solid be?

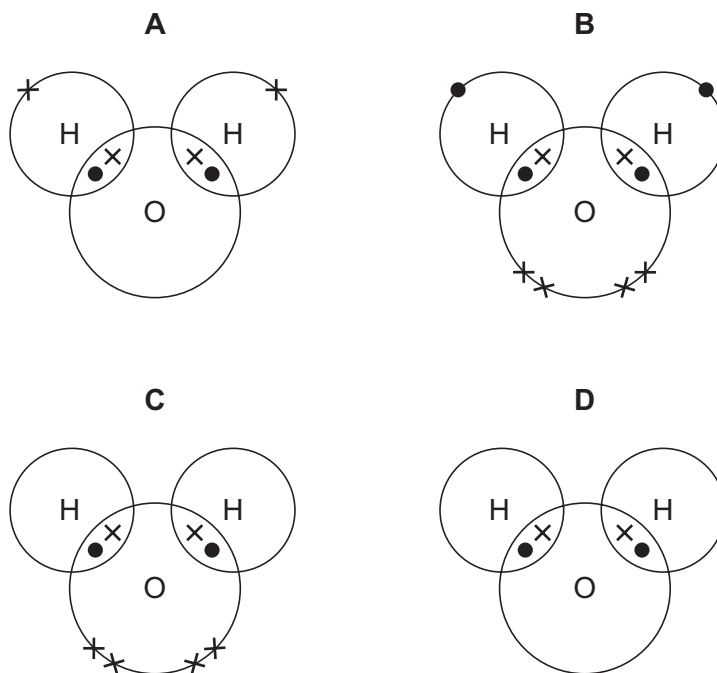
	brass	graphite	sodium chloride
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

- 7 Magnesium reacts with sulfuric acid.

What are the formulae of the products formed in this reaction?

- A MgSO_4 and H_2
- B MgSO_4 and H_2O
- C $\text{Mg}(\text{SO}_4)_2$ and H_2
- D $\text{Mg}(\text{SO}_4)_2$ and H_2O

8 Which diagram shows the arrangement of the outer shell electrons in a molecule of water?



9 Rubidium is in Group I of the Periodic Table and bromine is in Group VII.

Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

	electron change	formula of ion formed
A	electron gained	Rb ⁺
B	electron gained	Rb ⁻
C	electron lost	Rb ⁺
D	electron lost	Rb ⁻

10 Which statement explains why graphite is used as a lubricant?

- A** All bonds between the atoms are weak.
- B** It conducts electricity.
- C** It has a low melting point.
- D** Layers in the structure can slide over each other.

11 The relative atomic mass of chlorine is 35.5.

When calculating relative atomic mass, which particle is the mass of a chlorine atom compared to?

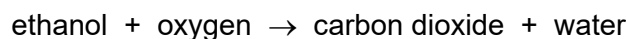
- A a neutron
- B a proton
- C an atom of carbon-12
- D an atom of hydrogen-1

12 Molten sodium chloride is electrolysed using inert electrodes.

Which row shows the products formed at the cathode and anode?

	cathode	anode
A	chlorine	hydrogen
B	chlorine	sodium
C	hydrogen	chlorine
D	sodium	chlorine

13 Ethanol is used as a fuel.



Which statements are correct?

- 1 The reaction is endothermic.
- 2 The products have more energy than the reactants.
- 3 The oxygen for this reaction comes from the air.
- 4 The temperature of the reaction mixture rises during this reaction.

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

14 Hydrogen and the isotope uranium-235 are both used to generate electricity.

Which term describes the change that occurs for **both** substances in this context?

- A combustion
- B endothermic
- C exothermic
- D decomposition

15 Which substance does **not** require oxygen in order to produce energy?

- A coal
- B hydrogen
- C natural gas
- D ^{235}U

16 When calcium carbonate reacts with dilute hydrochloric acid, carbon dioxide gas is given off.

This causes the reaction mixture to lose mass.

