



Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY

Paper 1 Multiple Choice (Core)

0620/13

October/November 2019

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **14** printed pages and **2** blank pages.



- 1 The diagram shows a cup of hot tea.



Which row describes the water particles in the air above the cup compared with the water particles in the cup?

	moving faster	closer together
A	✓	x
B	✓	✓
C	x	x
D	x	✓

- 2 A student is asked to measure the time taken for 0.4 g of magnesium carbonate to react completely with 25.0 cm³ of dilute hydrochloric acid.

Which pieces of apparatus does the student need?

- A** balance, stop-clock, pipette
B balance, stop-clock, thermometer
C balance, pipette, thermometer
D stop-clock, pipette, thermometer
- 3 Which method is used to separate a mixture of the following liquids?

liquid	boiling point/°C
methanol	64.5
ethanol	78.5
propan-1-ol	97.2
butan-1-ol	117.0

- A** crystallisation
B evaporation
C filtration
D fractional distillation

- 4 A sample of wax is heated. It begins to melt at 45 °C and finishes melting at 49 °C.

A sample of liquid is heated. It begins to boil at 141 °C and remains at 141 °C while it boils.

Which conclusion can be made from these results?

- A** Both substances are impure.
B Both substances are pure.
C The wax is not a pure substance and the liquid is a pure substance.
D The wax is a pure substance and the liquid is not a pure substance.
- 5 In which molecule are all the outer shell electrons involved in covalent bonding?
- A** Cl_2 **B** CH_4 **C** HCl **D** NH_3
- 6 The numbers of protons, neutrons and electrons present in the atoms P, Q, R and S are shown.

atom	number of protons	number of neutrons	number of electrons
P	4	5	4
Q	5	6	5
R	6	6	6
S	6	7	6

Which atoms are isotopes of the same element?

- A** P and Q only **B** Q and R only **C** R and S only **D** P and S only
- 7 What is an alloy?
- A** a compound of two metallic elements
B a compound of metallic and non-metallic elements
C a mixture of a metal and at least one other element
D a pure metal element
- 8 Graphite is a form of carbon.

Why can graphite be used as a lubricant?

- A** Graphite contains unbonded electrons which move through the structure.
B Graphite contains weak covalent bonds so the atoms move easily.
C Graphite has a low melting point so it easily turns into a liquid.
D Graphite has weak attractive forces between layers so they can move.

- 9 The thermal decomposition of 12.5 g of limestone (impure calcium carbonate) produces 5 g of calcium oxide.

Which mass of calcium oxide is produced by the thermal decomposition of 30 g of limestone?

- A** 6 g **B** 12 g **C** 15 g **D** 24 g

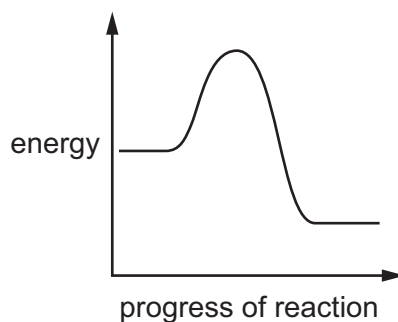
- 10 Dilute sulfuric acid and lead(II) bromide are separately electrolysed.

Which statements are correct?

- 1 Colourless gases are evolved when dilute sulfuric acid is electrolysed.
- 2 Lead(II) bromide can be electrolysed when molten.
- 3 Lead is formed at the positive electrode when lead(II) bromide is electrolysed.
- 4 Sulfate ions are produced at the negative electrode when dilute sulfuric acid is electrolysed.

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

- 11 An energy level diagram for a reaction is shown.



Which statement and explanation about this reaction are correct?

	statement	explanation
A	the reaction is endothermic	the products have more energy than the reactants
B	the reaction is endothermic	the products have less energy than the reactants
C	the reaction is exothermic	the products have more energy than the reactants
D	the reaction is exothermic	the products have less energy than the reactants

12 Hydrated cobalt(II) chloride decomposes when heated.



Which statements about this reaction are correct?

- 1 CoCl_2 is anhydrous cobalt(II) chloride.
- 2 Heat is released when water is added to CoCl_2 .
- 3 $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ is blue.
- 4 The reaction is not reversible.

A 1 and 2

B 1 and 3

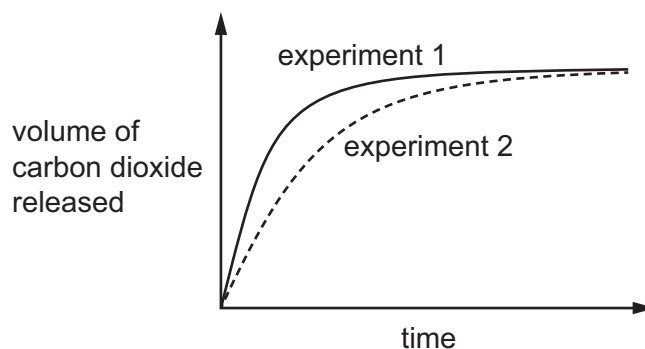
C 2 and 4

D 3 and 4

13 In experiment 1, small lumps of limestone are added to dilute hydrochloric acid at 40 °C.

The volume of carbon dioxide released is measured at regular time intervals.

