Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/13**

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

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[Turn over

1 Descriptions of the three states of matter are shown.

	particle separation	particle arrangement	type of motion
1	small	random	move past each other at low speed
2	large	random	rapid motion in straight lines
3	small	regular	vibration

Which row is correct?

	1	2	3
A	gas	liquid	solid
B	liquid	solid	gas
C	liquid	gas	solid
D	solid	gas	liquid

2 Which piece of apparatus is used to measure 13.7 cm^3 of dilute hydrochloric acid?

A balance

B burette

C conical flask

D pipette

3 Ethanol can be made by fermentation of sugar, using yeast.

This produces a mixture of ethanol and water.

How is ethanol separated from this mixture?

A Filter the mixture.

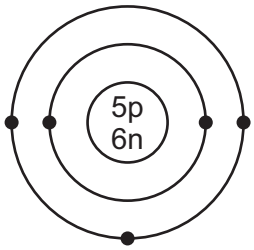
B Heat to evaporate the water.

C Heat to evaporate most of the water, and allow the ethanol to crystallise.

D Distil the mixture using a fractionating column.

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4 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

5 Which statement about the bonding in sodium chloride is correct?

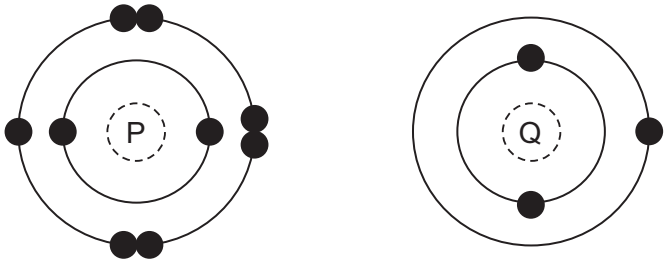
A Pairs of electrons are shared between the sodium and chlorine atoms.

B Chlorine atoms give electrons to sodium atoms to form positive and negative ions.

C There is covalent bonding between sodium and chlorine.

D The positive and negative ions have noble gas electronic structures.

6 The electronic structures of two atoms, P and Q, are shown.



P and Q combine together to form a compound.

What is the type of bonding in the compound and what is the formula of the compound?

	type of bonding	formula
A	ionic	PQ
B	ionic	PQ_2
C	covalent	PQ_2
D	covalent	PQ

7 Diamond and graphite are macromolecules.

Which statement is correct for **both** diamond and graphite?

A They act as lubricants.

B They conduct electricity.

C They have high melting points.

D They are very hard.

8 Aluminium oxide has the formula Al_2O_3.

Which statement about aluminium oxide is correct?

A 2 g of aluminium atoms are combined with 3 g of oxygen atoms.

B 2 g of aluminium atoms are combined with 3 g of oxygen molecules.

C Aluminium oxide has a relative formula mass of 102.

D Pure aluminium oxide contains a higher mass of oxygen than of aluminium.

9 Which statement about electrolysis is **not** correct?

A Bromine is produced at the cathode in the electrolysis of molten lead bromide.

B Electrolysis is the breakdown of a substance by electricity.

C Hydrogen is one of the products in the electrolysis of concentrated aqueous sodium chloride.

D Platinum is used as an inert electrode.

10 Which statements about ^{235}U are correct?

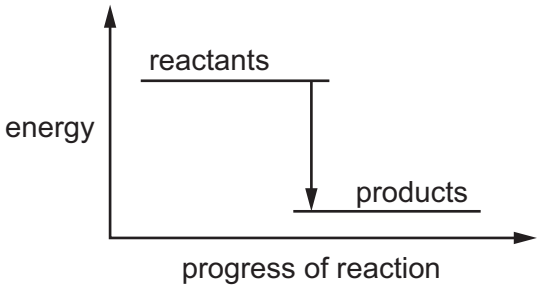
1 It is a radioactive isotope.

