Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/22**

Paper 2 Multiple Choice (Extended) **February/March 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 **15** printed pages and **1** blank page.

1 Pure water boils at 100 °C.

What happens to the water particles when water boils?

A They gain energy and move further apart.

B They gain energy and stay close together.

C They lose energy and move further apart.

D They lose energy and stay close together.

2 Which method should be used to separate a mixture of two liquids?

A crystallisation

B electrolysis

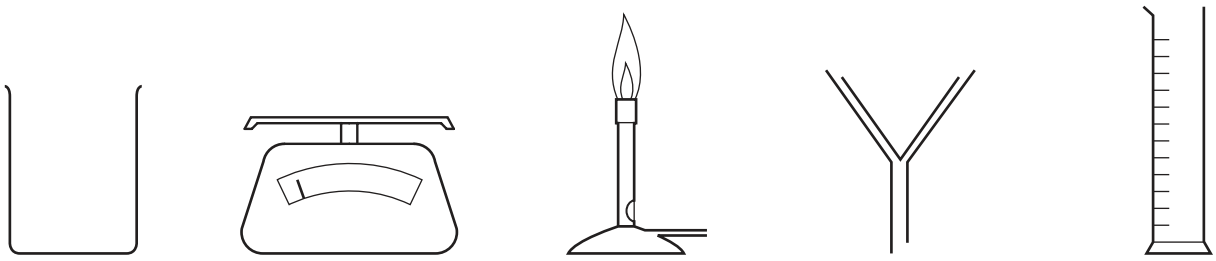
C filtration

D fractional distillation

3 Lead(II) iodide is insoluble in water.

Lead(II) iodide is made by adding aqueous lead(II) nitrate to aqueous potassium iodide.

Which pieces of apparatus are needed to obtain solid lead(II) iodide from 20 cm^3 of aqueous lead(II) nitrate?

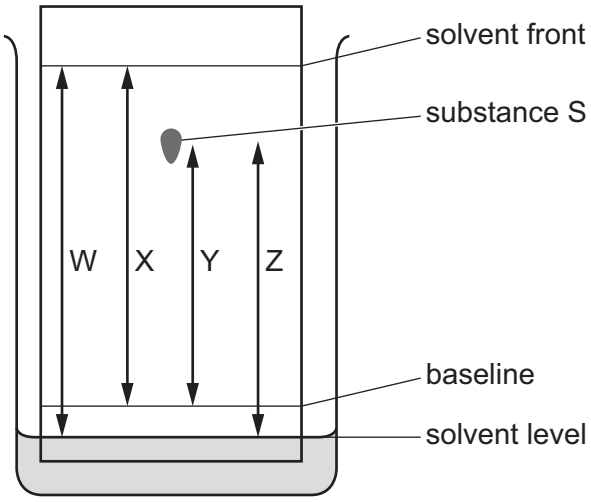


1 2 3 4 5

A 1, 2 and 4 **B** 1, 3 and 5 **C** 1, 4 and 5 **D** 2, 4 and 5

4 The chromatogram of substance S is shown.

Some distances, W, X, Y and Z, are labelled on the diagram.



How is the R_f value of substance S calculated?

A $\frac{X}{Y}$ **B** $\frac{W}{Z}$ **C** $\frac{Y}{X}$ **D** $\frac{Y}{W}$

5 Which row describes isotopes of the same element?

	number of protons	number of neutrons
A	different	different
B	different	same
C	same	different
D	same	same

6 Which row describes the structure of the positive ion in sodium chloride?

	protons	electrons	neutrons
A	11	11	12
B	11	10	12
C	17	17	18
D	17	18	18

[Turn over

7 Which statement about copper, diamond and silicon(IV) oxide is correct?

A Copper and silicon(IV) oxide have similar electrical conductivity.

B In diamond the carbon atoms are covalently bonded as flat sheets.

C In silicon(IV) oxide the silicon and oxygen atoms are covalently bonded as flat sheets.

D The structure of copper includes a lattice of positive ions.

8 An oxide of nitrogen has the following composition by mass: N, 30.4%; O, 69.6%.

It has a relative molecular mass of 92.

What is the molecular formula of the oxide of nitrogen?

