Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/23**

Paper 2 Multiple Choice (Extended) **October/November 2019**

45 minutes

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

0520730636

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.

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1 Which two gases will diffuse at the same rate, at the same temperature?

A carbon monoxide and carbon dioxide

B carbon monoxide and nitrogen

C chlorine and fluorine

D nitrogen and oxygen

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

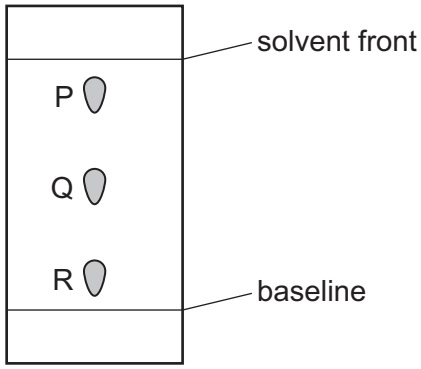
B balance, stop-clock, thermometer

C balance, pipette, thermometer

D stop-clock, pipette, thermometer

3 A substance is separated using chromatography.

The chromatogram is shown.



Which statement is **not** correct?

A P has a higher R_f value than Q.

B P, Q and R are all soluble in the solvent.

C R is the most soluble substance.

D The R_f value of P is less than 1.

4 Which statement about an ionic compound is **not** correct?

A It conducts electricity when dissolved in water.

B It has a high melting point due to strong attractive forces between ions.

C It has a regular lattice of oppositely charged ions in a ‘sea of electrons’.

D The ionic bonds are formed between metallic and non-metallic elements.

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5 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

6 Carbon has three isotopes, ^{12}C, ^{13}C and ^{14}C.

Why do all three isotopes have the same chemical properties?

A They all have the same atomic mass.

B They all have the same number of electrons in their outer shell.

C They all have the same number of electron shells.

D They all have the same number of nucleons.

7 Silicon(IV) oxide is a covalently bonded compound.

Which statements are correct?

1 Silicon atoms form four single bonds in silicon(IV) oxide.

2 Oxygen atoms form two double bonds in silicon(IV) oxide.

3 Silicon(IV) oxide has a high melting point.

4 Silicon(IV) oxide contains one silicon atom and four oxygen atoms.

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

8 Which statement describes the structure of copper?

A It has a lattice of negative ions in a ‘sea of electrons’.

B It has a lattice of negative ions in a ‘sea of protons’.

C It has a lattice of positive ions in a ‘sea of electrons’.

D It has a lattice of positive ions in a ‘sea of protons’.

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9 Magnesium carbonate decomposes on heating to form magnesium oxide and carbon dioxide as shown.

$$MgCO_3 \rightarrow MgO + CO_2$$

How much magnesium carbonate is needed to make 5.0 g of magnesium oxide?

A 3.5 g **B** 4.0 g **C** 6.5 g **D** 10.5 g

10 90 g of glucose is dissolved in water.

The glucose solution is fermented.

$$C_6H_{12}O_6 \rightarrow 2CO_2 + 2C_2H_5OH$$

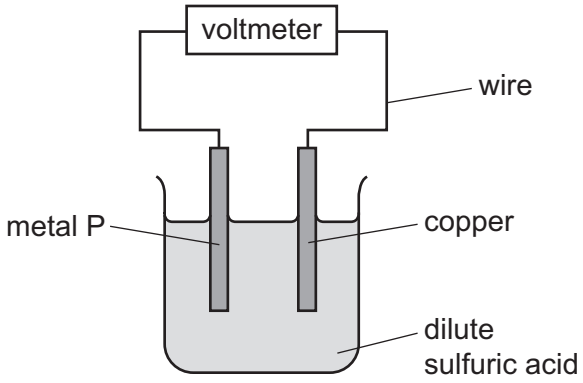
glucose, M_r = 180 ethanol, M_r = 46

After the fermentation finishes, 6.8 g of ethanol is obtained from the solution.

What is the percentage yield of ethanol?

A 7.4 **B** 7.6 **C** 14.8 **D** 29.6

11 The diagram shows a simple cell.



Which metal P produces the smallest voltage?

