Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/13**

Paper 1 Multiple Choice (Core) **October/November 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.

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1 ‘The movement of a substance **very slowly** from an area of high concentration to an area of low concentration.’

Which process is being described?

A a liquid being frozen

B a solid melting

C a substance diffusing through a liquid

D a substance diffusing through the air

2 When a dark grey solid element is heated, it changes directly into a purple gas.

Which word describes this change?

A boiling

B evaporation

C melting

D sublimation

3 Nickel(II) sulfate is a green solid that is soluble in water.

Which method is used to obtain a pure sample of nickel(II) sulfate crystals from a mixture of nickel(II) sulfate and sand?

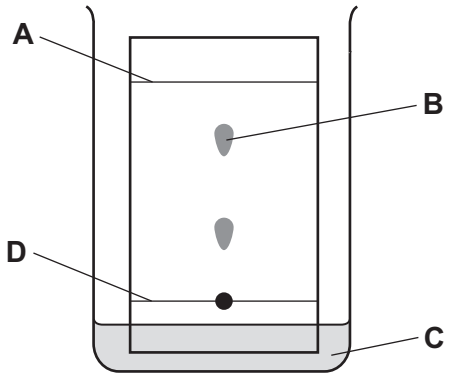
A Heat the mixture with water and distil it to give nickel(II) sulfate.

B Heat the mixture with water and leave it to crystallise.

C Heat the mixture with water and filter off the nickel(II) sulfate.

D Heat the mixture with water, filter and allow the solution to crystallise.

4 In the chromatography experiment shown, which label represents the solvent front?



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5 What is the meaning of the term *nucleon number*?

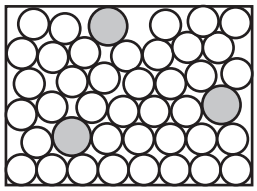
A the number of neutrons in the nucleus of an atom

B the number of protons in the nucleus of an atom

C the total number of protons and electrons in the nucleus of an atom

D the total number of protons and neutrons in the nucleus of an atom

6 The diagram represents the structure of a solid.



What could the solid be?

	brass	graphite	sodium chloride
A	✓	✓	✗
B	✓	✗	✗
C	✗	✓	✓
D	✗	✗	✓

7 Magnesium reacts with sulfuric acid.

What are the formulae of the products formed in this reaction?

A $MgSO_4$ and H_2

B $MgSO_4$ and H_2O

C $Mg(SO_4)_2$ and H_2

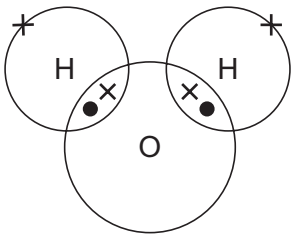
D $Mg(SO_4)_2$ and H_2O

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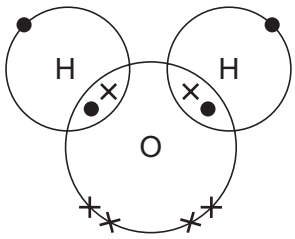
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8 Which diagram shows the arrangement of the outer shell electrons in a molecule of water?

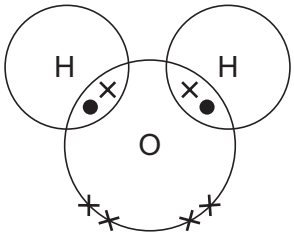
A



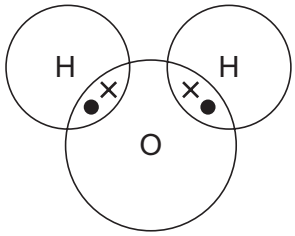
B



C



D



9 Rubidium is in Group I of the Periodic Table and bromine is in Group VII.

Rubidium reacts with bromine to form an ionic compound.

Which row shows the electron change taking place for rubidium and the correct formula of the rubidium ion?

	electron change	formula of ion formed
A	electron gained	Rb^+
B	electron gained	Rb^-
C	electron lost	Rb^+
D	electron lost	Rb^-

10 Which statement explains why graphite is used as a lubricant?

A All bonds between the atoms are weak.

B It conducts electricity.

C It has a low melting point.

D Layers in the structure can slide over each other.

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11 The relative atomic mass of chlorine is 35.5.

When calculating relative atomic mass, which particle is the mass of a chlorine atom compared to?

