



Cambridge International Examinations
Cambridge Ordinary Level

CHEMISTRY

5070/12

Paper 1 Multiple Choice

October/November 2017

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB recommended)



READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Do not use staples, paper clips, glue or correction fluid.

Write your name, Centre number and candidate number on the Answer Sheet in the spaces provided unless this has been done for you.

DO NOT WRITE IN ANY BARCODES.

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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

Each correct answer will score one mark. A mark will not be deducted for a wrong answer.

Any rough working should be done in this booklet.

A copy of the Periodic Table is printed on page 16.

Electronic calculators may be used.

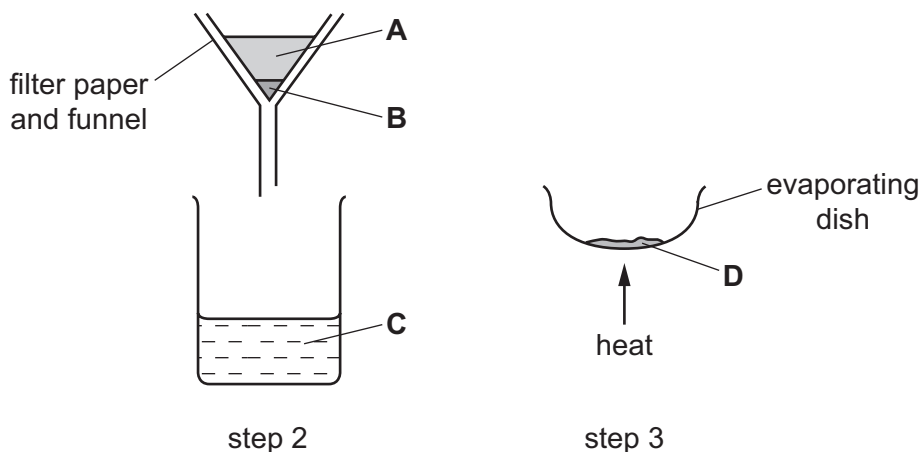
This document consists of **15** printed pages and **1** blank page.

- 1 A mixture of sand and sodium chloride can be separated in three steps.

Step 1 is to add water to the mixture.

The diagram shows step 2 and step 3.

Where is pure sodium chloride collected?

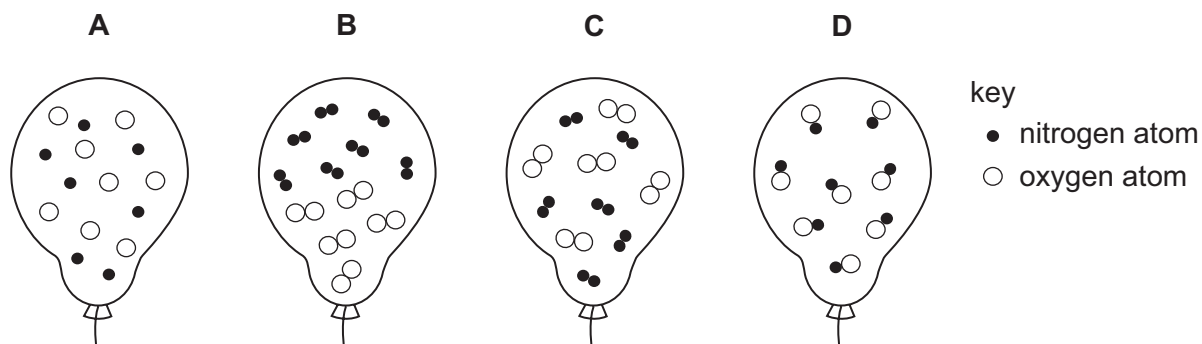


- 2 The results of two tests on solution X are shown.

reagent added	observation on adding a few drops of reagent	observation on adding an excess of reagent
aqueous sodium hydroxide	white precipitate	precipitate dissolves
aqueous ammonia	white precipitate	precipitate remains

Which ion is present in solution X?

