



Cambridge IGCSE™

CHEMISTRY

0620/12

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

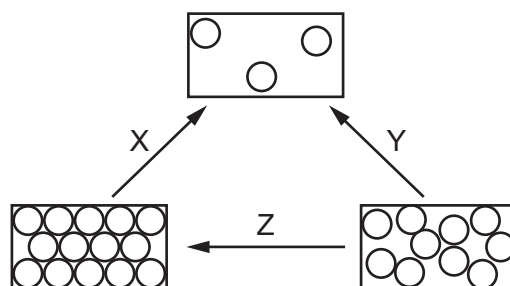
- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

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



1 Each rectangle shows the arrangement of particles in each of the three states of matter.

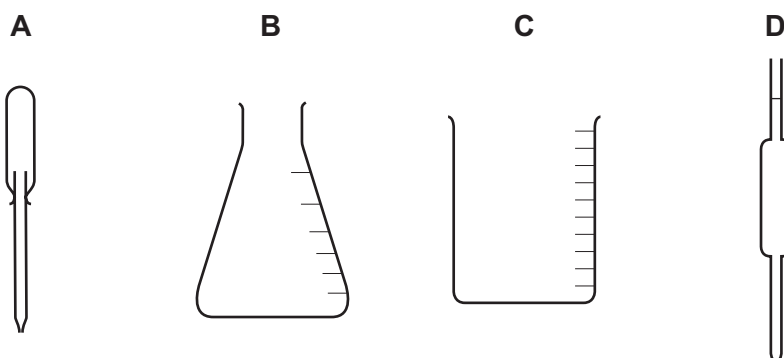
X, Y and Z represent the processes needed to change from one state to another.



What are the processes X, Y and Z?

	X	Y	Z
A	evaporating	subliming	condensing
B	evaporating	subliming	freezing
C	subliming	evaporating	condensing
D	subliming	evaporating	freezing

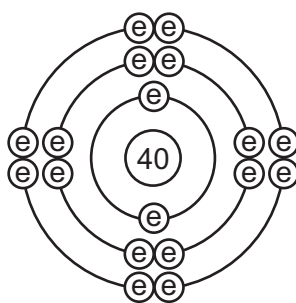
2 Which piece of apparatus is used to measure 25.0 cm^3 of aqueous sodium hydroxide?



3 Which process is used to produce drinking water from sea water?

- A** crystallisation
- B** distillation
- C** filtration
- D** chlorination

- 4 The diagram shows the electronic structure of a particle with a nucleon number (mass number) of 40.

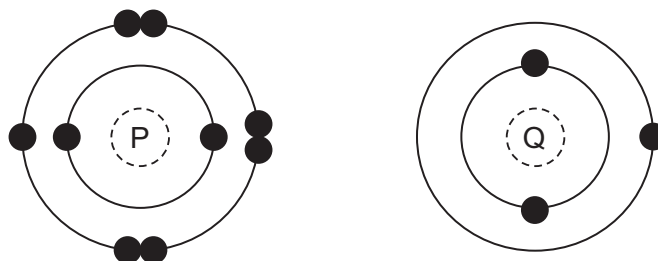


The table shows the suggestions that three students, 1, 2 and 3, made to identify the particle.

	student		
	1	2	3
particle	Ar	Cl	Ca ²⁺

Which students are correct?

- A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3
- 5 The Group I element sodium forms an ionic bond with the Group VII element fluorine.
- Which two ions are produced?
- A** Na⁺ and F⁺ **B** Na⁺ and F⁻ **C** Na⁻ and F⁻ **D** Na⁻ and F⁺
- 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 Graphite is a macromolecule.

Which statements about graphite are correct?

- 1 Carbon atoms form four covalent bonds with neighbouring atoms.
- 2 There are free electrons between layers of carbon atoms.
- 3 Graphite is a useful lubricant.
- 4 Graphite is a good conductor of electricity.

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

8 Aluminium oxide has the formula Al_2O_3 .

Which statement about aluminium oxide is correct?

- A** 2g of aluminium atoms are combined with 3g of oxygen atoms.
B 2g of aluminium atoms are combined with 3g 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 Dilute sulfuric acid is electrolysed using carbon electrodes.

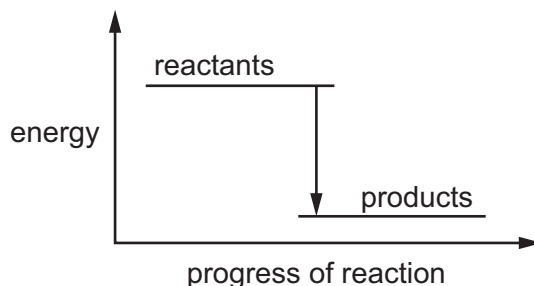
Which row shows the products formed at each electrode?

	anode	cathode
A	hydrogen	oxygen
B	hydrogen	sulfur
C	oxygen	hydrogen
D	oxygen	sulfur

10 Which fuel does **not** rely on combustion to release energy?

- A** gasoline
B hydrogen
C methane
D uranium

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 Which list contains **only** chemical changes?