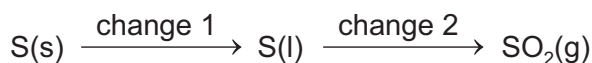
The results are shown.



Which changes give the results shown in experiment 2?

	limestone	temperature / °C
A	large lumps	40
B	powder	40
C	powder	60
D	small lumps	60

14 A sequence of changes involving sulfur is shown.



Which row describes the changes?

	change 1	change 2
A	chemical	chemical
B	chemical	physical
C	physical	chemical
D	physical	physical

15 In which equation is the iron oxidised?

- A** $\text{C} + \text{FeO} \rightarrow \text{CO} + \text{Fe}$
B $3\text{CO} + \text{Fe}_2\text{O}_3 \rightarrow 3\text{CO}_2 + 2\text{Fe}$
C $\text{Fe}_2\text{O}_3 + \text{H}_2 \rightarrow 2\text{FeO} + \text{H}_2\text{O}$
D $\text{PbO} + \text{Fe} \rightarrow \text{Pb} + \text{FeO}$

16 Which statements about dilute sulfuric acid are correct?

- 1 It turns red litmus paper blue.
- 2 It reacts with magnesium(II) oxide to form magnesium(II) sulfate and water.
- 3 It reacts with magnesium to form magnesium(II) sulfate and carbon dioxide.
- 4 Its pH is below pH 7.

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

17 X is a white powder. The following tests are done on X.

- No precipitate is seen when a few drops of aqueous sodium hydroxide are added to a solution of X.
- No gas is formed when X is heated with aqueous sodium hydroxide.
- X gives a lilac colour when put into a flame.
- When acidified aqueous silver nitrate is added to a solution of X a yellow precipitate is seen.

What is X?

- A** ammonium bromide
B ammonium iodide
C potassium bromide
D potassium iodide

18 Which three oxides are all acidic?

- A** CaO, NO₂, SO₂
B CaO, CO₂, Na₂O
C CO₂, NO₂, SO₂
D CO₂, Na₂O, SO₂

19 A method used to make copper(II) sulfate crystals is shown.

- 1 Place dilute sulfuric acid in a beaker.
- 2 Warm the acid.
- 3 Add copper(II) oxide until it is in excess.
- 4 Filter the mixture.
- 5 Evaporate the filtrate until crystals start to form.
- 6 Leave the filtrate to cool.

What are the purposes of step 3 and step 4?

	step 3	step 4
A	to ensure all of the acid has reacted	to obtain solid copper(II) sulfate
B	to ensure all of the acid has reacted	to remove the excess of copper(II) oxide
C	to speed up the reaction	to obtain solid copper(II) sulfate
D	to speed up the reaction	to remove the excess of copper(II) oxide

- 20 Which element from Period 3 of the Periodic Table has the most metallic character?
- A aluminium
 - B magnesium
 - C silicon
 - D sodium
- 21 Which pair of elements reacts together most violently?
- A chlorine and lithium
 - B chlorine and potassium
 - C iodine and lithium
 - D iodine and potassium
- 22 Which statement does **not** describe a transition element?
- A It is used as a catalyst in industrial reactions.
 - B It has white compounds and gives a yellow flame test.
 - C It produces a black oxide and a blue sulfate.
 - D It forms green, violet and orange compounds.
- 23 Which statement describes a gas which is in Group VIII of the Periodic Table?
- A A colourless gas that helps substances burn.
 - B A pollutant gas present in car exhausts.
 - C A gas that is less dense than air and makes a 'pop' sound with a lighted splint.
 - D A gas that is used in lamps.
- 24 Some properties of substance X are listed.
- It conducts electricity when molten.
 - It has a high melting point.
 - It burns in oxygen and the oxide dissolves in water to give a solution with pH 11.

What is X?

- A a covalent compound
- B a macromolecule
- C a metal
- D an ionic compound

25 A metal reacts vigorously with water.

Which statement about the metal is correct?

- A It is above hydrogen in the reactivity series.
- B It is below magnesium in the reactivity series.
- C Its oxide can be reduced with carbon.
- D It does not react with dilute acids.

26 Iron is extracted from its ore in the blast furnace.

Which raw material is **not** used in this process?