2 It burns in air to produce greenhouse gases.

3 It is used as an energy source.

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

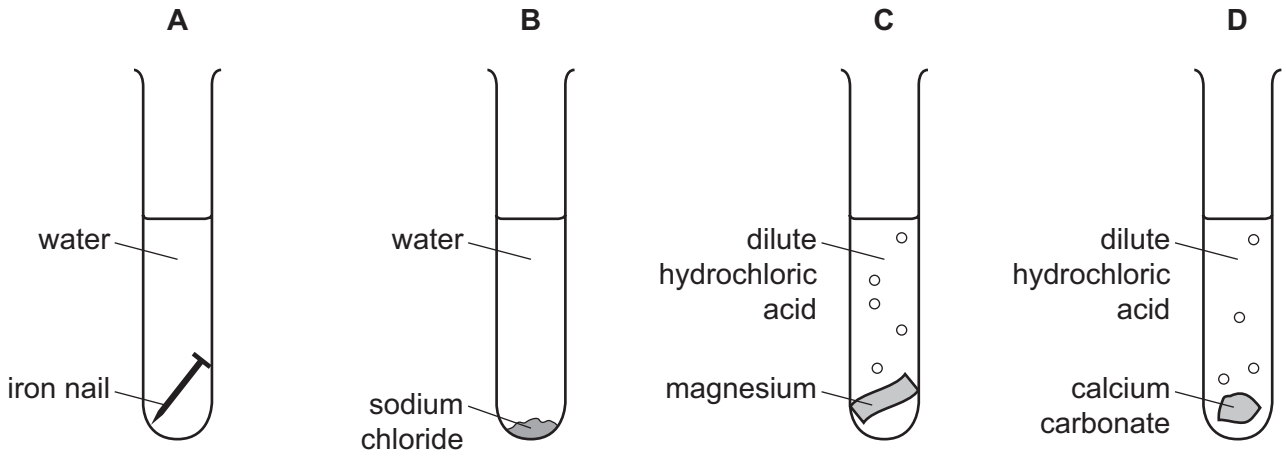
11 The energy level diagram shows the energy of the reactants and products in a chemical reaction.



Which row correctly describes the energy change and the type of reaction shown?

	description of energy change	type of reaction
A	energy is given out to the surroundings	endothermic
B	energy is given out to the surroundings	exothermic
C	energy is taken in from the surroundings	endothermic
D	energy is taken in from the surroundings	exothermic

12 In which tube is a physical change taking place?



13 Magnesium is reacted with dilute hydrochloric acid of the same concentration in four experiments using different conditions.

Which reaction finished in the shortest time?

A 2 g of magnesium powder in 50 cm^3 of dilute HCl at 45 °C

B 2 g of magnesium powder in 50 cm^3 of dilute HCl at 50 °C

C 2 g of magnesium ribbon in 50 cm^3 of dilute HCl at 45 °C

D 2 g of magnesium ribbon in 50 cm^3 of dilute HCl at 50 °C

14 Blue copper(II) sulfate crystals are heated in air until they turn into a white powder.

The powder is allowed to cool and after a few days it starts to turn blue.

Why does the white powder start to turn blue?

A Carbon dioxide in the air reacts with the powder to form copper(II) carbonate.

B The powder reacts with water in the air to form copper(II) hydroxide.

C The white copper compound is slowly oxidised.

D Water is absorbed from the air and causes the reaction to reverse.

15 Steam reacts with carbon to produce carbon monoxide and hydrogen.

$$C(s) + H_2O(g) \rightarrow CO(g) + H_2(g)$$

Which substance is reduced in the reaction?

A carbon

B carbon monoxide

C hydrogen

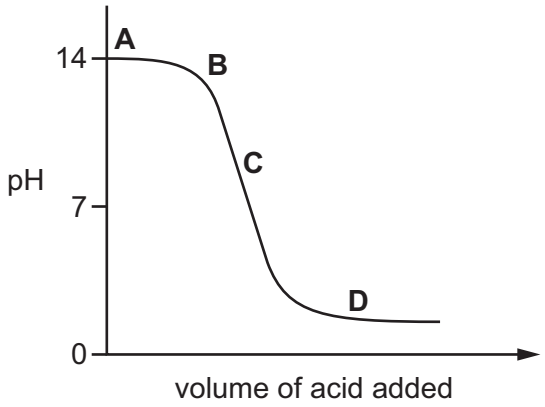
D water

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16 The graph shows how the pH of a solution changes as an acid is added to an alkali.

$$\text{acid} + \text{alkali} \rightarrow \text{salt} + \text{water}$$

Which letter represents the area of the graph where both acid and salt are present?

