Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/12**

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.

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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

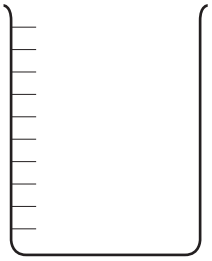
2 Oxygen melts at –219 °C and boils at –183 °C.

At which temperature is oxygen a liquid?

A –225 °C **B** –189 °C **C** –175 °C **D** 25 °C

3 Which diagram shows a burette?

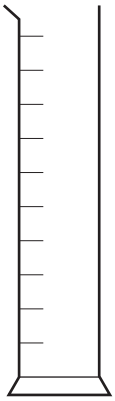
A



B



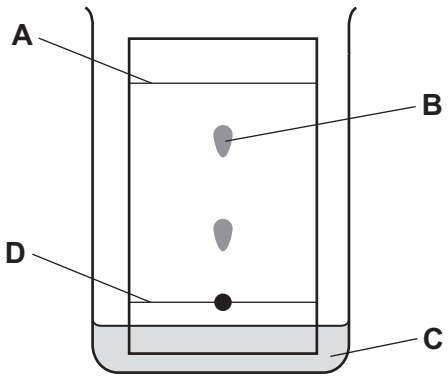
C



D



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



5 Different methods of separation rely on substances having different properties.

Which property does distillation make use of?

A boiling point

B colour

C particle size

D solubility in different solvents

6 Which statement about atomic structure is correct?

A Isotopes have a different nucleon number but the same proton number.

B Metal atoms gain electrons to achieve a noble gas electronic structure.

C The nucleon number is the total number of electrons and neutrons in the nucleus of the atom.

D Protons and neutrons are oppositely charged particles.

7 Which element is a non-metal?

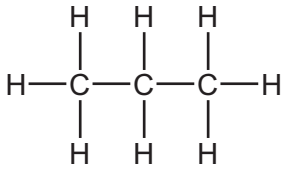
A scandium

B sodium

C strontium

D sulfur

8 The structure of propane, C_3H_8, is shown.



How many electrons are involved in the bonding of propane?

A 8 **B** 10 **C** 16 **D** 20

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.

11 The formula of which compound contains the largest number of Group VII atoms?

A $C_{13}H_{13}IO_8$ **B** Cl_2O_6 **C** $Al(BrO_3)_3$ **D** $NaFC_2H_2O_2$

12 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

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13 Universal indicator solution is added to a neutral solution of concentrated aqueous sodium chloride.

The solution, which contains H^+ (hydrogen), Na^+ (sodium), Cl^- (chloride) and OH^- (hydroxide) ions, is electrolysed.

The product at the cathode is hydrogen gas and the product at the anode is chlorine gas.

What happens to the colour of the indicator **in the solution** during electrolysis?

A The colour changes from blue to green.

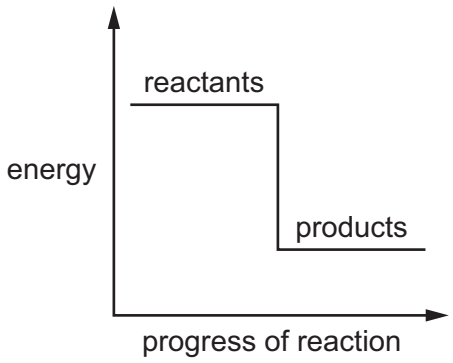
B The colour changes from blue to red.

C The colour changes from green to blue.

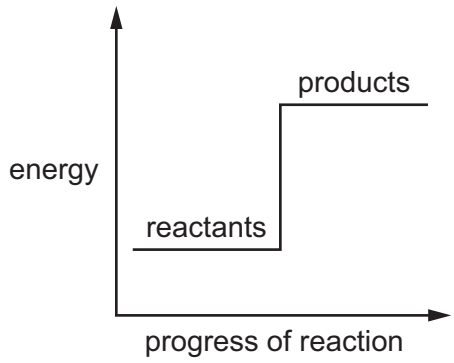
D The colour changes from green to red.