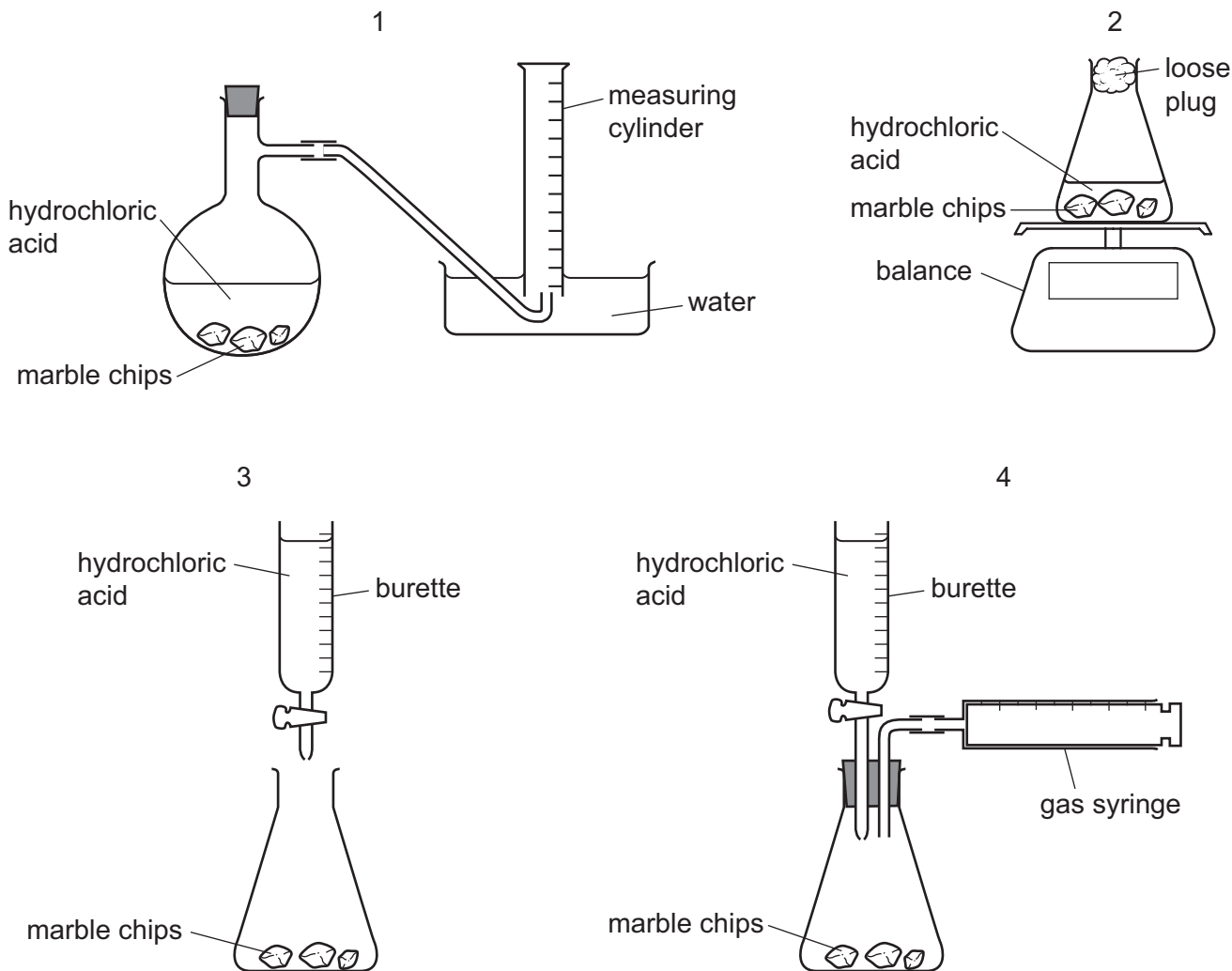
- A Al^{3+} B Ca^{2+} C Cu^{2+} D Zn^{2+}
- 3 Which diagram shows the arrangement of particles inside a balloon containing a mixture of the gases nitrogen and oxygen?



- 4 A student follows the rate of the reaction between marble chips, CaCO_3 , and dilute hydrochloric acid.



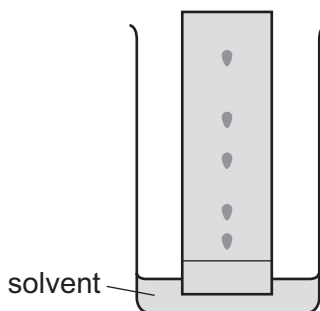
Which diagrams show apparatus that is suitable for this experiment?



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

4

- 5 A chemist wishes to separate and identify a mixture of substances using paper chromatography. The diagram shows the apparatus used. The solvent is water.



The solvent front is allowed to reach the top of the paper before the chemist removes the paper from the solvent.

Which problem does this cause?

- A** This causes the spot nearest the bottom of the paper to catch up with the spot above it.
- B** This makes it impossible to calculate R_f values.
- C** This makes it impossible to use a locating agent.
- D** This results in a safety hazard caused by solvent fumes.
- 6 Which particle contains the same number of both neutrons and electrons?
- A** ${}^{40}_{20}\text{Ca}^{2+}$ **B** ${}^{24}_{12}\text{Mg}^{2+}$ **C** ${}^{19}_{9}\text{F}^{-}$ **D** ${}^{32}_{16}\text{S}^{2-}$
- 7 Which statement is correct for all metals?
- A** They are hard and brittle.
- B** They are made up of a lattice of positive and negative ions.
- C** They conduct electricity by movement of electrons.
- D** They conduct electricity by movement of ions.