A NO **B** NO_2 **C** NO_4 **D** N_2O_4

9 Calcium carbonate reacts with dilute hydrochloric acid according to the equation shown.

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$$

10 g of calcium carbonate is reacted with 100 cm^3 of 1 mol / dm^3 hydrochloric acid.

The following statements are made.

1 1.2 dm^3 of carbon dioxide is formed.

2 5.6 g of calcium chloride is formed.

3 4.8 g of carbon dioxide is formed.

4 No calcium carbonate is left when the reaction is completed.

Which statements about the reaction are correct?

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

10 Which substance is **not** produced during the electrolysis of concentrated aqueous sodium chloride?

A chlorine

B hydrogen

C sodium

D sodium hydroxide

11 Aqueous copper(II) sulfate is electrolysed using copper electrodes.

What are the ionic half-equations for the reactions that occur at each electrode?

	anode	cathode
A	$Cu \rightarrow Cu^{2+} + 2e^-$	$Cu^{2+} + 2e^- \rightarrow Cu$
B	$Cu^{2+} + 2e^- \rightarrow Cu$	$Cu \rightarrow Cu^{2+} + 2e^-$
C	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	$Cu^{2+} + 2e^- \rightarrow Cu$
D	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	$2H^+ + 2e^- \rightarrow H_2$

12 10 g of ammonium nitrate is added to water at 25 °C and the mixture stirred.

The ammonium nitrate dissolves and, after one minute, the temperature of the solution is 10 °C.

Which word describes this change?

A endothermic

B exothermic

C neutralisation

D reduction

13 Hydrogen reacts with chlorine according to the following equation.

$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$

The reaction is exothermic.

Which statement about this reaction is correct?

A Energy absorbed for bond breaking is greater than the energy released in bond making.

B Energy absorbed for bond breaking is less than the energy released in bond making.

C Energy released in bond breaking is greater than the energy absorbed in bond making.

D Energy released in bond breaking is less than the energy absorbed in bond making.

[Turn over

14 Hydrogen-oxygen fuel cells can be used to power cars. Platinum is used as a catalyst.

The amount of energy produced per gram is shown for three fuels.

fuel	energy produced per g of fuel / kJ
hydrogen	143
methane	55
petrol	44

Which statement is correct and is an advantage of a hydrogen-oxygen fuel cell?

A Hydrogen is difficult to store.

B Hydrogen produces less energy per gram than methane or petrol.

C Platinum is rare and expensive.

D The only product is water.

15 A student adds dilute hydrochloric acid at two different temperatures to two different lumps of limestone. The lumps of limestone have the same mass.

The carbon dioxide gas produced is collected in a gas syringe.

The volume of carbon dioxide collected in 1 minute at each temperature is shown.

temperature / °C	volume of carbon dioxide produced in 1 minute / cm^3
25	10
50	40

Which row describes and explains the results obtained at 50 °C compared with 25 °C?

	reaction rate	energy of collisions
A	higher	lower
B	higher	higher
C	lower	lower
D	lower	higher

16 Which reaction is reversible?

A $Cu + ZnSO_4 \rightarrow CuSO_4 + Zn$

B $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

C $CuO + H_2 \rightarrow Cu + H_2O$

D $CuSO_4 \bullet 5H_2O \rightarrow CuSO_4 + 5H_2O$

17 Some nitrogen dioxide gas was put in a gas syringe. The end of the gas syringe is sealed.

A reversible reaction occurs. The reaction reaches equilibrium.

$$\underset{\text{dark brown}}{2NO_2(g)} \rightleftharpoons \underset{\text{light yellow}}{N_2O_4(g)}$$

The forward reaction is exothermic.

Which statement about the reaction is correct?

A If the gas syringe is placed in a cold water bath, the colour becomes darker.

B If the gas syringe is placed in a hot water bath, the colour becomes lighter.

C If the volume in the gas syringe is increased, the colour becomes lighter.

D If the volume in the gas syringe is decreased, the colour becomes lighter.

18 The reaction between magnesium and carbon dioxide is shown in the equation.

$$2Mg + CO_2 \rightarrow 2MgO + C$$

Which statement describes what happens in this reaction?

A Carbon is oxidised.

B Magnesium is reduced.

C Neither oxidation nor reduction happens.

D The carbon in carbon dioxide is reduced.