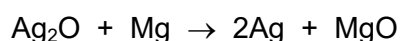
Four separate experiments are performed.

The starting mass, and the mass after five minutes, are measured for each reaction mixture.

In which experiment is carbon dioxide produced at the greatest rate?

	starting mass /g	mass after five minutes /g
A	14.37	11.89
B	16.52	15.29
C	16.76	14.12
D	16.99	15.21

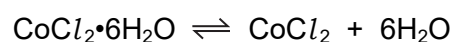
17 Silver oxide reacts with magnesium to make silver and magnesium oxide.



Which substance is oxidised in this reaction?

- A magnesium
- B magnesium oxide
- C silver
- D silver oxide

- 18 When pink crystals of cobalt(II) chloride are heated, steam is given off and the colour of the solid changes to blue.



What happens when water is added to the blue solid?

	colour	temperature
A	changes to pink	decreases
B	changes to pink	increases
C	remains blue	decreases
D	remains blue	increases

- 19 Which oxide is used to neutralise acidic gases in a power station?

- A** calcium oxide
- B** carbon dioxide
- C** nitrogen oxide
- D** sulfur dioxide

- 20 Period 3 of the Periodic Table contains the elements sodium to argon.

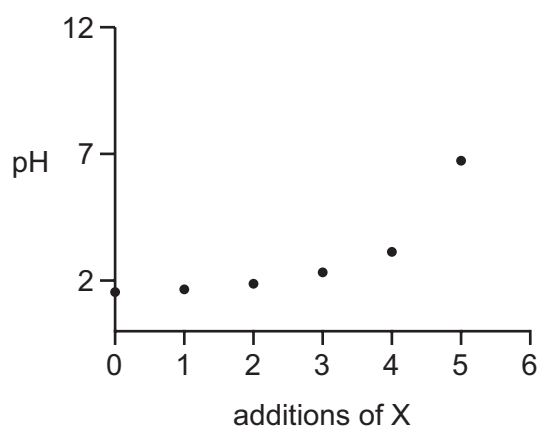
Element Q is a non-metal from this period.

Which statement about Q is correct?

- A** It conducts electricity.
- B** It has a lower proton number than sodium.
- C** It has electrons in only three shells.
- D** It is malleable.

21 Equal masses of a solid, X, are added in turn to an aqueous solution, Y.

The pH of the solution is measured after each addition until the pH becomes 7. The readings are plotted as shown.



What are X and Y?

	X	Y
A	Cu(s)	HCl(aq)
B	Mg(s)	HCl(aq)
C	NH ₄ Cl(s)	NaOH(aq)
D	Zn(OH) ₂ (s)	NaOH(aq)

22 An aqueous cation reacts with aqueous sodium hydroxide to form a white precipitate.

The precipitate is insoluble in excess sodium hydroxide.

What is the aqueous cation?

- A** aluminium ion
- B** calcium ion
- C** chromium ion
- D** zinc ion

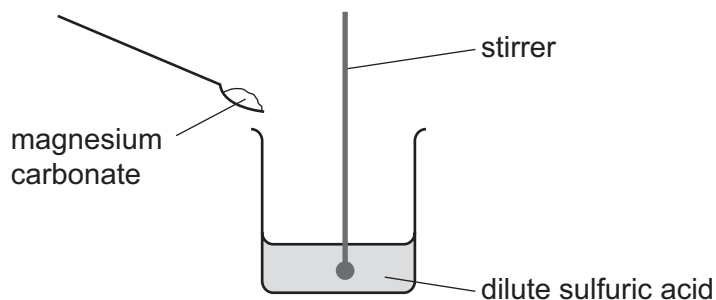
23 Vinegar has a pH of 3.

Which statement about vinegar is correct?

- A** It forms a salt with sulfuric acid.
- B** It reacts with some metals to form hydrogen gas.
- C** It reacts with ammonium compounds to give ammonia gas.
- D** It turns red litmus blue.