- 8 X represents the element of atomic number 8 and Y represents the element of atomic number 16.

The two elements react together to form a compound.

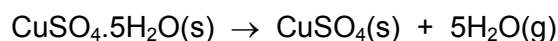
Which row is correct for the compound formed?

	formula	type of bonding
A	Y_2X	covalent
B	Y_2X	ionic
C	X_2Y	covalent
D	X_2Y	ionic

- 9 The empirical formula of a liquid compound is C_2H_4O .

To find the empirical formula, it is necessary to know

- A** the density of the compound.
 - B** the percentage composition by mass of the compound.
 - C** the relative molecular mass of the compound.
 - D** the volume occupied by 1 mole of the compound.
- 10 25.0 g of hydrated copper(II) sulfate crystals are heated to produce anhydrous copper(II) sulfate and water vapour.



What is the mass of anhydrous copper(II) sulfate formed?

[M_r : $CuSO_4$, 160; H_2O , 18]

- A** 9.0 g **B** 16.0 g **C** 22.5 g **D** 25.0 g
- 11 Which sample contains the most atoms?
- A** 0.5 moles of water
 - B** 1.0 moles of carbon dioxide
 - C** 1.0 moles of methane
 - D** 2.0 moles of hydrogen chloride
- 12 The relative atomic mass of chlorine is 35.5.
- What is the mass of 2 moles of chlorine gas?
- A** 17.75 g **B** 35.5 g **C** 71 g **D** 142 g

- 13 One mole of an organic compound, **Q**, is completely burnt in oxygen and produces exactly three moles of water.

Which compound is **Q**?

- A butane, C_4H_{10}
- B ethanol, C_2H_5OH
- C propane, C_3H_8
- D propanol, C_3H_7OH

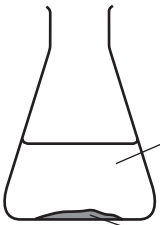
- 14 In an experiment, 1 mol of powdered copper and 1 mol of powdered zinc are placed in a flask.

Dilute acid, containing 1 mol of acid, is added to the flask.

The flask is left until all the reactions, if any, are complete.

Which diagram shows the result of the experiment?

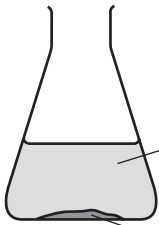
A



colourless neutral solution

1 mol of copper

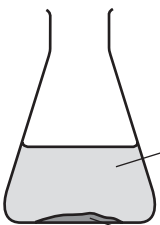
B



blue neutral solution

0.5 mol of copper + 0.5 mol of zinc

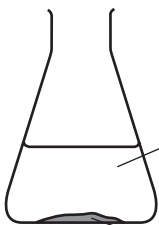
C



blue neutral solution

1 mol of zinc

D



colourless acidic solution

1 mol of copper + 1 mol of zinc

- 15** A simple cell can be made using two different metals as the electrodes and an aqueous solution as the electrolyte.

Which statements about simple cells are correct?

- 1 A greater voltage is produced using magnesium and silver than using magnesium and copper.
- 2 The electrolyte is an aqueous solution containing both positive and negative ions.
- 3 The more reactive metal will release electrons.

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

- 16** Magnesium can be produced by electrolysis of molten magnesium chloride, $MgCl_2$.

What are the equations for the reactions that occur at the positive electrode and at the negative electrode?

	positive electrode	negative electrode
A	$2Cl^- \rightarrow Cl_2 + 2e^-$	$2H^+ + 2e^- \rightarrow H_2$
B	$Cl_2 + 2e^- \rightarrow 2Cl^-$	$Mg^{2+} + 2e^- \rightarrow Mg$
C	$2Cl^- \rightarrow Cl_2 + 2e^-$	$Mg^{2+} + 2e^- \rightarrow Mg$
D	$2Cl^- \rightarrow Cl_2 + 2e^-$	$Mg^{2+} + 2e^- \rightarrow 2Mg$

- 17** Three different solutions were electrolysed using inert electrodes.

- solution 1 aqueous sodium chloride
 solution 2 concentrated hydrochloric acid
 solution 3 dilute sulfuric acid

Which solutions produce hydrogen at the negative electrode?

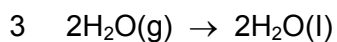
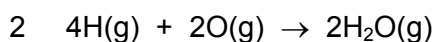
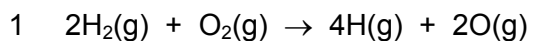
A 1, 2 and 3 **B** 1 and 2 only **C** 1 only **D** 2 and 3 only

- 18** Compound **Y** reacts with oxygen. This reaction has a positive enthalpy change of reaction, ΔH .