- A bauxite
- B coke
- C hematite
- D limestone

27 Which statement about metals and their uses is correct?

- A Aluminium is used in the manufacture of aircraft because it has a high density.
- B Copper is used to make cooking utensils because it is a poor conductor of heat.
- C Mild steel is used to make car bodies because it is brittle and breaks easily.
- D Stainless steel is used to make cutlery because it is resistant to corrosion.

28 River water contains soluble impurities, insoluble impurities and bacteria.

River water is made safe to drink by filtration and chlorination.

Which statement is correct?

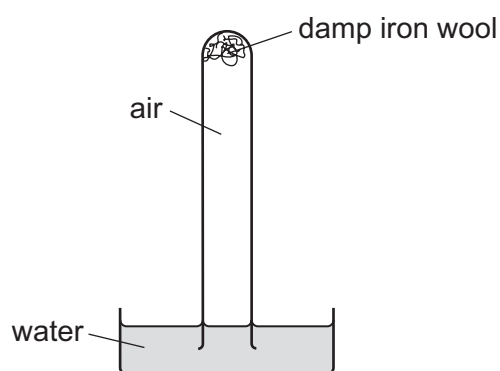
- A Filtration removes bacteria and insoluble impurities, and chlorination removes soluble impurities.
- B Filtration removes insoluble impurities, and chlorination kills the bacteria.
- C Filtration removes soluble and insoluble impurities, and chlorination kills the bacteria.
- D Filtration removes soluble impurities and bacteria, and chlorination removes insoluble impurities.

- 29** Clean, dry air contains nitrogen, oxygen and small amounts of other gases. The noble gases have been left out of the table.

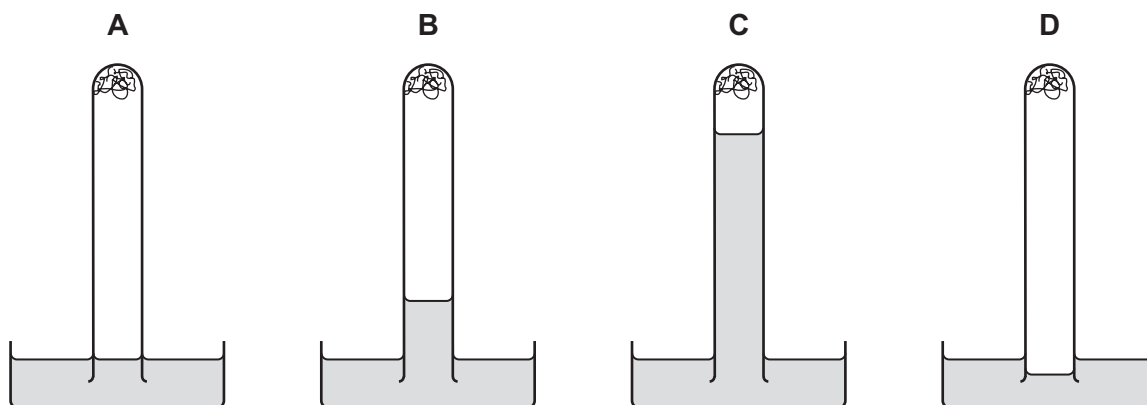
Which row shows the composition of clean, dry air?

	nitrogen / %	oxygen / %	other gases
A	21	78	small amount of carbon dioxide
B	21	78	small amount of carbon monoxide
C	78	21	small amount of carbon dioxide
D	78	21	small amount of carbon monoxide

- 30** The apparatus shown is set up and left for a week.



Which diagram shows the level of the water at the end of the week?



31 Farmers add calcium oxide (lime) and ammonium salts to their fields.

The compounds are not added at the same time because they react with each other.

Which gas is produced in this reaction?

- A** ammonia
- B** carbon dioxide
- C** hydrogen
- D** nitrogen

32 Which information about carbon dioxide and methane is correct?

		carbon dioxide	methane
A	formed when vegetation decomposes	✓	✗
B	greenhouse gas	✓	✓
C	present in unpolluted air	✗	✗
D	produced during respiration	✗	✓

key

✓ = true

✗ = false

33 What are uses of sulfur dioxide?

- 1 as a bleach in the manufacture of wood pulp
- 2 as a food preservative
- 3 in the conversion of iron to steel
- 4 in water treatment

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

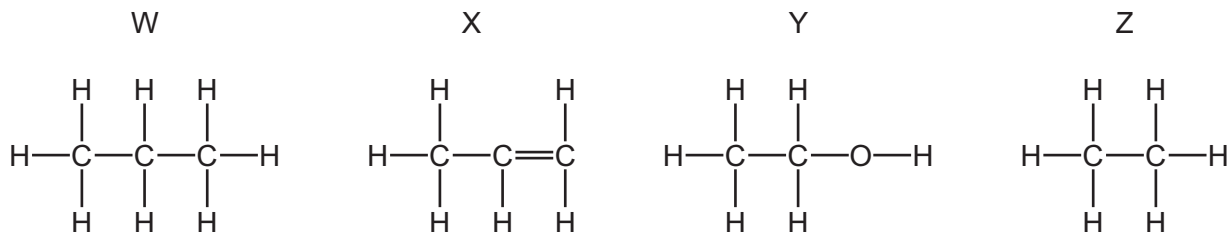
34 Which type of reaction occurs when lime is manufactured from limestone?