- A** melting, evaporating, dissolving
- B** rusting, freezing, subliming
- C** neutralisation, polymerisation, combustion
- D** boiling, condensing, distillation

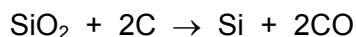
13 Which row shows the changes that **all** increase the rate of a chemical reaction?

	concentration of reactants	temperature	particle size
A	decrease	decrease	decrease
B	decrease	increase	increase
C	increase	decrease	increase
D	increase	increase	decrease

14 Which reaction is reversible?

- A an iron nail rusting when left in moist air
- B limestone reacting with an acid to form carbon dioxide gas
- C magnesium burning in air to produce a white ash
- D white anhydrous copper(II) sulfate turning blue when water is added

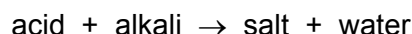
15 When heated strongly, silicon(IV) oxide reacts with carbon.



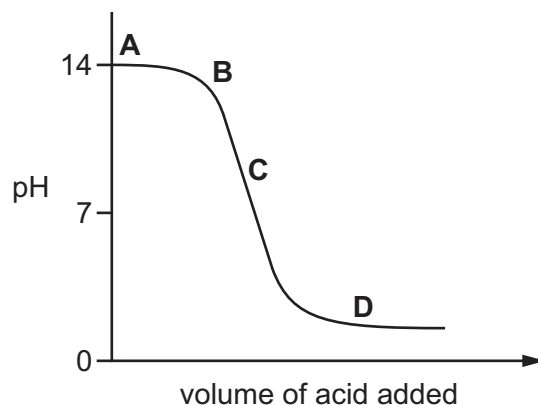
Which term describes what happens to silicon(IV) oxide?

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

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



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

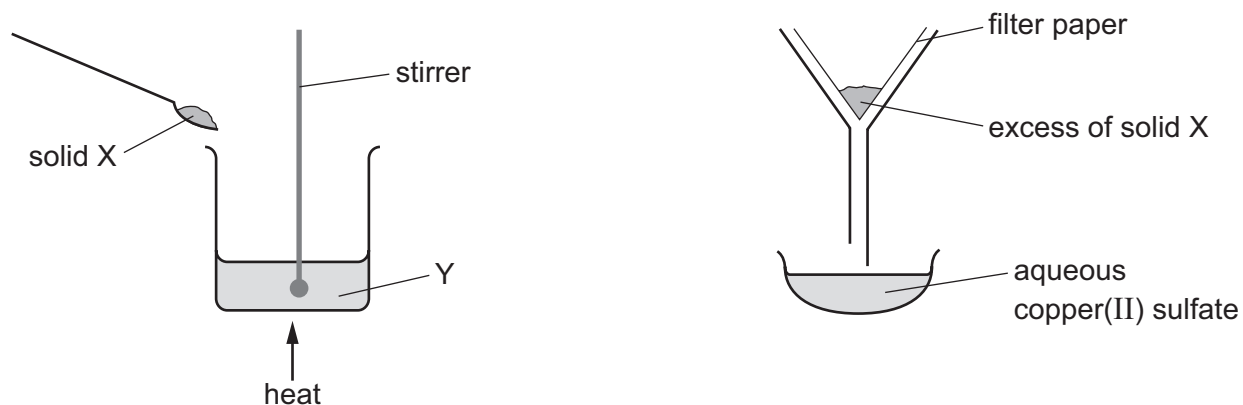


17 Element G is a metal in Group I of the Periodic Table and element H is a non-metal in Group VII. Both of these elements form oxides.

Which statement about their oxides is correct?

- A Both oxides are acidic.
- B Both oxides are basic.
- C The oxide of G is acidic and the oxide of H is basic.
- D The oxide of H is acidic and the oxide of G is 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 An aqueous solution of a compound M is tested.

The results are shown.

- It gave a lilac colour in a flame test.
- It produced a white precipitate when tested with acidified barium nitrate.

What is M?

- A** copper(II) chloride
- B** copper(II) sulfate
- C** potassium carbonate
- D** potassium sulfate

- 20 The character of the elements and charges on the ions of the elements change across the Periodic Table.

Which row describes the elements on the left of the table and the elements on the right?

	elements on the left		elements on the right	
	character	charge on ion	character	charge on ion
A	metallic	positive	non-metallic	negative
B	metallic	negative	non-metallic	positive
C	non-metallic	positive	metallic	negative
D	non-metallic	negative	metallic	positive

- 21 Which statement about Group I and Group VII elements is correct?

