Cambridge Assessment International Education

Cambridge IGCSE™

CHEMISTRY **0620/22**

Paper 2 Multiple Choice (Extended) **February/March 2022**

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.

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[Turn over

1 Which gas has the fastest rate of diffusion?

A H_2 **B** CH_4 **C** CO_2 **D** SO_2

2 In which state does 1 dm^3 of methane contain the most particles?

A gas at 100 °C

B gas at room temperature

C liquid

D solid

3 Which statement explains why isotopes of the same element have the same chemical properties?

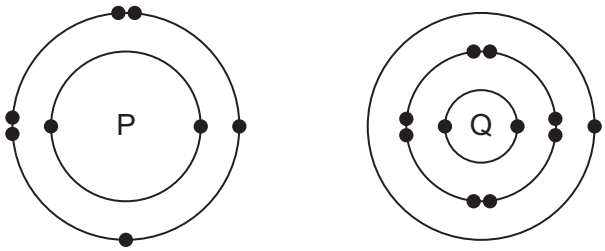
A They have the same electronic structure.

B They have the same relative mass.

C They have the same nucleon number.

D They have the same proton number.

4 The electronic structures of atoms P and Q are shown.



P and Q form an ionic compound.

What is the formula of the compound?

A PQ **B** P_2Q **C** P_2Q_3 **D** PQ_2

5 Fermentation of sugar produces a mixture of ethanol solution and solid yeast.

How is the solid yeast removed from the mixture?

A crystallisation

B distillation

C filtration

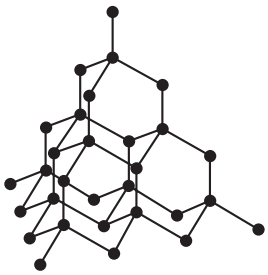
D fractional distillation

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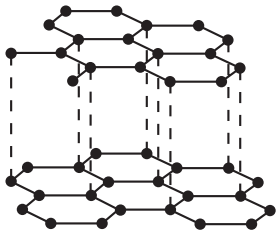
6 Which row explains why copper is a good conductor of electricity at room temperature?

	copper ions move freely	electrons move freely
A	no	no
B	no	yes
C	yes	no
D	yes	yes

7 Which pair of statements about diamond and graphite is correct?



diamond



graphite

A Diamond and graphite are both pure carbon. They are both macromolecules.

B Diamond and graphite can both be used as electrodes. Graphite is also used as a lubricant.

C Diamond has covalent bonds. Graphite has ionic bonds.

D Diamond is hard with a high melting point. Graphite is soft with a low melting point.

8 Sodium nitride contains the nitride ion, N^{3-}.

Sodium nitride is unstable and decomposes into its elements.

What is the equation for the decomposition of sodium nitride?

A $2NaN_3 \rightarrow 2Na + 3N_2$

B $2Na_3N \rightarrow 6Na + N_2$

C $2NaN_3 \rightarrow Na_2 + 3N_2$

D $2Na_3N \rightarrow 6Na + 2N$

9 Compound X contains carbon, hydrogen and oxygen only.

By mass, it contains 26.7% carbon and 2.2% hydrogen.

What is the empirical formula of X?

A CHO **B** C_2HO **C** CH_2O **D** CHO_2

10 Caesium fluoride is an ionic compound.

Which statements about caesium fluoride are correct?

1 It conducts electricity when solid.

2 It has a high melting point.

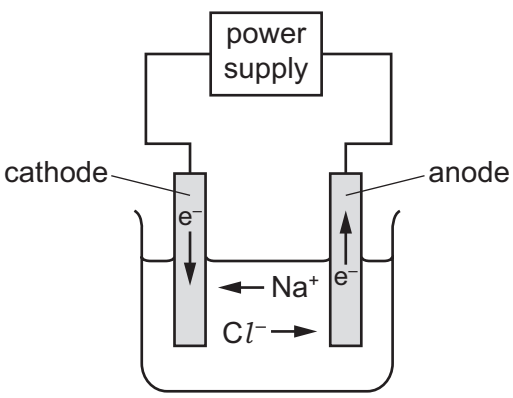
3 It is soluble in water.

