Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/12**

Paper 1 Multiple Choice (Core) **May/June 2021**

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.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

1 Iodine changes directly from a grey solid to a purple gas when it is heated.

What is the name of this process?

A condensation

B evaporation

C separation

D sublimation

2 Some sugar is contaminated with glass.

How is a sample of solid sugar obtained from the mixture?

A dissolve in water and then evaporate

B dissolve in water, then filter and then dry the solid residue

C dissolve in water, then filter and evaporate the filtrate

D dissolve in water and then distil

3 Which statement about paper chromatography is correct?

A A solvent is needed to dissolve the paper.

B Paper chromatography separates mixtures of solvents.

C The solvent should cover the baseline.

D The baseline should be drawn in pencil.

4 Element X has 7 protons.

Element Y has 8 more protons than X.

Which statement about element Y is correct?

A Y has more electron shells than X.

B Y has more electrons in its outer shell than X.

C Y is in a different group of the Periodic Table from X.

D Y is in the same period of the Periodic Table as X.

5 A covalent molecule Q contains only six shared electrons.

What is Q?

A ammonia, NH_3

B chlorine, Cl_2

C methane, CH_4

D water, H_2O

6 What is the formula of the product of burning sodium in chlorine gas?

A $NaCl$ **B** Na_2Cl **C** $NaCl_2$ **D** Na_2Cl_2

7 Chemical compounds formed from a Group I element and a Group VII element contain ionic bonds.

How are the ionic bonds formed?

A Electrons are transferred from Group VII atoms to Group I atoms.

B Electrons are shared between Group I atoms and Group VII atoms.

C Electrons are lost by Group I atoms and Group VII atoms.

D Electrons are transferred from Group I atoms to Group VII atoms.

8 Some information about particles P, Q, R and S is shown.

	nucleon number	number of neutrons	number of electrons
P	12	6	6
Q	24	12	10
R	16	8	10
S	14	8	6

Which two particles are isotopes of the same element?

A P and Q **B** P and S **C** Q and R **D** R and S

9 What is the relative formula mass of magnesium nitrate, $Mg(NO_3)_2$?

A 74 **B** 86 **C** 134 **D** 148

10 In separate experiments, electricity was passed through concentrated aqueous sodium chloride and molten lead(II) bromide.

What would happen in **both** experiments?

A A halogen would be formed at the anode.

B A metal would be formed at the cathode.

C Hydrogen would be formed at the anode.

D Hydrogen would be formed at the cathode.

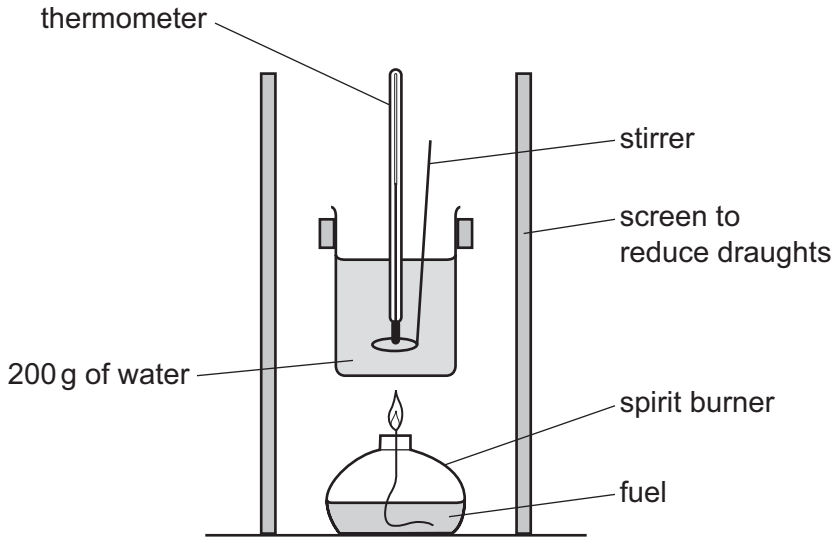
11 A reaction involving aluminium is shown.

$$xAl + yO_2 + 6H_2O \rightarrow xAl(OH)_3$$

Which values of x and y balance the equation?

	x	y
A	2	3
B	3	2
C	3	4
D	4	3

12 Four different fuels are used to heat a beaker of water, for the same amount of time, using the apparatus shown.



The initial temperature of the water and the temperature after heating by the fuel are recorded.