14 Which energy level diagram represents an endothermic reaction?

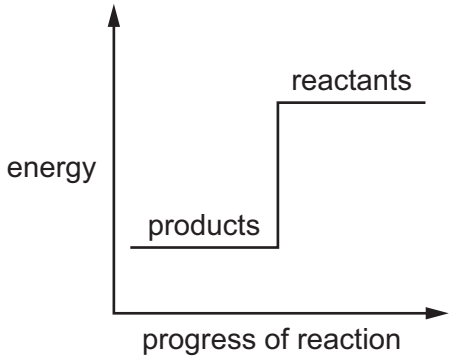
A



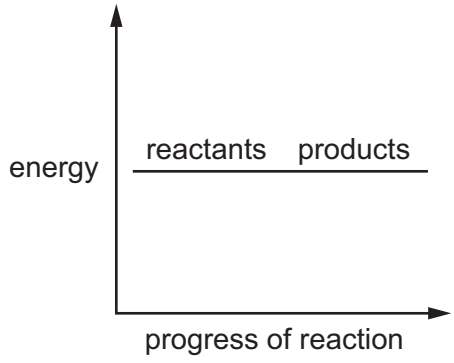
B



C



D



15 Which process is a physical change?

A burning a piece of magnesium

B dissolving calcium carbonate in hydrochloric acid

C melting an ice cube

D the rusting of an iron nail

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

A coal

B hydrogen

C natural gas

D ^{235}U

17 Nitrogen, N_2, and hydrogen, H_2, can be converted into ammonia, NH_3, using a catalyst.

What is the purpose of the catalyst?

A to increase the amount of ammonia produced

B to increase the rate of reaction

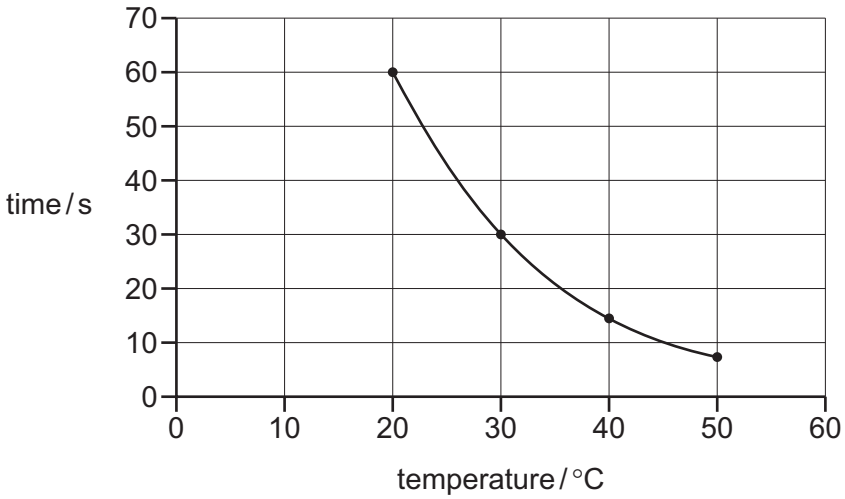
C to reduce the amount of reactants needed

D to reduce the rate of reaction

18 A reaction is carried out at four different temperatures.

The time taken for the reaction to complete at each temperature is measured.

The results are shown.



What is the relationship between temperature and rate of reaction?

A The rate decreases as the temperature increases.

B The rate increases as the temperature increases.

C The rate is proportional to the temperature.

D The rate is inversely proportional to the temperature.

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19 During the manufacture of sulfuric acid, sulfur dioxide is converted to sulfur trioxide.

$$2SO_2 + O_2 \rightarrow 2SO_3$$

Which type of reaction is this?

A displacement

B neutralisation

C oxidation

D thermal decomposition

20 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

21 Which statement describes a base?

A It reacts with ammonium chloride to produce ammonia gas.

B It reacts with calcium carbonate to produce carbon dioxide gas.

C It reacts with copper to produce hydrogen gas.

D It turns blue litmus red.

22 Which compound is an acidic oxide?

A aluminium oxide

B carbon dioxide

C copper(II) oxide

D magnesium oxide

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[Turn over

23 Which statement describes how a flame test is done?

A The tip of a clean wire is dipped into the substance and the wire is placed in a blue Bunsen burner flame.

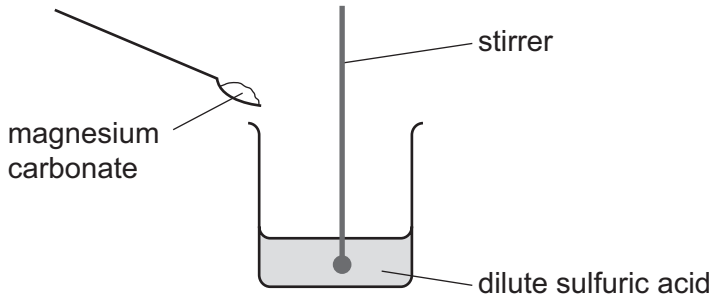
B The tip of a clean wire is dipped into the substance and the wire is placed in a yellow Bunsen burner flame.

C A wooden splint is lit and is placed above a test-tube containing the gas being tested.

D A wooden splint is lit, blown out and the glowing splint put into a test-tube of the gas being tested.