A calcium

B iron

C magnesium

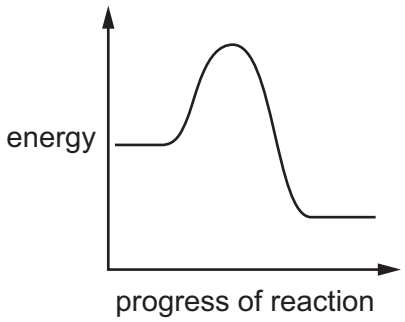
D zinc

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12 What are the ionic half-equations for the electrode reactions during the electrolysis of concentrated aqueous sodium chloride?

	anode	cathode
A	$Cl_2 + 2e^- \rightarrow 2Cl^-$	$H_2 \rightarrow 2H^+ + 2e^-$
B	$2Cl^- \rightarrow Cl_2 + 2e^-$	$2H^+ + 2e^- \rightarrow H_2$
C	$H_2 \rightarrow 2H^+ + 2e^-$	$Cl_2 + 2e^- \rightarrow 2Cl^-$
D	$2H^+ + 2e^- \rightarrow H_2$	$2Cl^- \rightarrow Cl_2 + 2e^-$

13 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

14 Which gases are used to generate electricity in a fuel cell?

A carbon dioxide and oxygen

B hydrogen and methane

C hydrogen and oxygen

D methane and carbon dioxide

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15 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

16 Magnesium reacts with dilute hydrochloric acid.

Which statement about the particles in the reaction is correct?

A Increasing the concentration of dilute hydrochloric acid increases the collision rate but has no effect on the activation energy.

B Increasing the concentration of dilute hydrochloric acid increases the collision rate and the activation energy.

C Increasing the temperature of the reaction increases the activation energy.

D Increasing the temperature of the reaction causes all collisions to lead to a reaction.

17 Two molecules of nitrogen dioxide combine in a reversible reaction to form dinitrogen tetroxide.

The forward reaction is exothermic.

$$2NO_2(g) \rightleftharpoons N_2O_4(g)$$

Which changes in reaction conditions would **both** increase the amount of dinitrogen tetroxide at equilibrium?

A decreasing the temperature and decreasing the pressure

B decreasing the temperature and increasing the pressure

C increasing the temperature and decreasing the pressure

D increasing the temperature and increasing the pressure

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18 Chlorine displaces bromine from aqueous potassium bromide.

The ionic equation for the reaction is shown.

$$Cl_2 + 2Br^- \rightarrow 2Cl^- + Br_2$$

Which statement about this reaction is correct?

A Bromide ions act as an oxidising agent.

B Bromide ions are oxidised when electrons are lost.

C Chlorine acts as a reducing agent.

D Chlorine is reduced when electrons are lost.

19 Which substance is a neutral oxide?

A aluminium oxide

B carbon monoxide

C sulfur dioxide

D zinc oxide

20 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

21 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

22 Lead(II) iodide is formed as a precipitate in the reaction shown.

$$Pb(NO_3)_2(aq) + 2NaI(aq) \rightarrow PbI_2(s) + 2NaNO_3(aq)$$

Which method is used to separate the lead(II) iodide from the mixture?

A crystallisation

B distillation

C evaporation

D filtration

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.

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24 Which pair of elements reacts together most violently?

A chlorine and lithium

B chlorine and potassium

C iodine and lithium

D iodine and potassium

25 Iron reacts with dilute hydrochloric acid to form iron(II) chloride, $FeCl_2$. Iron reacts with chlorine to form iron(III) chloride, $FeCl_3$.

Which property of transition elements is shown by this information?

A Transition elements have high melting points.

B Transition elements can act as catalysts.

C Transition elements have variable oxidation states.

D Transition elements have coloured compounds.

26 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

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.

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28 Which word equation represents a reaction which occurs?

A sodium oxide + carbon → sodium + carbon dioxide

B sodium oxide + iron → sodium + iron(II) oxide

C iron(II) oxide + copper → iron + copper(II) oxide

D iron(III) oxide + carbon → iron + carbon dioxide

29 Why is cryolite used in the extraction of aluminium by electrolysis?

A It changes bauxite to aluminium oxide.