Which fuel releases the most heat energy?

	initial temperature / °C	temperature after heating / °C
A	17	46
B	24	52
C	26	61
D	30	62

13 Which substance is **not** used as a fuel?

A ethanol

B hydrogen

C methane

D oxygen

[Turn over

14 When sulfur is heated it undergoes a .....1..... change as it melts.

Further heating causes the sulfur to undergo a .....2..... change and form sulfur dioxide.

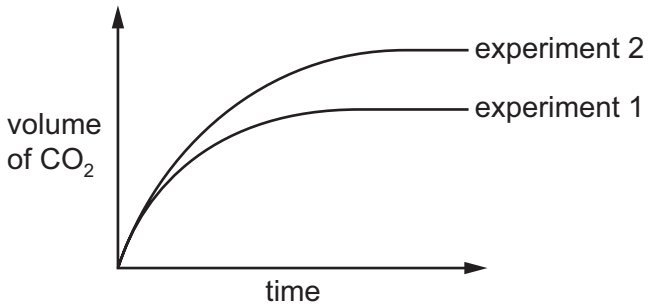
Which words complete gaps 1 and 2?

	1	2
A	chemical	chemical
B	chemical	physical
C	physical	chemical
D	physical	physical

15 An excess of calcium carbonate reacts with dilute hydrochloric acid. The volume of carbon dioxide produced is measured at regular time intervals. The results are shown as experiment 1.

The experiment is repeated with only **one** change to the reaction conditions.

The results are shown as experiment 2.



Which change is made in experiment 2?

A The concentration of the acid is increased.

B The volume of acid is increased.

C The mass of calcium carbonate is increased.

D The calcium carbonate is powdered.

16 The equation represents a reaction that can be reversed by changing the conditions.

$$\underset{\text{blue}}{\text{anhydrous cobalt(II) chloride}} + \text{water} \rightleftharpoons \underset{\text{pink}}{\text{hydrated cobalt(II) chloride}}$$

Which statement is correct?

A When anhydrous cobalt(II) chloride is heated, water vapour is produced.

B Blue cobalt(II) chloride paper turns pink when placed in water vapour.

C Anhydrous cobalt(II) chloride paper is pink and turns blue when placed in water.

D The colour changes from blue to pink when hydrated cobalt(II) chloride is heated.

17 Which statements about acids are correct?

1 They react with carbonates to form carbon dioxide.

2 They react with metals to form hydrogen.

3 They react with ammonium salts to form ammonia.

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

18 Element X forms an oxide, XO, that neutralises sulfuric acid.

Which row describes X and XO?

	element X	nature of oxide, XO
A	metal	acidic
B	metal	basic
C	non-metal	acidic
D	non-metal	basic

19 Which test for the named gas is correct?

A Oxygen extinguishes a lighted splint.

B Hydrogen relights a glowing splint.

C Ammonia turns blue litmus red.

D Carbon dioxide turns limewater milky.

20 Three tests are done to identify the ions present in aqueous solution X.

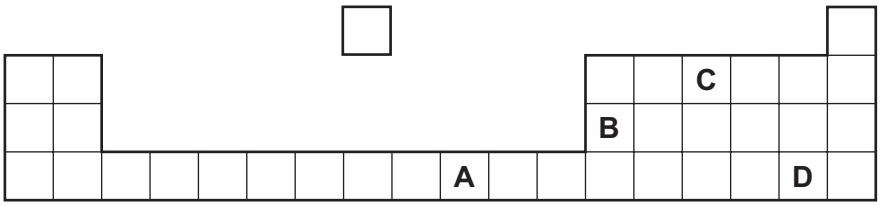
test	test result
dilute nitric acid, followed by aqueous silver nitrate	cream precipitate
aqueous sodium hydroxide	white precipitate, soluble in excess
aqueous ammonia	white precipitate, soluble in excess

Which ions are present in X?