19 Which changes involve reduction?

1 $2I^- \rightarrow I_2 + 2e^-$

2 $CuO + H_2 \rightarrow Cu + H_2O$

3 $Al^{3+} + 3e^- \rightarrow Al$

4 $Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$

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

20 Barium hydroxide is an alkali. It reacts with hydrochloric acid.

How does the pH of the hydrochloric acid change as an excess of aqueous barium hydroxide is added?

A The pH decreases from pH 14 and becomes constant at pH 7.

B The pH decreases from pH 14 to about pH 1.

C The pH increases from pH 1 and becomes constant at pH 7.

D The pH increases from pH 1 to about pH 14.

21 Which statement describes a chemical property of aluminium oxide, Al_2O_3?

A It reacts with acids but not with bases.

B It reacts with acids and bases.

C It reacts with bases but not with acids.

D It reacts with water.

22 The results of two tests on an aqueous solution of X are shown.

test	observation
aqueous sodium hydroxide added	green precipitate formed
acidified aqueous silver nitrate added	yellow precipitate formed

What is X?

A copper(II) chloride

B copper(II) iodide

C iron(II) chloride

D iron(II) iodide

23 Four stages used to prepare an insoluble salt are listed.

1 drying
2 filtration
3 precipitation
4 washing

In which order are the stages done?

A $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$

B $3 \rightarrow 2 \rightarrow 4 \rightarrow 1$

C $3 \rightarrow 4 \rightarrow 1 \rightarrow 2$

D $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$

24 The elements sodium to argon form Period 3 of the Periodic Table.

Which row describes the trend across Period 3 from left to right?

	number of outer shell electrons	metallic character	group number
A	decreases	decreases	decreases
B	decreases	increases	decreases
C	increases	decreases	increases
D	increases	increases	increases

25 Astatine is below iodine in Group VII in the Periodic Table.

Which row describes the properties of astatine?

	state at room temperature	reactivity
A	gas	displaces chlorine, bromine and iodine
B	gas	displaces iodine but does not displace chlorine or bromine
C	solid	displaces iodine but does not displace chlorine or bromine
D	solid	does not displace chlorine, bromine or iodine

[Turn over

26 Which statement explains why elements in Group VIII of the Periodic Table are unreactive?

A They are monatomic gases.

B They form stable diatomic molecules.

C They have a full outer shell of electrons.

D They share electrons with each other.

27 In which reaction does Fe(s) form ions when the mixture is heated?

A Fe(s) + CaO(s)

B Fe(s) + MgO(s)

C Fe(s) + ZnO(s)

D Fe(s) + CuO(s)

28 The list gives the order of some metals and hydrogen in the reactivity series.

Metal X is also included.

most reactive	K
	Mg
	Zn
	H
	X
least reactive	Cu

Which row correctly shows the properties of metal X?

	reacts with dilute acids	oxide reduced by carbon
A	no	no
B	no	yes
C	yes	no
D	yes	yes

29 Which metal carbonate does **not** produce carbon dioxide when it is heated?

A copper(II) carbonate

B iron(II) carbonate

C potassium carbonate

D zinc carbonate

30 Which statement about the extraction of metals is correct?

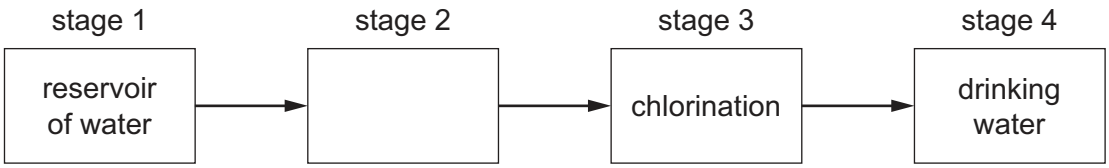
A Aluminium is extracted by the electrolysis of hematite.

B Cryolite acts as a reducing agent in the extraction of aluminium.

C Zinc is extracted by the electrolysis of zinc blende.

D Zinc is obtained by heating zinc oxide with coke.

31 The diagram shows how water is treated to make it suitable for drinking.



What happens in stage 2?