B It decreases the melting point of the aluminium.

C It dissolves the aluminium oxide.

D It protects the anodes from corrosion.

30 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.

31 How are oxygen and nitrogen separated from air?

A chromatography

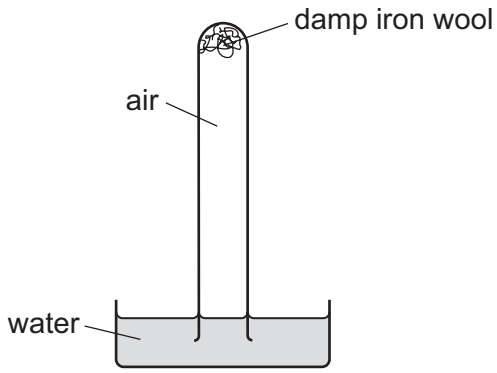
B condensation and filtration

C crystallisation

D fractional distillation

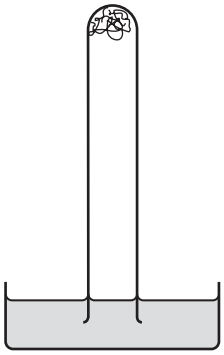
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32 The apparatus shown is set up and left for a week.

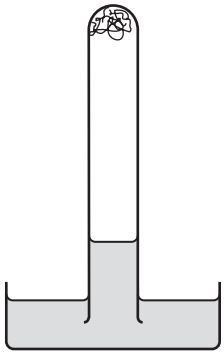


Which diagram shows the level of the water at the end of the week?

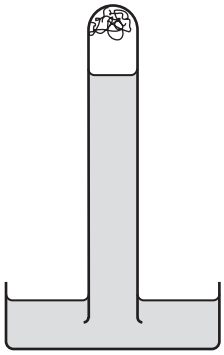
A



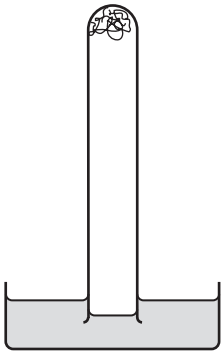
B



C



D



33 The following processes are part of the carbon cycle.

1 photosynthesis

2 combustion

3 respiration

Which processes decrease the amount of carbon dioxide in the atmosphere?

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

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34 Ammonium sulfate is used as a fertiliser.

It is made from ammonia and sulfuric acid.

Which words complete gaps 1, 2 and 3?

The .....1..... is made by the .....2..... process in which .....3..... is used as a catalyst.

	1	2	3
A	ammonia	Contact	iron
B	ammonia	Haber	vanadium(V) oxide
C	sulfuric acid	Contact	vanadium(V) oxide
D	sulfuric acid	Haber	iron

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

A combustion

B neutralisation

C redox

D thermal decomposition

36 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.

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

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

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38 Ethanol is made by fermentation of sugars and by the catalytic addition of steam to ethene.

What are two advantages of making ethanol by the catalytic addition of steam to ethene rather than by fermentation of sugars?

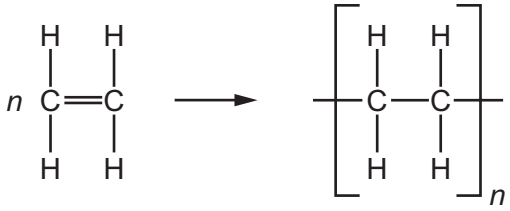
A faster reaction and renewable raw materials

B purer product and faster reaction

C renewable raw materials and continuous process

D uses more energy and forms a purer product

39 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)

40 Proteins and starch are both natural polymers.

Both proteins and starch are hydrolysed by dilute acids.

What are the products of hydrolysis of proteins and of starch?

	products of hydrolysis of proteins	products of hydrolysis of starch
A	amines and carboxylic acids	simple sugars
B	amines and carboxylic acids	alcohols and carboxylic acids
C	amino acids	simple sugars
D	amino acids	alcohols and carboxylic acids

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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.).