24 A student carries out an experiment to prepare pure magnesium sulfate crystals.

The diagram shows the first stage of the preparation.



He adds magnesium carbonate until no more reacts.

Which process should he use for the next stage?

- A crystallisation
 - B evaporation
 - C filtration
 - D neutralisation
- 25 Which statement about the halogens and their compounds is correct?
- A The colour of the element gets lighter going down Group VII.
 - B The elements get less dense going down Group VII.
 - C When chlorine is added to sodium iodide solution, iodine is formed.
 - D When iodine is added to sodium bromide solution, bromine is formed.
- 26 Which compound contains a transition metal ion and a halide ion?
- A aluminium iodide
 - B calcium fluoride
 - C iron(III) oxide
 - D nickel(II) chloride

27 A flammable gas needs to be removed from a tank at an industrial plant.

For safety reasons, an inert gas is used.

Which gas is suitable?

- A argon
- B hydrogen
- C methane
- D oxygen

28 A substance, X, has the following properties.

- 1 It has a high melting point.
- 2 It conducts electricity in the solid and liquid states.
- 3 It is malleable.
- 4 It has a high density.

What is X?

- A a ceramic
- B copper
- C graphite
- D sodium chloride

29 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

30 Mild steel and stainless steel are two alloys containing the element iron.

Which row identifies a use of each alloy?

	a use of mild steel	a use of stainless steel
A	car bodies	cutlery
B	car bodies	electrical wiring
C	food containers	cutlery
D	food containers	electrical wiring

31 Coke (carbon) and limestone are two raw materials used in the extraction of iron from hematite.

Which type of reaction occurs when each substance is heated during the process?

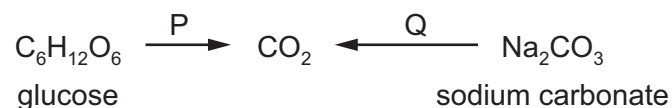
	coke	limestone
A	redox	redox
B	redox	thermal decomposition
C	thermal decomposition	redox
D	thermal decomposition	thermal decomposition

32 Oxides of nitrogen are given out from car exhausts.

Which row best shows why oxides of nitrogen are unwanted in the atmosphere?

	acidic	toxic
A	no	no
B	no	yes
C	yes	no
D	yes	yes

33 Two reactions, P and Q, produce carbon dioxide.



Which types of reaction are P and Q?

	P	Q
A	neutralisation	neutralisation
B	neutralisation	respiration
C	respiration	neutralisation
D	respiration	respiration

34 Which gas is used as a food preservative?

- A** methane
- B** fluorine
- C** oxygen
- D** sulfur dioxide

35 Which calcium compound does **not** neutralise an acid soil?

- A** calcium oxide
- B** calcium sulfate
- C** calcium hydroxide
- D** calcium carbonate

36 Petroleum is separated into fractions by fractional distillation.

Separation occurs in a fractionating column.

Some properties of three of these fractions are shown.

fraction	boiling point range / °C	number of carbon atoms in the molecules
1		5–10
2	320–350	16–24
3	120–210	

Which statement is correct?

- A Fraction 1 has a higher boiling point range than fraction 2.
- B Fraction 2 is removed from a higher point in the fractionating column than fraction 1.
- C Molecules in fraction 3 have shorter chains than those in fraction 2.
- D None of the fractions are liquid at room temperature.

37 How many atoms are there in one molecule of ethanoic acid?

- A 5
- B 6
- C 8
- D 11

38 The flow chart shows the preparation of ethanol and some important chemistry of ethanol.



What are X, Y and Z?

	X	Y	Z
A	yeast	combustion	oxygen
B	glucose	combustion	steam
C	glucose	polymerisation	water
D	yeast	fermentation	glucose

39 Which substance is **not** a fraction obtained from the fractional distillation of petroleum?

- A ethene
- B fuel oil
- C naphtha
- D refinery gas

40 Some plastics are non-biodegradable.

What is the meaning of the term *non-biodegradable*?