A a neutron

B a proton

C an atom of carbon-12

D an atom of hydrogen-1

12 Molten sodium chloride is electrolysed using inert electrodes.

Which row shows the products formed at the cathode and anode?

	cathode	anode
A	chlorine	hydrogen
B	chlorine	sodium
C	hydrogen	chlorine
D	sodium	chlorine

13 Ethanol is used as a fuel.

$$\text{ethanol} + \text{oxygen} \rightarrow \text{carbon dioxide} + \text{water}$$

Which statements are correct?

1 The reaction is endothermic.

2 The products have more energy than the reactants.

3 The oxygen for this reaction comes from the air.

4 The temperature of the reaction mixture rises during this reaction.

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

14 Hydrogen and the isotope uranium-235 are both used to generate electricity.

Which term describes the change that occurs for **both** substances in this context?

A combustion

B endothermic

C exothermic

D decomposition

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15 Which substance does **not** require oxygen in order to produce energy?

A coal

B hydrogen

C natural gas

D ^{235}U

16 When calcium carbonate reacts with dilute hydrochloric acid, carbon dioxide gas is given off.

This causes the reaction mixture to lose mass.

Four separate experiments are performed.

The starting mass, and the mass after five minutes, are measured for each reaction mixture.

In which experiment is carbon dioxide produced at the greatest rate?

	starting mass / g	mass after five minutes / g
A	14.37	11.89
B	16.52	15.29
C	16.76	14.12
D	16.99	15.21

17 Silver oxide reacts with magnesium to make silver and magnesium oxide.

$$Ag_2O + Mg \rightarrow 2Ag + MgO$$

Which substance is oxidised in this reaction?

A magnesium

B magnesium oxide

C silver

D silver oxide

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18 When pink crystals of cobalt(II) chloride are heated, steam is given off and the colour of the solid changes to blue.

$$CoCl_2 \cdot 6H_2O \rightleftharpoons CoCl_2 + 6H_2O$$

What happens when water is added to the blue solid?

	colour	temperature
A	changes to pink	decreases
B	changes to pink	increases
C	remains blue	decreases
D	remains blue	increases

19 Which oxide is used to neutralise acidic gases in a power station?

A calcium oxide

B carbon dioxide

C nitrogen oxide

D sulfur dioxide

20 Period 3 of the Periodic Table contains the elements sodium to argon.

Element Q is a non-metal from this period.

Which statement about Q is correct?

A It conducts electricity.

B It has a lower proton number than sodium.

C It has electrons in only three shells.

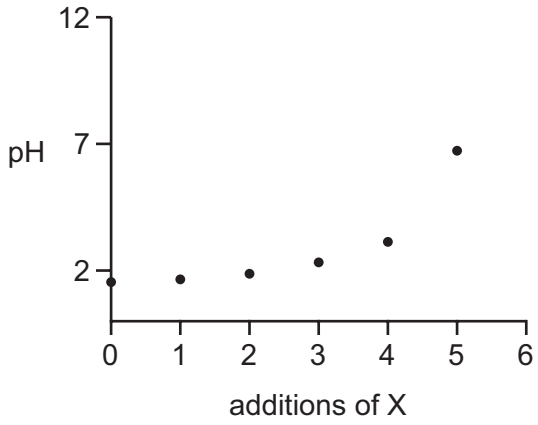
D It is malleable.

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21 Equal masses of a solid, X, are added in turn to an aqueous solution, Y.

The pH of the solution is measured after each addition until the pH becomes 7. The readings are plotted as shown.



What are X and Y?

	X	Y
A	Cu(s)	HC*l*(aq)
B	Mg(s)	HC*l*(aq)
C	$NH_4C\mathit{l}$(s)	NaOH(aq)
D	$Zn(OH)_2$(s)	NaOH(aq)

22 An aqueous cation reacts with aqueous sodium hydroxide to form a white precipitate.

The precipitate is insoluble in excess sodium hydroxide.

What is the aqueous cation?

A aluminium ion

B calcium ion

C chromium ion

D zinc ion

23 Vinegar has a pH of 3.

Which statement about vinegar is correct?

A It forms a salt with sulfuric acid.

B It reacts with some metals to form hydrogen gas.

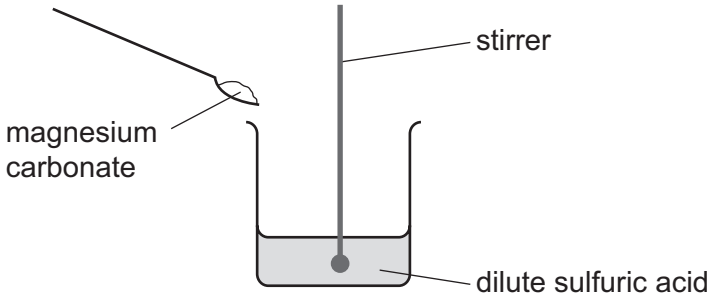
C It reacts with ammonium compounds to give ammonia gas.