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 row about elements in the Periodic Table is correct?

	statement 1	statement 2
A	two elements in the same group have similar chemical properties	metals are on the left of the table
B	two elements in the same group have similar chemical properties	metals are on the right of the table
C	two elements in the same period have similar chemical properties	metals are on the left of the table
D	two elements in the same period have similar chemical properties	metals are on the right of the table

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26 Tennessine, Ts, is a newly discovered element.

The atomic number of tennessine is 117 and it is placed directly underneath astatine in Group VII of the Periodic Table.

The trends in properties of Group VII elements are shown.

element	boiling point / °C	colour	density in g / cm^3	reactivity
fluorine	–188	pale yellow	0.002	extremely high
chlorine	–35	green	0.003	very high
bromine	60	red-brown	3.103	high
iodine	184	dark grey	4.933	low

Which statement about the properties of tennessine is likely to be correct?

A Tennessine has a higher reactivity than astatine.

B Tennessine has a lower boiling point than astatine.

C Tennessine is a lighter colour than astatine.

D Tennessine is more dense than astatine.

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

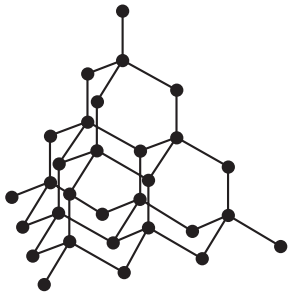
B copper

C graphite

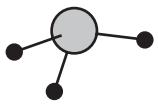
D sodium chloride

29 Which diagram best represents the structure of a substance that is a good conductor of electricity at 25 °C?

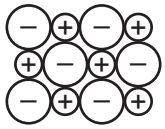
A



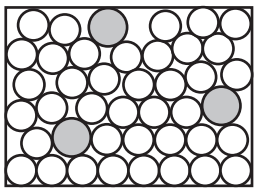
B



C



D



30 Some properties of element Y are listed.

- It reacts with hydrochloric acid to make hydrogen gas.
- It reacts with steam but not with cold water.
- The oxide of Y cannot be reduced by carbon.

What is element Y?

A copper

B iron

C magnesium

D sodium

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31 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

32 Water is purified using several processes.

Four of the processes are listed.

1 Chlorine is added to water to kill any bacteria.

2 Water is passed through coarse gravel to remove large pieces of dirt.

3 Water is passed through wire screens to remove large twigs.

4 Water is passed through fine sand to remove small particles.

In which order are the processes carried out?

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

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

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

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

33 When solid S is heated strongly, it forms gas G.

G turns limewater cloudy.

What are S and G and which type of reaction does S undergo?

	S	G	type of reaction
A	calcium carbonate	carbon dioxide	combustion
B	calcium carbonate	carbon dioxide	thermal decomposition
C	sodium carbonate	oxygen	combustion
D	sodium carbonate	oxygen	thermal decomposition

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[Turn over

34 The element sulfur is found in a number of different minerals.

Which mineral contains the greatest percentage by mass of sulfur?

A barite, $BaSO_4$

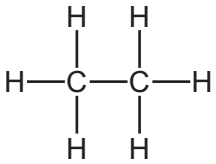
B galena, PbS

C gypsum, $CaSO_4$

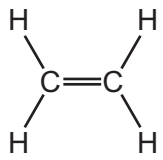
D pyrite, FeS_2

35 Which structure represents a molecule of ethanol?

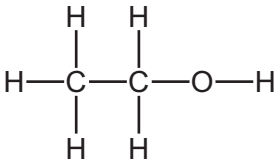
A



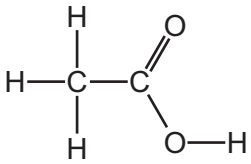
B



C



D



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.

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37 Which statement describes methane?

A It is an alcohol.

B It is an unsaturated molecule.

C It contains carbon, hydrogen and oxygen atoms only.

D Each molecule contains four single covalent bonds.

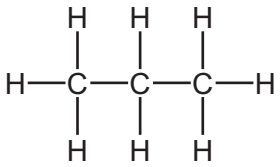
38 The flow chart shows the preparation of ethanol and some important chemistry of ethanol.

substance X $\xrightarrow{\text{fermentation}}$ ethanol $\xrightarrow{\text{process Y}}$ carbon dioxide + substance Z

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 The structure of propane is shown.



Which statement about the atoms and the bonding in propane is correct?

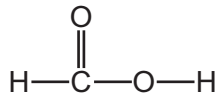
A All the bonds are single bonds.

B Each carbon atom only bonds with two hydrogen atoms.

C Propane is an unsaturated molecule.

D There are three carbon-carbon bonds.

40 The structure of a compound X is shown.



X is in the same homologous series as ethanoic acid.

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

	reacts with $CaCO_3$ to produce a gas	neutralises CuO	turns methyl orange red
A	no	no	no
B	no	yes	no
C	yes	yes	yes
D	yes	no	yes

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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.).