Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/13**

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.

IB21 06_0620_13/2RP

[Turn over

1 A 1 cm^3 sample of substance X is taken. This is sample 1.

X is then converted to a different physical state and a 1 cm^3 sample is taken. This is sample 2.

Sample 2 contains more particles in the 1 cm^3 than sample 1.

Which process caused this increase in the number of particles in 1 cm^3?

A boiling of liquid X

B condensation of gaseous X

C evaporation of liquid X

D sublimation of solid X

2 Solid carbon dioxide changes directly into a gas under suitable conditions of temperature and pressure.

Carbon dioxide gas moves from a high concentration to a low concentration.

Which row names these two processes?

	changing from solid to gas	moving from a high concentration to a low concentration
A	evaporation	Brownian motion
B	evaporation	diffusion
C	sublimation	Brownian motion
D	sublimation	diffusion

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 Which piece of apparatus is used to measure exactly 25.00 cm^3 of hydrochloric acid?

A beaker

B measuring cylinder

C pipette

D balance

7 Which statement about isotopes of the same element is correct?

A They have different numbers of electrons.

B They have different numbers of neutrons.

C They have different numbers of protons.

D They have the same mass number.

8 Potassium reacts with iodine to form an ionic compound.

$$2K + I_2 \rightarrow 2KI$$

Which statements describe what happens when potassium reacts with iodine?

1 Each potassium atom loses two electrons.

2 Each potassium atom loses one electron.

3 Each iodine atom gains one electron.

4 Each iodine atom gains two electrons.

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

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 The equation for the decomposition of calcium carbonate is shown.

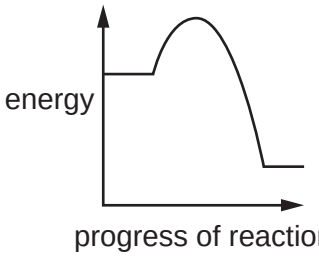
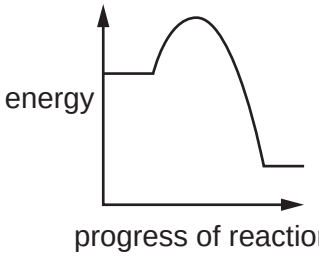
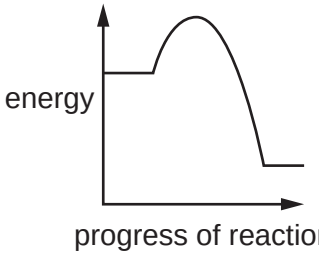
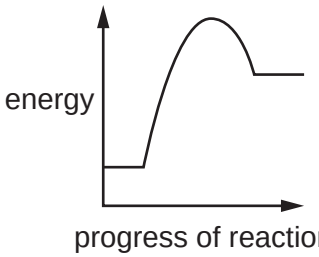
$$CaCO_3 \rightarrow CaO + CO_2$$

What mass of calcium oxide is produced when 10 g of calcium carbonate is heated?

A 4.4 g **B** 5.0 g **C** 5.6 g **D** 10.0 g

12 Heat energy transfer during chemical reactions can be described using energy level diagrams.

In which row is the description correct?

	energy level diagram	description
1		exothermic
2		heat energy absorbed from environment
3		heat energy released to environment
4		endothermic

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

13 The equations for two reactions are shown.

1 $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

2 $2H_2 + O_2 \rightarrow 2H_2O$

Which statement about the reactions is correct?

A Heat energy is released during both these reactions.

B Heat energy is absorbed during both these reactions.

C Heat energy is released during reaction 1 but absorbed during reaction 2.

D Heat energy is released during reaction 2 but absorbed during reaction 1.

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 Copper(II) carbonate reacts with dilute sulfuric acid.

Which conditions produce the fastest rate of reaction?

	form of copper(II) carbonate	temperature of dilute sulfuric acid / °C
A	large lumps	37
B	large lumps	70
C	powder	37
D	powder	70

16 Hydrated copper(II) sulfate is blue. When it is heated it forms white anhydrous copper(II) sulfate.

How is a sample of anhydrous copper(II) sulfate changed into hydrated copper(II) sulfate?

A Water is added.

B It is cooled down.

C It is heated up.

D Water is removed.

17 Copper(II) oxide reacts with iron. The equation for the reaction is shown.

$$3CuO + 2Fe \rightarrow 3Cu + Fe_2O_3$$

Why can this reaction be described as the reduction of copper(II) oxide?

A Iron gains oxygen.

B The copper(II) oxide loses oxygen.

C The copper(II) oxide weighs less after the reaction than before.

D There are fewer substances on the right of the equation.

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 methods of salt preparation are suitable for copper(II) chloride?

1 Add copper(II) carbonate to dilute hydrochloric acid.

2 Add copper to dilute hydrochloric acid.

3 Warm copper(II) oxide with dilute hydrochloric acid.

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

20 A white solid, J, is tested and the observations are shown.

test	observations
flame test	red flame
acidify with nitric acid then add aqueous silver nitrate	white precipitate

What is J?

A lithium bromide

B lithium chloride

C sodium bromide

D sodium chloride

21 Which statement about the Periodic Table is **not** correct?

A Elements in the same period have similar properties.

B It can be used to predict the properties of elements.

C Non-metals are found on the right side of the table.

D There are more metals than non-metals.