4 It is highly volatile.

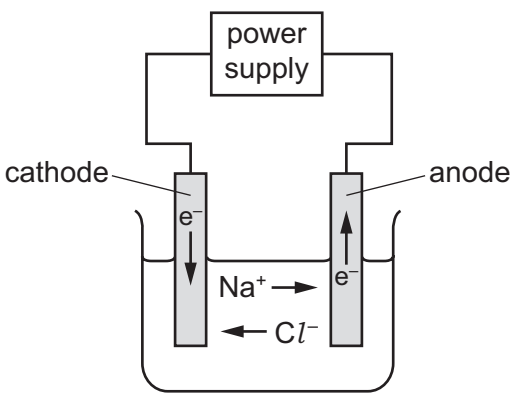
A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

11 Which diagram shows the direction of movement of ions and electrons during the electrolysis of molten sodium chloride?

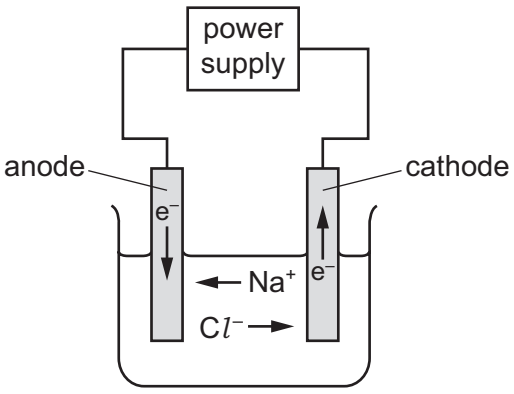
A



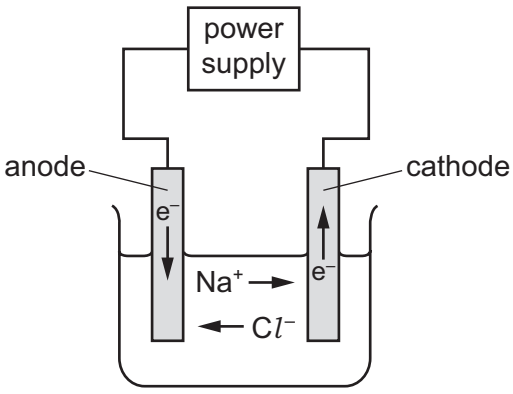
B



C



D



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12 Calcium carbonate, $CaCO_3$, reacts with dilute hydrochloric acid to produce carbon dioxide.

The equation for the reaction is shown. The relative formula mass of calcium carbonate is 100.

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$$

10 g of calcium carbonate is reacted with an excess of dilute hydrochloric acid.

Which mass of carbon dioxide is produced?

A 2.2 g **B** 2.8 g **C** 4.4 g **D** 44 g

13 Molten sodium chloride and concentrated aqueous sodium chloride are electrolysed using platinum electrodes.

What are the products at the negative electrode (cathode) in each electrolysis?

	molten sodium chloride	concentrated aqueous sodium chloride
A	hydrogen	hydrogen
B	hydrogen	sodium
C	sodium	hydrogen
D	sodium	sodium

14 An object is electroplated with silver using an aqueous silver salt as the electrolyte.

Which row is correct?

	the object to be electroplated is the	the other electrode is made from
A	anode	carbon
B	anode	silver
C	cathode	carbon
D	cathode	silver

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15 Which row describes the changes that occur in an endothermic reaction?

	energy change	temperature
A	energy given out to the surroundings	decreases
B	energy given out to the surroundings	increases
C	energy taken in from the surroundings	decreases
D	energy taken in from the surroundings	increases

16 Which statement about fuels is correct?

A Heat energy is only produced by burning fuels.

B Hydrogen is used as a fuel although it is difficult to store.

C Methane is a good fuel because it produces only water when burned.

D Uranium is burned in air to produce energy.

17 Which statement about endothermic and exothermic reactions is correct?

A In an endothermic reaction, less energy is absorbed in bond breaking than is released in bond forming.

B In an endothermic reaction, the activation energy is always higher than in an exothermic reaction.

C In an exothermic reaction, more energy is absorbed in bond breaking than is released in bond forming.

D In an exothermic reaction, the reactants are higher on an energy level diagram than the products.

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18 The reaction used to manufacture ammonia from nitrogen and hydrogen is reversible.

An equilibrium is established between ammonia, nitrogen and hydrogen.

Which statement describes the equilibrium?

A Both the forward reaction and the backward reaction have the same rate.

B The rate of the backward reaction is greater than the rate of the forward reaction.

C The rate of the forward reaction is greater than the rate of the backward reaction.

D The forward and backward reactions have both stopped.