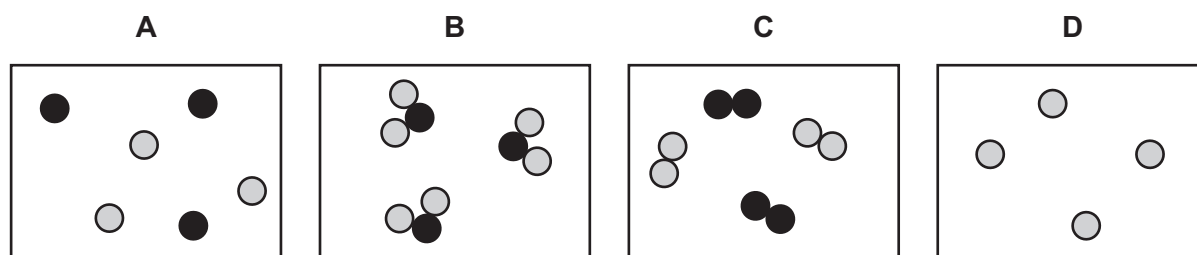
- A** Group VII elements are monoatomic non-metals.
- B** Lithium is more reactive with water than caesium.
- C** The melting points of Group I metals increase down the group.
- D** Potassium bromide reacts with chlorine to produce an orange solution.

- 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 diagram shows a mixture of noble gases?



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.

25 The reactions of four metals, W, X, Y and Z, are shown.

metal	observations
W	reacts with steam and hydrochloric acid but not cold water
X	reacts with hydrochloric acid but not with steam or cold water
Y	reacts with hydrochloric acid and cold water
Z	does not react with hydrochloric acid

What is the order of reactivity for metals W, X, Y and Z?

	most reactive	→		least reactive
A	Y	W	X	Z
B	Y	X	W	Z
C	Z	W	X	Y
D	Z	X	W	Y

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 Which statement about mild steel explains why it is a good choice for car bodies?

- A It is cheap and strong.
- B It is a good conductor.
- C It is low density.
- D It resists rusting.

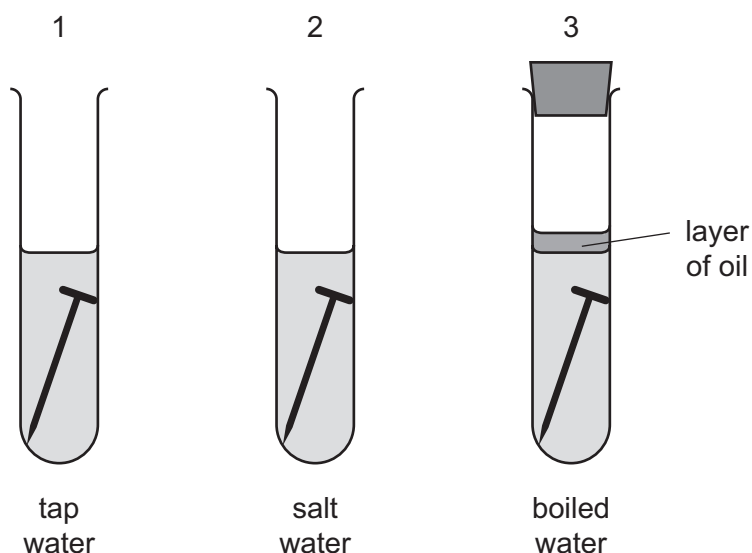
28 Which statement about pure water is **not** correct?

- A It condenses at 100 °C.
- B It freezes at 0 °C.
- C It turns cobalt(II) chloride paper blue.
- D It turns anhydrous copper(II) sulfate blue.

29 Which compounds **both** contribute to 'acid rain'?

- A carbon monoxide and lead compounds
- B carbon monoxide and oxides of nitrogen
- C oxides of nitrogen and sulfur dioxide
- D sulfur dioxide and lead compounds