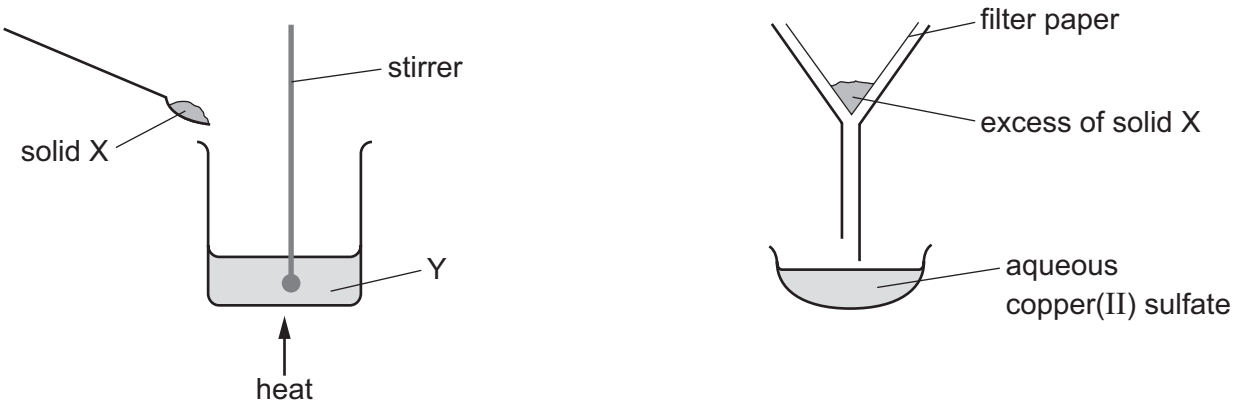


17 Element E is in Group II of the Periodic Table.

Which row describes element E and its oxide?

	element E	oxide of E
A	metal	acidic
B	metal	basic
C	non-metal	acidic
D	non-metal	basic

18 The apparatus shown is used to prepare aqueous copper(II) sulfate.



What are X and Y?

	X	Y
A	copper	aqueous iron(II) sulfate
B	copper(II) chloride	dilute sulfuric acid
C	copper(II) oxide	dilute sulfuric acid
D	sulfur	aqueous copper(II) chloride

19 Four different colourless solutions are each tested separately with aqueous sodium hydroxide and with acidified silver nitrate.

Which solution is sodium chloride?

	aqueous sodium hydroxide	acidified silver nitrate
A	no visible reaction	white precipitate
B	no visible reaction	no visible reaction
C	white precipitate	no visible reaction
D	white precipitate	white precipitate

20 Which statement about elements in Period 3 of the Periodic Table is correct?

A Aluminium is a non-metal in Group III.

B Argon is in Group VIII and has eight electrons in its outer shell.

C Magnesium is in Group II and has three electrons in its outer shell.

D Sulfur is a metal in Group VI.

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21 The elements in Group I include lithium, sodium and potassium.

Which statements about these elements are correct?

1 Sodium is denser than lithium.

2 Lithium has a lower melting point than potassium.

3 Potassium is a relatively soft metal.

4 Sodium is less reactive than lithium but more reactive than potassium.

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

22 The properties of the element titanium, Ti, can be predicted from its position in the Periodic Table.

Which row identifies the properties of titanium?

	can be used as a catalyst	conducts electricity when solid	has low density	forms coloured compounds
A	✓	✓	✓	✗
B	✓	✓	✗	✓
C	✓	✗	✓	✓
D	✗	✓	✓	✓

23 Which statement about the noble gases is correct?

A Argon is used in light bulbs and balloons.

B Helium reacts with oxygen in the air.

C They all have full outer electron shells.

D They are all diatomic molecules.

24 Which property is shown by **all** metals?

A They are extracted from their ores by heating with carbon.

B They conduct electricity.

C They form acidic oxides.

D They react with hydrochloric acid to form hydrogen.

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25 P, Q, R and S are metals.

P reacts with dilute hydrochloric acid forming hydrogen.

Q reacts violently with water.

R reacts with water to give hydrogen.

S is formed by heating its oxide with carbon

Which row identifies the metals?

	P	Q	R	S
A	copper	sodium	potassium	iron
B	zinc	magnesium	calcium	iron
C	zinc	sodium	calcium	magnesium
D	iron	potassium	sodium	zinc

26 Molten iron from the blast furnace contains impurities.

The process of turning the impure iron into steel involves blowing oxygen into the molten iron and adding calcium oxide.

What are the reasons for blowing in oxygen and adding calcium oxide?

	blowing in oxygen	adding calcium oxide
A	carbon is removed by reacting with oxygen	reacts with acidic impurities making slag
B	carbon is removed by reacting with oxygen	reacts with slag and so removes it
C	iron reacts with the oxygen	reacts with acidic impurities making slag
D	iron reacts with the oxygen	reacts with slag and so removes it

27 Why is stainless steel used to make cutlery?

A It does not corrode.

B It has a low density.

C It is a good conductor of electricity.

D It is a good conductor of heat.

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28 Which substances can be used to detect the presence of water?