19 How does increasing the concentration affect the reacting particles in a chemical reaction?

	increases the collision rate	increases the proportion of particles with the activation energy
A	✓	✗
B	✓	✓
C	✗	✗
D	✗	✓

20 Methyl orange is added to dilute hydrochloric acid and to aqueous sodium hydroxide.

What is the colour of the methyl orange in each solution?

	colour in dilute hydrochloric acid	colour in aqueous sodium hydroxide
A	orange	red
B	red	yellow
C	red	orange
D	yellow	red

21 Zinc oxide is an amphoteric oxide.

Which types of substances will react with zinc oxide?

A acids and bases

B acids only

C bases only

D neither acids nor bases

22 Information about some silver compounds is shown.

compound	formula	solubility in water
silver carbonate	Ag_2CO_3	insoluble
silver chloride	$AgCl$	insoluble
silver nitrate	$AgNO_3$	soluble
silver oxide	Ag_2O	insoluble

Which equation shows a reaction which **cannot** be used to make a silver salt?

A $AgNO_3(aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3(aq)$

B $Ag_2O(s) + 2HNO_3(aq) \rightarrow 2AgNO_3(aq) + H_2O(l)$

C $Ag_2CO_3(s) + 2HNO_3(aq) \rightarrow 2AgNO_3(aq) + H_2O(l) + CO_2(g)$

D $2Ag(s) + 2HCl(aq) \rightarrow 2AgCl(s) + H_2(g)$

23 Aqueous ethanoic acid is a weak acid.

Aqueous sodium hydroxide is a strong base.

Aqueous ethanoic acid is neutralised by aqueous sodium hydroxide.

Which statements are correct?

1 Aqueous ethanoic acid accepts protons from hydroxide ions.

2 The aqueous ethanoic acid used is fully dissociated into ions.

3 The aqueous sodium hydroxide used is fully dissociated into ions.

4 The reaction produces a salt and water.

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

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24 Three properties of element X are listed.

- It contains atoms with a full outer shell of electrons.
- It is monoatomic.
- It is unreactive.

In which part of the Periodic Table is the element placed?

A Group I

B Group VII

C Group VIII

D transition elements

25 Which word equation represents a reaction that occurs?

A sodium oxide + carbon $\rightarrow$ sodium + carbon dioxide

B sodium oxide + iron $\rightarrow$ sodium + iron(II) oxide

C iron(II) oxide + copper $\rightarrow$ iron + copper(II) oxide

D iron(III) oxide + carbon $\rightarrow$ iron + carbon dioxide

26 Which statement about the extraction of aluminium is correct?

A Aluminium is formed at the cathode during the electrolysis of aluminium oxide.

B Hematite is mainly aluminium oxide.

C Molten cryolite is used to raise the melting point of the aluminium oxide.

D Oxygen gains electrons at the anode during the electrolysis of aluminium oxide.

27 Metal M is mixed with copper to produce brass.

What is M?

A chromium

B nickel

C vanadium

D zinc

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28 The table gives some properties of an element.

melting point in °C	3422
appearance of the element	grey
appearance of the chloride of the element	dark blue
density in g / cm^3	19.2
electrical conductivity when solid	good

Which other property does this element have?

A acts as a catalyst

B brittle

C forms an acidic oxide

D highly reactive with water

29 Ammonia is produced using the Haber process.

Which row shows the source of the raw materials and the reaction conditions?

	source of nitrogen	source of hydrogen	temperature / °C	pressure / atm
A	air	hydrocarbons	200	200
B	hydrocarbons	air	450	2
C	air	hydrocarbons	450	200
D	air	hydrocarbons	450	2

30 How many species are acting as bases in this reversible reaction?

$$HNO_3 + H_2O \rightleftharpoons H_3O^+ + NO_3^-$$

A 3 **B** 2 **C** 1 **D** 0

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31 The equation for a reaction occurring in the Contact process is shown.

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

What is the catalyst used in this reaction?

A iron

B phosphoric(V) acid

C sulfuric acid

D vanadium(V) oxide

32 Which information about carbon dioxide and methane is correct?

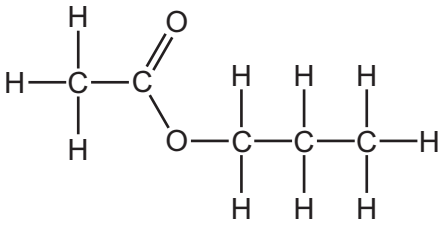
		carbon dioxide	methane
A	formed when vegetation decomposes	✓	✗
B	greenhouse gas	✓	✓
C	present in unpolluted air	✗	✗
D	produced during respiration	✗	✓

key

✓ = correct

✗ = not correct

33 The structure of an ester is shown.



What are the names of the carboxylic acid and the alcohol that react together to form this ester?

	carboxylic acid	alcohol
A	ethanoic acid	ethanol
B	ethanoic acid	propan-1-ol
C	propanoic acid	ethanol
D	propanoic acid	propan-1-ol

34 Which statements about lime are correct?

1 Lime is made by heating calcium carbonate (limestone).

2 Lime is used to desulfurise flue gases.

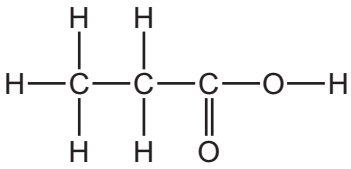
3 Lime is used to treat alkaline soil.