A Al^{3+} and Br^- **B** Al^{3+} and I^- **C** Zn^{2+} and Br^- **D** Zn^{2+} and I^-

21 Part of the Periodic Table is shown.

Which element is a non-metal with the lowest melting point?



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

Which statement about the elements is correct?

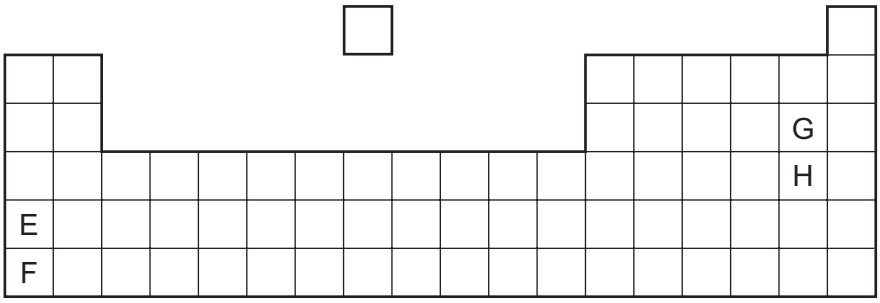
A Na and Mg are poor conductors of electricity.

B Na and Mg react with acids to make hydrogen.

C S and Cl are malleable and ductile.

D S and Cl have the highest melting and boiling points.

23 The diagram shows the positions of elements E, F, G and H in the Periodic Table.



Which statements about elements E, F, G and H are correct?

1 E has a higher density than F.

2 E has a higher melting point than F.

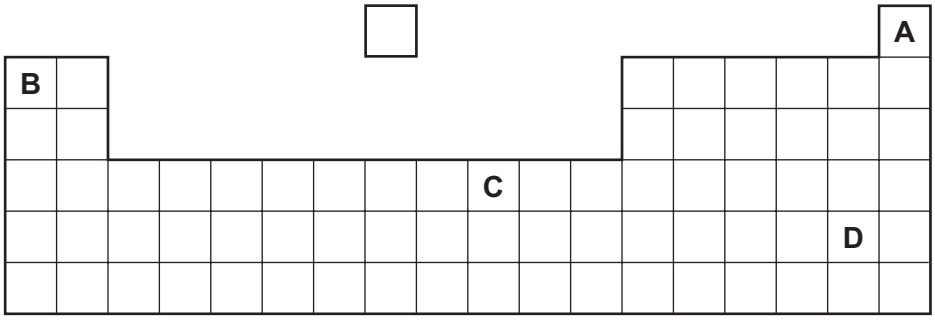
3 G has a darker colour than H.

4 G has a lower melting point than H.

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

24 An element melts at 1455 °C, has a density of 8.90 g / cm^3 and forms a green chloride.

Where in the Periodic Table is this element found?



25 The noble gases are placed in Group VIII of the Periodic Table.

Which statement explains why they are unreactive?

A They have eight electrons in their outer shell.

B They have a full outer shell of electrons.

C They have even numbers of neutrons.

D They have even numbers of protons.

26 Iron from a blast furnace is treated with oxygen and with calcium oxide to make steel.

Which substances in the iron are removed?

	oxygen removes	calcium oxide removes
A	carbon	acidic oxides
B	carbon	basic oxides
C	iron	acidic oxides
D	iron	basic oxides

27 Cobalt, manganese and chromium are all metals.

- Cobalt(II) oxide reacts with carbon to form cobalt metal.
- Manganese(II) oxide does not react with carbon.
- Chromium(II) oxide does not react with carbon.
- Chromium does not react with water.
- Manganese reacts with water.