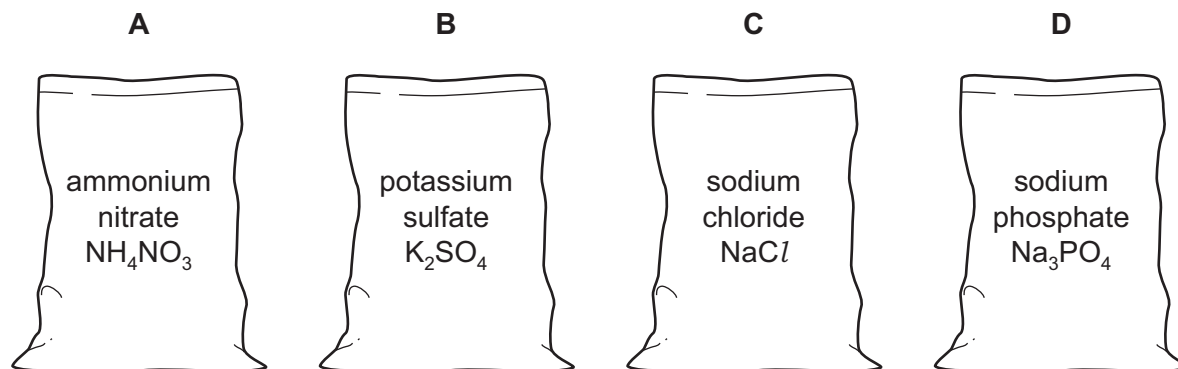
30 The diagrams show experiments to investigate rusting of iron nails.



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 Which bag is **not** suitable for use as a fertiliser?



32 X is a colourless greenhouse gas.

It is a waste product from digestion in animals.

It is generally unreactive, but it can be burnt.

What is X?

- A** carbon dioxide
- B** methane
- C** nitrogen
- D** sulfur dioxide

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).

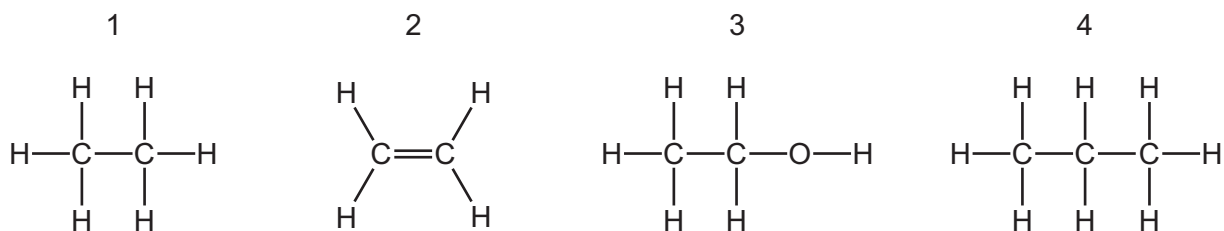
- 1 manufacture of cement
- 2 manufacture of iron
- 3 treating alkaline soils

Which suggestions are correct?

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

- 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 The structures of four compounds are shown.



Which compounds are members of the same homologous series?

- A** 1 and 2 only **B** 1 and 4 **C** 1, 2 and 3 **D** 2 and 4
- 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 Which statement about alcohols is correct?

- A** Alcohols and carboxylic acids have the same functional group.
B Ethanoic acid is produced from the reduction of ethanol.
C Ethanol is produced in an addition reaction between ethene and hydrogen.
D Water is produced from the combustion of alcohols.

39 An organic compound, P, reacts with zinc to produce a gas, Q.

What are P and Q?

	P	Q
A	ethanoic acid	carbon dioxide
B	ethanoic acid	hydrogen
C	ethanol	carbon dioxide
D	ethanol	hydrogen

40 Which substances are natural polymers?

- 1 proteins
- 2 carbohydrates
- 3 nylon
- 4 poly(ethene)

A 1 and 2

B 1 and 3

C 2 and 3

D 3 and 4

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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	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	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					
39 K potassium 39	40 Ca calcium 40	37 Rb rubidium 85	55 Cs caesium 133	87 Fr francium —	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	54 Xe xenon 131	86 Rn radon —						
57 La lanthanum 139	89 Ac actinium —	58 Ce cerium 140	90 Th thorium 232	59 Pr praseodymium 141	91 Pa protactinium 231	60 Nd neodymium 144	92 U uranium 238	61 Pm promethium —	62 Sm samarium 150	94 Pu plutonium —	63 Eu europium 152	95 Am americium —	64 Gd gadolinium 157	96 Cm curium —	65 Tb terbium 159	97 Bk berkelium —	66 Dy dysprosium 163	98 Cf californium —	67 Ho holmium 165	99 Es einsteinium —	68 Er erbium 167	100 Fm fermium —	69 Tm thulium 169	101 Md mendelevium —	70 Yb ytterbium 173	102 No nobelium —	71 Lu lutetium 175	103 Lr lawrencium —
57 La lanthanoids	89-103 Ac actinoids	58 Ce	90 Th	59 Pr	91 Pa	60 Nd	92 U	61 Pm	62 Sm	94 Pu	63 Eu	95 Am	64 Gd	96 Cm	65 Tb	97 Bk	66 Dy	98 Cf	67 Ho	99 Es	68 Er	100 Fm	69 Tm	101 Md	70 Yb	102 No	71 Lu	103 Lr

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.).