22 Bromine and iodine are elements in Group VII of the Periodic Table.

Which statement about these elements is correct?

A Iodine displaces bromide ions from solution.

B Bromine is a lighter colour than iodine.

C Bromine is more dense than iodine.

D Bromine is less reactive than iodine.

23 Helium and neon exist as monoatomic gases at room temperature and pressure.

statement 1 Helium and neon have eight electrons in their outer shell.

statement 2 Helium and neon are unreactive.

Which option is correct?

A Statement 1 and statement 2 are incorrect.

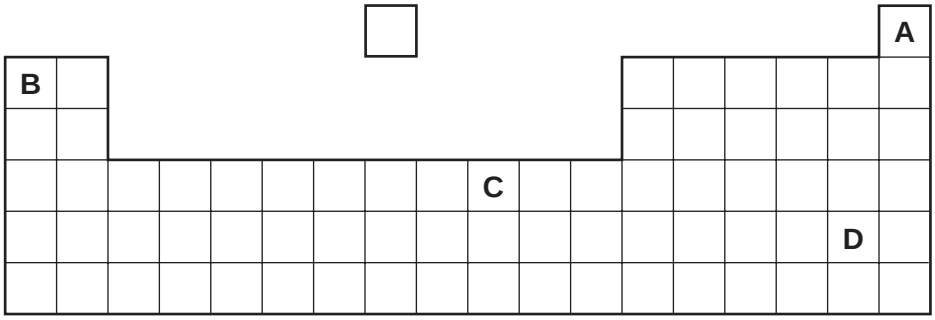
B Statement 1 is correct and explains statement 2.

C Statement 1 is correct, but does not explain statement 2.

D Statement 1 is incorrect, but statement 2 is correct.

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 Which statement about the reactivity of metals is correct?

A Iron is more reactive than magnesium.

B Copper reacts with dilute hydrochloric acid.

C Potassium reacts with cold water.

D Calcium oxide is reduced more easily than iron oxide.

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 Water is removed from reservoirs and undergoes several stages of treatment to make it suitable for drinking.

Which statements about the stages are correct?

1 Chlorine is added to the water to kill harmful bacteria.

2 Water is heated to remove dissolved oxygen gas.

3 Water is filtered to remove solids.

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

28 Which gas is an air pollutant that causes acid rain?

A argon

B carbon monoxide

C methane

D nitrogen dioxide

29 An NPK fertiliser is made by mixing two compounds.

The first compound has the formula $(NH_4)_2HPO_4$.

What is the formula of the second compound?

A $CaCO_3$ **B** KNO_3 **C** $NaCl$ **D** $(NH_4)_2SO_4$

30 Which reaction does **not** occur during the extraction of iron from hematite in a blast furnace?

A $C + O_2 \rightarrow CO_2$

B $CaO + SiO_2 \rightarrow CaSiO_3$

C $CO_2 + C \rightarrow 2CO$

D $4Fe + 3O_2 \rightarrow 2Fe_2O_3$

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 Metal X is a good conductor of electricity and is used for electrical wiring.

Metal Y is used to make an alloy which is resistant to corrosion and is used to make cutlery.

Metal Z is light and strong and is used in the manufacture of aircraft.

What are X, Y and Z?

	X	Y	Z
A	aluminium	iron	copper
B	copper	iron	aluminium
C	aluminium	copper	iron
D	copper	aluminium	iron

33 Which statement about calcium carbonate is correct?

A It is made by the thermal decomposition of limestone.

B It is used to neutralise alkaline soils.

C It is a reactant in the test for carbon dioxide.

D It is used to remove impurities in iron extraction.

34 What is the main constituent of natural gas?

A hydrogen

B methane

C nitrogen

D oxygen

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 P, Q, R and S are organic compounds.

P is formed by reacting ethene with steam.

Q decolourises bromine water.

R is a hydrocarbon; all of its bonds are single covalent bonds.

S is a waste product from digestion in animals.

Which compounds are alkanes?

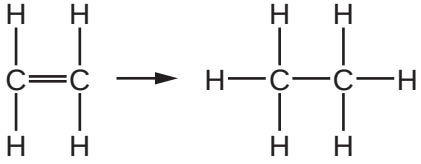
A P and Q **B** P and S **C** Q and R **D** R and S

38 Which row describes how ethanol is used?

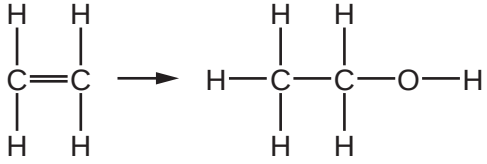
	fuel	solvent
A	no	no
B	no	yes
C	yes	no
D	yes	yes

39 Which diagram shows the conversion of ethene into ethanol?

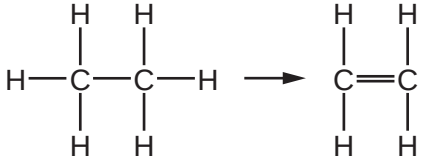
A



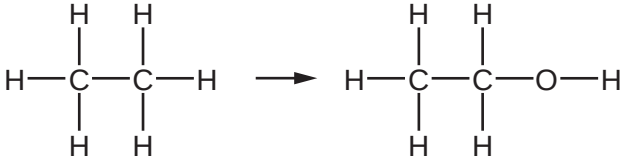
B



C



D



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.).