A condensation

B sublimation

C evaporation

D filtration

32 What are the main substances produced by the fractional distillation of liquid air?

A oxygen and carbon dioxide

B oxygen and nitrogen

C helium and nitrogen

D hydrogen and oxygen

[Turn over

33 The raw materials for the Haber process are hydrogen and nitrogen.

What are the sources of the hydrogen and nitrogen?

A hydrogen from ethanol and nitrogen from NPK fertilisers

B hydrogen from methane and nitrogen from air

C hydrogen from sulfuric acid and nitrogen from air

D hydrogen from water and nitrogen from ammonium nitrate

34 Which process removes carbon dioxide from the Earth's atmosphere?

A combustion

B heating limestone

C photosynthesis

D respiration

35 The Contact process is used to make sulfuric acid.

The steps in the process are listed.

1 Dissolve sulfur trioxide in 98% concentrated sulfuric acid.

2 Heat sulfur strongly in air.

3 Add oleum to water.

4 Pass sulfur dioxide over a vanadium(V) oxide catalyst.

Which sequence of steps is correct?

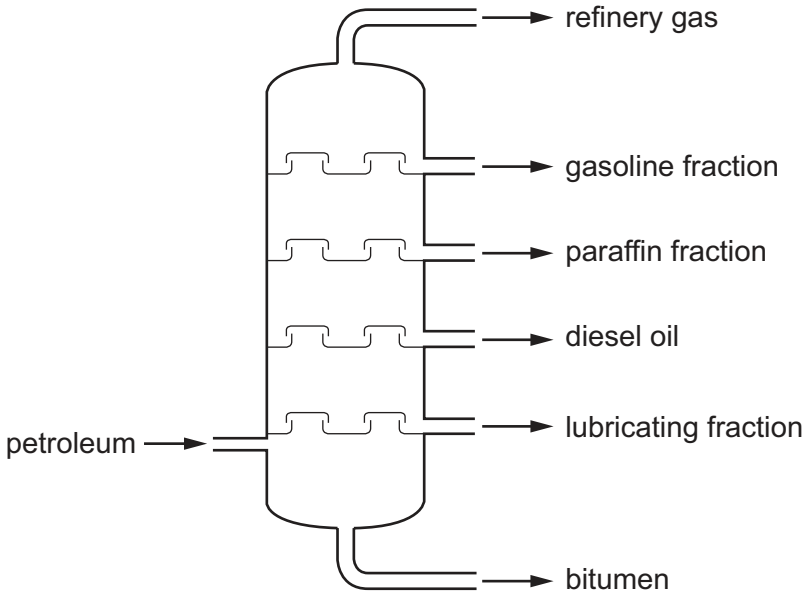
A $4 \rightarrow 1 \rightarrow 2 \rightarrow 3$

B $4 \rightarrow 2 \rightarrow 3 \rightarrow 1$

C $2 \rightarrow 1 \rightarrow 4 \rightarrow 3$

D $2 \rightarrow 4 \rightarrow 1 \rightarrow 3$

36 The fractional distillation of petroleum is shown.



Which fraction is the least volatile?

A bitumen

B diesel oil

C gasoline fraction

D refinery gas

37 Which statement about members of a homologous series is correct?

A Successive members differ by CH_3.

B Successive members have a molecular mass that differs by 14.

C They have the same molecular formula.

D They have identical physical properties.

38 Ethanol is manufactured on a large scale by fermentation.

Which statement about fermentation is correct?

A It is a continuous process.

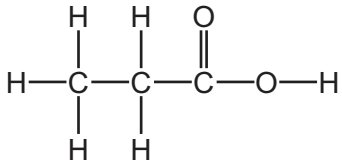
B A renewable raw material is used.

C It is a very fast reaction.

D The ethanol produced is pure.

39 The structure of a compound, G, is shown.

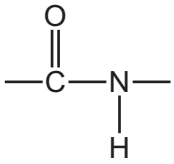
G is in the same homologous series as ethanoic acid.



Which row describes some of the properties of an aqueous solution of G?

	produces a gas with magnesium	turns methyl orange yellow
A	no	yes
B	no	no
C	yes	no
D	yes	yes

40 Which statement about polymers is correct?

A Nylon contains the  linkage.

B Nylon is a polyester.

C Propane can be polymerised by addition polymerisation.

D The linkage in *Terylene* contains a carbon-carbon double bond.

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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.).