4 The chemical name for lime is calcium oxide.

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

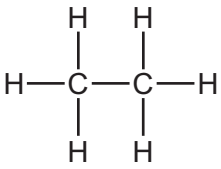
35 Which structure is correctly named?

A



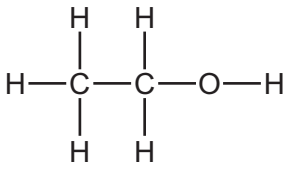
ethanoic acid

B



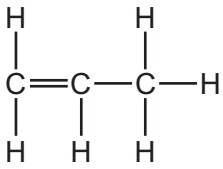
ethene

C



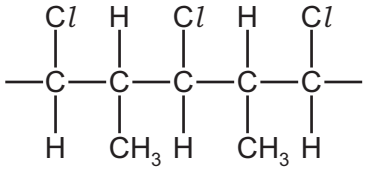
ethanol

D



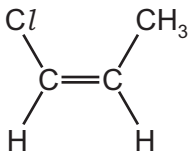
propane

36 The structure of part of a polymer is shown.

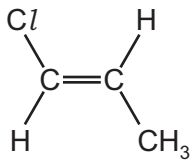


Which monomers can be used to make this polymer?

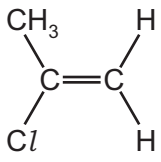
1



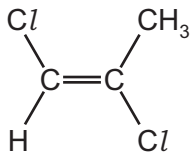
2



3



4



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

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37 Carboxylic acids are made by the oxidation of alcohols.

Which carboxylic acid is produced from CH_3CH_2OH?

A butanoic acid

B ethanoic acid

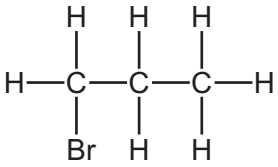
C methanoic acid

D propanoic acid

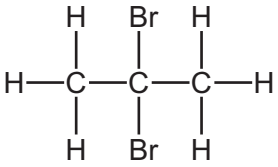
38 Propene, C_3H_6, reacts with bromine, Br_2, in an addition reaction.

Which structure represents the product of this reaction?

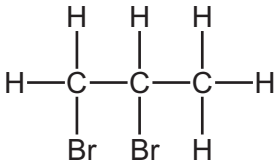
A



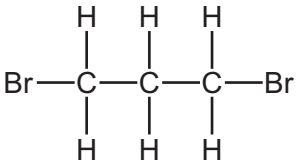
B



C



D



39 Which statements about ethanol are correct?

1 Ethanol is used as a solvent.

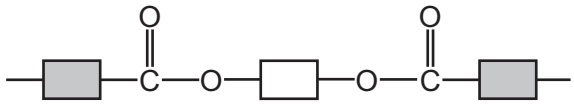
2 Ethanol can be made directly from ethane.

3 Ethanol is a covalent compound.

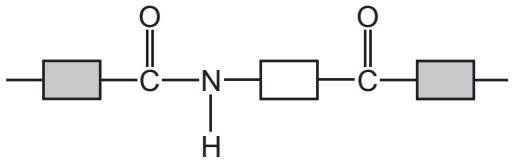
A 1 only **B** 1 and 2 **C** 1 and 3 **D** 2 and 3

40 Which diagram represents the structure of nylon?

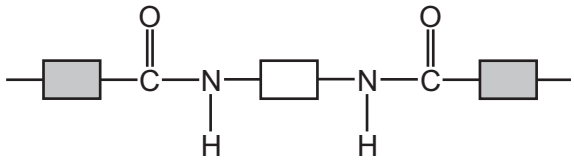
A



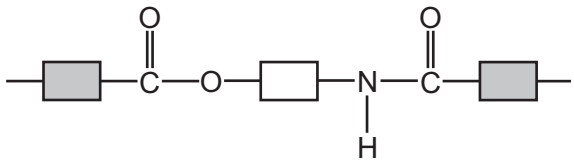
B



C



D



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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.).