Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/13**

Paper 1 Multiple Choice (Core) **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 Level1/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	✓	✗
B	✓	✓
C	✗	✗
D	✗	✓

2 A student is asked to measure the time taken for 0.4 g of magnesium carbonate to react completely with 25.0 cm^3 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.

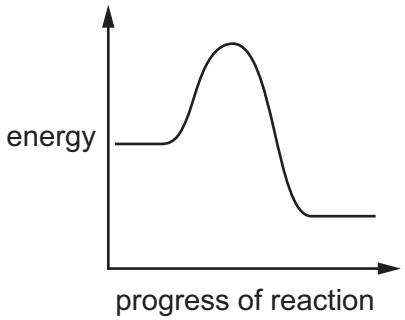
2 Lead(II) bromide can be electrolysed when molten.

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.

$$CoCl_2 \cdot 6H_2O \longrightarrow CoCl_2 + 6H_2O$$

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 $CoCl_2 \cdot 6H_2O$ is blue.

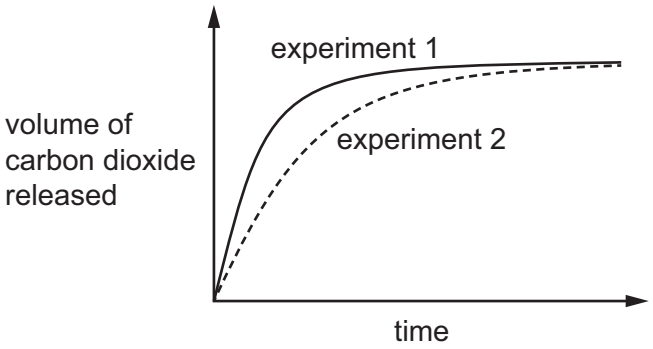
4 The reaction is not reversible.

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.

$$S(s) \xrightarrow{\text{change 1}} S(l) \xrightarrow{\text{change 2}} SO_2(g)$$

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 $C + FeO \rightarrow CO + Fe$

B $3CO + Fe_2O_3 \rightarrow 3CO_2 + 2Fe$

C $Fe_2O_3 + H_2 \rightarrow 2FeO + H_2O$

D $PbO + Fe \rightarrow Pb + FeO$

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, NO_2, SO_2

B CaO, CO_2, Na_2O

C CO_2, NO_2, SO_2

D CO_2, Na_2O, SO_2

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.

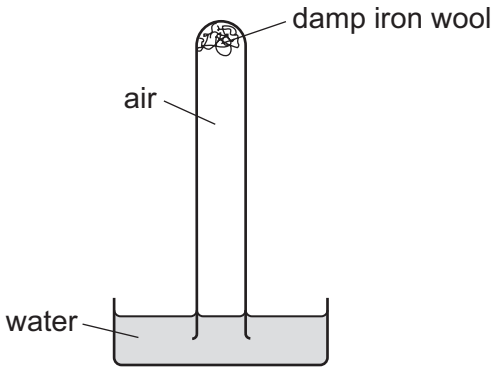
D Filtration removes soluble impurities and bacteria, and chlorination removes insoluble impurities.

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?

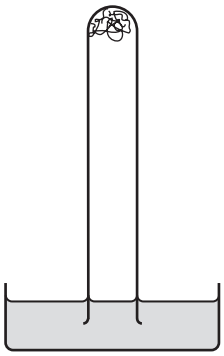
	nitrogen / %	oxygen / %	other gases
A	21	78	small amount of carbon dioxide
B	21	78	small amount of carbon monoxide
C	78	21	small amount of carbon dioxide
D	78	21	small amount of carbon monoxide

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?

A



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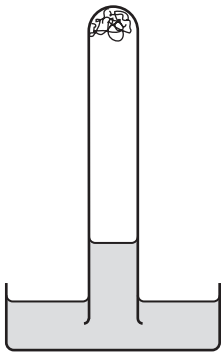
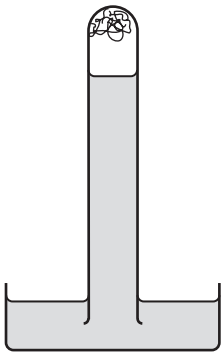
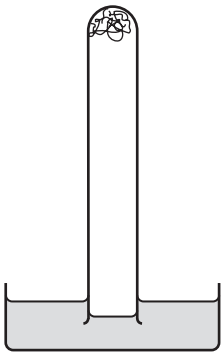


C



D



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.

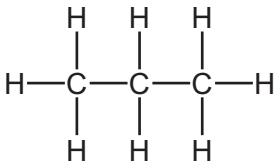
B Coal, natural gas and oxygen are all fuels.

C Hydrogen is the main constituent of natural gas.

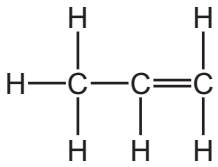
D Petroleum is separated into useful substances by fractional distillation.

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

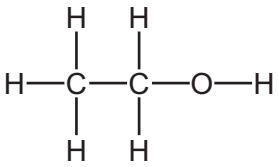
W



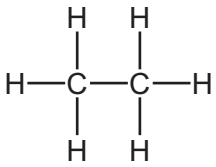
X



Y



Z



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	✓	✓	✗
C	✓	✗	✓
D	✗	✓	✓

39 Which statement about aqueous ethanoic acid is correct?

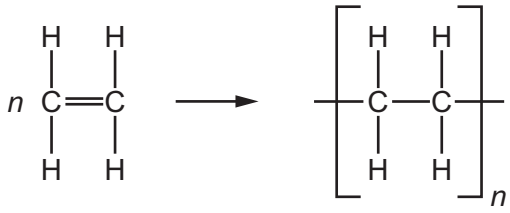
A It reacts with magnesium to form oxygen gas.

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
							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.).