1 cobalt(II) chloride

2 copper(II) sulfate

3 litmus

4 methyl orange

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

29 Which two compounds are formed by the burning of fossil fuels and are atmospheric pollutants?

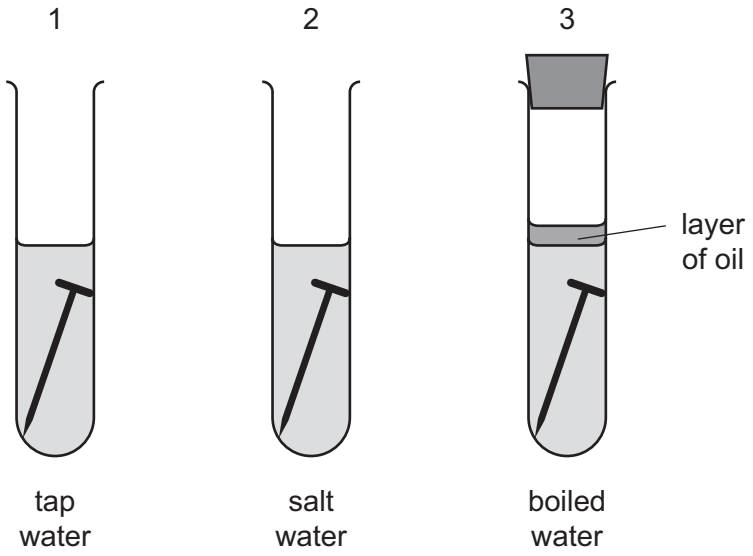
A carbon dioxide and hydrogen chloride

B carbon monoxide and sulfur dioxide

C oxides of nitrogen and water

D oxides of nitrogen and ammonia

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



In which test-tubes do the nails rust?

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

31 A farmer knows his soil needs phosphorus and potassium.

He has a choice of four fertilisers.

1 NH_4NO_3

2 $(NH_4)_3PO_4$

3 KNO_3

4 $(NH_2)_2CO$

Which fertilisers should he use?

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

32 Which process is a source of methane?

A respiration

B combustion of ethanol

C decomposition of calcium carbonate

D decomposition of vegetation

33 The list shows four methods that were suggested for the formation of carbon dioxide.

1 cracking methane using steam

2 action of heat on a carbonate

3 complete combustion of methane

4 reaction of a carbonate with oxygen

Which methods would result in the production of carbon dioxide?

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

34 A student suggests three uses of calcium carbonate (limestone).

1 manufacture of cement

2 manufacture of iron

3 treating alkaline soils

Which suggestions are correct?

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

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35 Which list shows the fractions obtained from distilling petroleum, in order of increasing boiling point?

A bitumen → diesel oil → fuel oil → lubricating oil

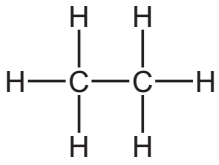
B diesel oil → gasoline → naphtha → kerosene

C gasoline → naphtha → kerosene → diesel oil

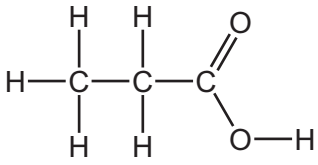
D kerosene → lubricating oil → naphtha → refinery gas

36 Which structure represents a compound in the alcohol homologous series?

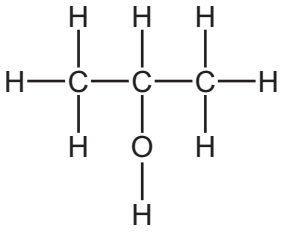
A



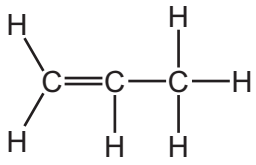
B



C



D



37 Increasing the number of atoms in one molecule of a hydrocarbon increases the amount of energy released when it burns.

What is the correct order?

	less energy released	⟶	more energy released
A	ethene	ethane	methane
B	ethene	methane	ethane
C	methane	ethane	ethene
D	methane	ethene	ethane

38 Compound X has the molecular formula C_2H_6O.

Which statement about compound X is correct?

A X is unsaturated.

B X is a carboxylic acid.

C X is formed by the reaction of ethane with steam.

D X is used as a fuel.

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39 A small quantity of a solid chemical is added to a large excess of aqueous ethanoic acid.

No bubbles of gas are seen and the solid dissolves to give a colourless solution.

What was the solid chemical?

A calcium hydroxide

B copper(II) oxide

C magnesium

D sodium carbonate

40 Which statement about carbohydrates and proteins is correct?

A Carbohydrates and proteins are constituents of food.

B Carbohydrates and proteins are natural polymers used to make larger molecules called monomers.

C Carbohydrates and proteins are synthetic polymers.

D Carbohydrates and proteins cause pollution as they are non-biodegradable.

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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.).