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

35 Which statement is correct?

- A** Bitumen is used as a fuel for ships.
- B** Coal, natural gas and oxygen are all fuels.
- C** Hydrogen is the main constituent of natural gas.
- D** Petroleum is separated into useful substances by fractional distillation.

36 The structures of four organic compounds, W, X, Y and Z, are shown.



Which compounds are members of the same homologous series?

- A** W and X **B** W and Z **C** X and Y **D** Y and Z

37 How many different types of bonds are present in ethanoic acid, CH_3COOH ?

	type of bond		
	C–H	C–C	C=O
A	3	1	1
B	3	0	2
C	4	0	2
D	4	1	2

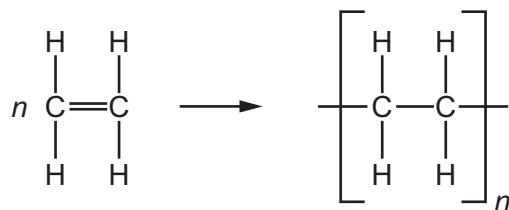
38 Which products are obtained by the cracking of an alkane?

	alkene	hydrogen	water
A	✓	✓	✓
B	✓	✓	x
C	✓	x	✓
D	x	✓	✓

39 Which statement about aqueous ethanoic acid is correct?

- A** It reacts with magnesium to form oxygen gas.
B It reacts with sodium carbonate to form carbon dioxide gas.
C It turns red litmus paper blue.
D It turns methyl orange yellow.

40 The diagram shows the structure of a monomer and of the polymer made from it.



What are the monomer and polymer?

	monomer	polymer
A	ethane	poly(ethane)
B	ethane	poly(ethene)
C	ethene	poly(ethane)
D	ethene	poly(ethene)

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The Periodic Table of Elements

Group																	
I	II	III										IV	V	VI	VII	VIII	
		1Hhydrogen1															
		Key atomic number atomic symbol name relative atomic mass															
3Li lithium 7	4Be beryllium 9											5B boron 11	6C carbon 12	7N nitrogen 14	8O oxygen 16	9F fluorine 19	10Ne neon 20
11Na sodium 23	12Mg magnesium 24											13Al aluminium 27	14Si silicon 28	15P phosphorus 31	16S sulfur 32	17Cl chlorine 35.5	18Ar argon 40
19K potassium 39	20Ca calcium 40	21Sc scandium 45	22Ti titanium 48	23V vanadium 51	24Cr chromium 52	25Mn manganese 55	26Fe iron 56	27Co cobalt 59	28Ni nickel 59	29Cu copper 64	30Zn zinc 65	31Ga gallium 70	32Ge germanium 73	33As arsenic 75	34Se selenium 79	35Br bromine 80	36Kr krypton 84
37Rb rubidium 85	38Sr strontium 88	39Y yttrium 89	40Zr zirconium 91	41Nb niobium 93	42Mo molybdenum 96	43Tc technetium —	44Ru ruthenium 101	45Rh rhodium 103	46Pd palladium 106	47Ag silver 108	48Cd cadmium 112	49In indium 115	50Sn tin 119	51Sb antimony 122	52Te tellurium 128	53I iodine 127	54Xe xenon 131
55Cs caesium 133	56Ba barium 137	57–71lanthanoids	72Hf hafnium 178	73Ta tantalum 181	74W tungsten 184	75Re rhenium 186	76Os osmium 190	77Ir iridium 192	78Pt platinum 195	79Au gold 197	80Hg mercury 201	81Tl thallium 204	82Pb lead 207	83Bi bismuth 209	84Po polonium —	85At astatine —	86Rn radon —
87Fr francium —	88Ra radium —	89–103actinoids	104Rf rutherfordium —	105Db dubnium —	106Sg seaborgium —	107Bh bohrium —	108Hs hassium —	109Mt meitnerium —	110Ds darmstadtium —	111Rg roentgenium —	112Cn copernicium —	113Nh nihonium —	114Fl flerovium —	115Lv livermorium —	116Ts tennessine —	117Uue unbinetium —	118Og oganeson —

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.).