What is the order of reactivity of these metals?

	least reactive →		most reactive
A	cobalt	chromium	manganese
B	cobalt	manganese	chromium
C	chromium	manganese	cobalt
D	manganese	chromium	cobalt

28 Iron is extracted from hematite. Aluminium is extracted from bauxite.

Which statements about the extraction processes are correct?

1 Both involve reduction.

2 Both take place at high temperature.

3 Both involve electrolysis.

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

29 Which property of aluminium makes it useful for food containers?

A It conducts heat.

B It has low density.

C It is strong.

D It resists corrosion.

30 Which substance is essential for iron nails to rust?

A carbon dioxide

B hydrogen

C nitrogen

D oxygen

31 Which row describes the uses of sulfur and sulfur dioxide?

	sulfur	sulfur dioxide
A	extraction of aluminium	food preservative
B	extraction of aluminium	manufacture of cement
C	manufacture of sulfuric acid	food preservative
D	manufacture of sulfuric acid	manufacture of cement

32 Which substance is a diatomic covalent molecule found in pure dry air?

A argon

B carbon dioxide

C nitrogen

D hydrogen

[Turn over

33 The equations represent two reactions, P and Q, of lime (calcium oxide).

P $CaO + SiO_2 \rightarrow CaSiO_3$

Q $CaO + SO_2 \rightarrow CaSO_3$

In which processes do the reactions occur?

	P	Q
A	extraction of iron	extraction of iron
B	extraction of iron	flue gas desulfurisation
C	flue gas desulfurisation	extraction of iron
D	flue gas desulfurisation	flue gas desulfurisation

34 Which gas is the main constituent of natural gas?

A ethane

B ethene

C methane

D propane

35 Which compounds belong to the same homologous series?

A ethane and propane

B ethanoic acid and ethanol

C methane and ethene

D propene and ethanoic acid

36 Which statement about alkanes is correct?

A They burn in oxygen.

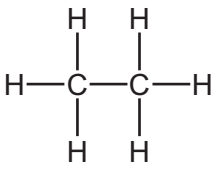
B They contain carbon, hydrogen and oxygen atoms.

C They contain double bonds.

D They contain ionic bonds.

37 Which compound decolourises aqueous bromine?

A



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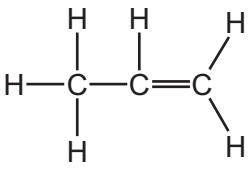

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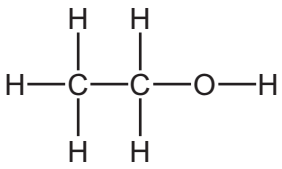

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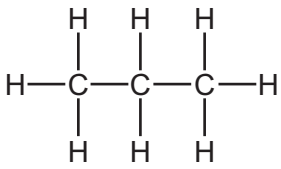


38 What is the chemical equation for the process of fermentation?

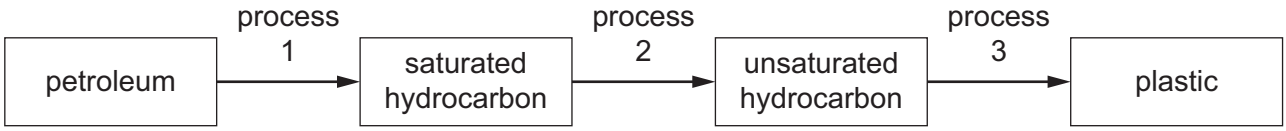
A $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$

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

C $C_6H_{12}O_6 + 3H_2O \rightarrow 3C_2H_5OH + 3O_2$

D $C_6H_{12}O_6 + 3O_2 \rightarrow 6CO + 6H_2O$

39 The flow chart shows how petroleum may be turned into a plastic.



What are processes 1, 2 and 3?

	process 1	process 2	process 3
A	cracking	fractional distillation	polymerisation
B	cracking	polymerisation	fractional distillation
C	fractional distillation	cracking	polymerisation
D	fractional distillation	polymerisation	cracking

40 Which substance is a natural polymer?

A ethene

B *Terylene*

C nylon

D protein

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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.).