D It turns red litmus blue.

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24 A student carries out an experiment to prepare pure magnesium sulfate crystals.

The diagram shows the first stage of the preparation.



He adds magnesium carbonate until no more reacts.

Which process should he use for the next stage?

A crystallisation

B evaporation

C filtration

D neutralisation

25 Which statement about the halogens and their compounds is correct?

A The colour of the element gets lighter going down Group VII.

B The elements get less dense going down Group VII.

C When chlorine is added to sodium iodide solution, iodine is formed.

D When iodine is added to sodium bromide solution, bromine is formed.

26 Which compound contains a transition metal ion and a halide ion?

A aluminium iodide

B calcium fluoride

C iron(III) oxide

D nickel(II) chloride

27 A flammable gas needs to be removed from a tank at an industrial plant.

For safety reasons, an inert gas is used.

Which gas is suitable?

A argon

B hydrogen

C methane

D oxygen

28 A substance, X, has the following properties.

1 It has a high melting point.

2 It conducts electricity in the solid and liquid states.

3 It is malleable.

4 It has a high density.

What is X?

A a ceramic

B copper

C graphite

D sodium chloride

29 A metal M is between sodium and magnesium in the reactivity series.

Which reactions occur with M and its oxide?

	M reacts with steam	M can be extracted by heating its oxide with carbon
A	no	no
B	no	yes
C	yes	no
D	yes	yes

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30 Mild steel and stainless steel are two alloys containing the element iron.

Which row identifies a use of each alloy?

	a use of mild steel	a use of stainless steel
A	car bodies	cutlery
B	car bodies	electrical wiring
C	food containers	cutlery
D	food containers	electrical wiring

31 Coke (carbon) and limestone are two raw materials used in the extraction of iron from hematite.

Which type of reaction occurs when each substance is heated during the process?

	coke	limestone
A	redox	redox
B	redox	thermal decomposition
C	thermal decomposition	redox
D	thermal decomposition	thermal decomposition

32 Oxides of nitrogen are given out from car exhausts.

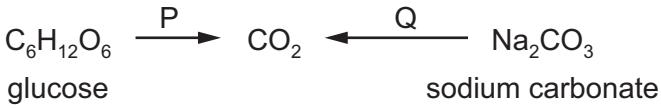
Which row best shows why oxides of nitrogen are unwanted in the atmosphere?

	acidic	toxic
A	no	no
B	no	yes
C	yes	no
D	yes	yes

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[Turn over

33 Two reactions, P and Q, produce carbon dioxide.



Which types of reaction are P and Q?

	P	Q
A	neutralisation	neutralisation
B	neutralisation	respiration
C	respiration	neutralisation
D	respiration	respiration

34 Which gas is used as a food preservative?

A methane

B fluorine

C oxygen

D sulfur dioxide

35 Which calcium compound does **not** neutralise an acid soil?

A calcium oxide

B calcium sulfate

C calcium hydroxide

D calcium carbonate

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36 Petroleum is separated into fractions by fractional distillation.

Separation occurs in a fractionating column.

Some properties of three of these fractions are shown.

fraction	boiling point range / °C	number of carbon atoms in the molecules
1		5 – 10
2	320–350	16–24
3	120–210	

Which statement is correct?

A Fraction 1 has a higher boiling point range than fraction 2.

B Fraction 2 is removed from a higher point in the fractionating column than fraction 1.

C Molecules in fraction 3 have shorter chains than those in fraction 2.

D None of the fractions are liquid at room temperature.

37 How many atoms are there in one molecule of ethanoic acid?

A 5 **B** 6 **C** 8 **D** 11

38 The flow chart shows the preparation of ethanol and some important chemistry of ethanol.



What are X, Y and Z?

	X	Y	Z
A	yeast	combustion	oxygen
B	glucose	combustion	steam
C	glucose	polymerisation	water
D	yeast	fermentation	glucose

39 Which substance is **not** a fraction obtained from the fractional distillation of petroleum?

A ethene

B fuel oil

C naphtha

D refinery gas

40 Some plastics are non-biodegradable.

What is the meaning of the term *non-biodegradable*?

A cannot be recycled for further use

B gives off greenhouse gases when burnt

C harmful to animals and plants

D not broken down by natural processes

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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.).