- A cannot be recycled for further use
- B gives off greenhouse gases when burnt
- C harmful to animals and plants
- D not broken down by natural processes

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The Periodic Table of Elements

		Group												
I	II	III	IV	V	VI	VII	VIII							
3 Li lithium 7	4 Be beryllium 9	11 Na sodium 23	12 Mg magnesium 24	19 K potassium 39	20 Ca calcium 40	37 Rb rubidium 85	55 Cs caesium 133	87 Fr francium —	1 H hydrogen 1	2 He helium 4				
57 La lanthanum 139	89 Ac actinium —	72 Hf hafnium 178	74 W tungsten 184	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 —
58 Ce cerium 140	90 Th thorium 232	73 Ta tantalum 181	75 Re rhenium 186	77 Co cobalt 59	78 Ni nickel 59	79 Cu copper 64	80 Zn zinc 65	81 Ga gallium 70	82 Ge germanium 73	83 As arsenic 75	84 Se selenium 79	85 Br bromine 80	86 Kr krypton 84	87 Xe xenon 131
59 Pr praseodymium 141	91 Pa protactinium 231	74 Zr zirconium 91	76 Ru ruthenium 101	77 Rh rhodium 103	78 Pd palladium 106	79 Ag silver 108	80 Cd cadmium 112	81 In indium 115	82 Sn tin 119	83 Sb antimony 122	84 Te tellurium 128	85 I iodine 127	86 Xe xenon 131	87 Rn radon —
60 Nd neodymium 144	92 U uranium 238	75 Nb niobium 93	77 Mo molybdenum 96	78 Tc technetium —	79 Ru ruthenium 101	80 Rh rhodium 103	81 Pd palladium 106	82 Ag silver 108	83 Cd cadmium 112	84 In indium 115	85 Sn tin 119	86 Sb antimony 122	87 Te tellurium 128	88 Po polonium —
61 Pm promethium —	93 Np neptunium —	76 Mo molybdenum 96	77 Tc technetium —	78 Ru ruthenium 101	79 Rh rhodium 103	80 Pd palladium 106	81 Ag silver 108	82 Cd cadmium 112	83 In indium 115	84 Sn tin 119	85 Sb antimony 122	86 Te tellurium 128	87 Po polonium —	88 At astatine —
62 Sm samarium 150	94 Pu plutonium —	77 Re rhenium 186	78 Os osmium 190	79 Ir iridium 192	80 Pt platinum 195	81 Au gold 197	82 Hg mercury 201	83 Tl thallium 204	84 Pb lead 207	85 Bi bismuth 209	86 Po polonium —	87 At astatine —	88 Rn radon —	89 Fr francium —
63 Eu europium 152	95 Am americium —	78 Os osmium 190	79 Ir iridium 192	80 Pt platinum 195	81 Au gold 197	82 Hg mercury 201	83 Tl thallium 204	84 Pb lead 207	85 Bi bismuth 209	86 Po polonium —	87 At astatine —	88 Rn radon —	89 Fr francium —	90 Ra radium —
64 Gd gadolinium 157	96 Cm curium —	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
65 Tb terbium 159	97 Bk berkelium —	80 Zn zinc 65	81 Ga gallium 70	82 Ge germanium 73	83 As arsenic 75	84 Se selenium 79	85 Br bromine 80	86 Kr krypton 84	87 Xe xenon 131	88 Po polonium —	89 Fr francium —	90 Ra radium —	91 Pa protactinium 231	92 U uranium 238
66 Dy dysprosium 163	98 Cf californium —	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 —
67 Ho holmium 165	99 Es einsteinium —	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 —
68 Er erbium 167	100 Fm fermium —	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 —
69 Tm thulium 169	101 Md mendelevium —	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 —
70 Yb ytterbium 173	102 No nobelium —	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 —
71 Lu lutetium 175	103 Lr lawrencium —	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 —

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).