What information can be deduced about **Y** and its reaction with oxygen?

- A** Compound **Y** can be used as a fuel.
- B** Compound **Y** could be a hydrocarbon.
- C** In the reaction the energy needed to break bonds is greater than the energy released when bonds are made.
- D** In the reaction the products are at a lower energy level than the reactants.

19 The formation of liquid water from hydrogen and oxygen may occur in three stages.



Which stages are endothermic?

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

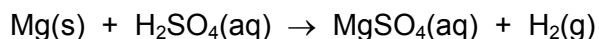
20 Sulfur trioxide is produced by the following reaction.



Which change in conditions would produce a greater amount of SO_3 at equilibrium?

- A adding a catalyst
B increasing the pressure
C increasing the temperature
D removing some SO_2 and O_2

21 Magnesium reacts with dilute sulfuric acid.



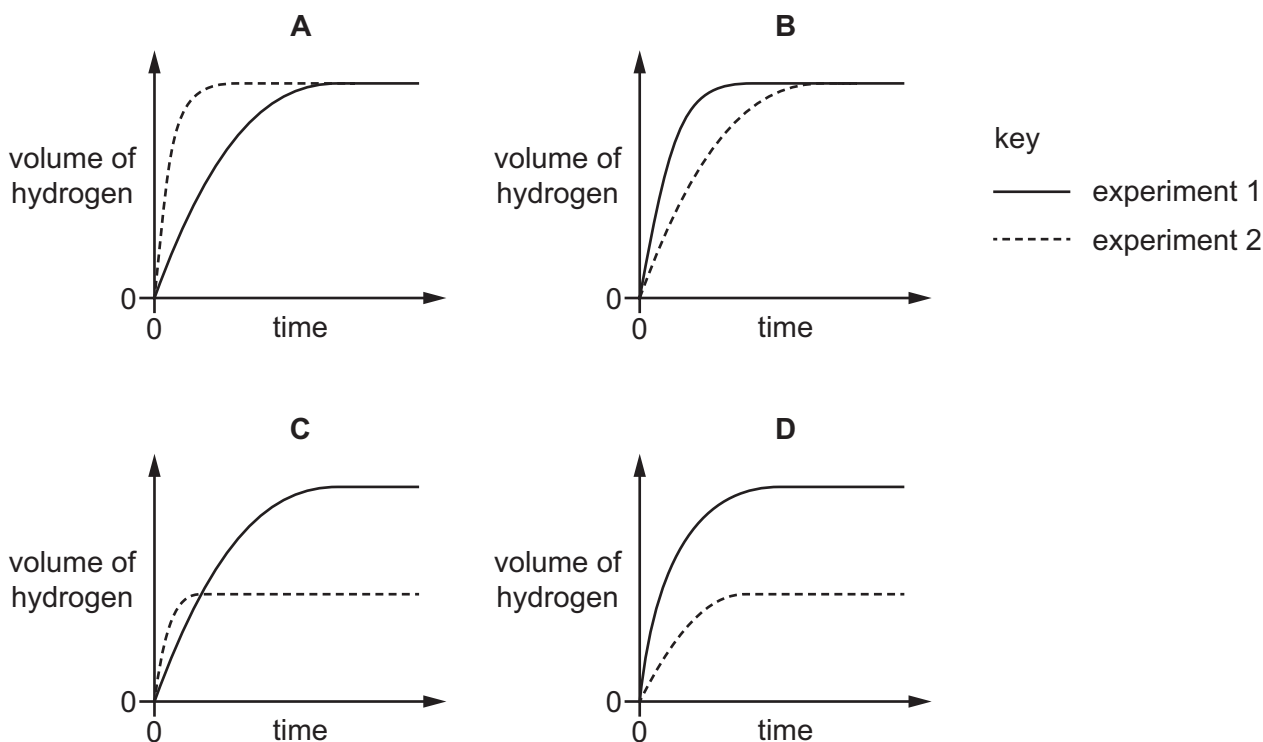
Two experiments were carried out.

experiment 1 24.0 g of magnesium was reacted with 100 cm³ of 1.0 mol/dm³ sulfuric acid.

experiment 2 24.0 g of magnesium was reacted with 50 cm³ of 2.0 mol/dm³ sulfuric acid.

In each experiment the volume of hydrogen was measured at various times. The results were plotted on a graph.

Which graph is correct?



22 Which statement is correct for both aluminium and iron?

- A Both form 2+ ions.
- B Both have amphoteric oxides.
- C The manufacture of both metals involves the reduction of the metal ions.
- D They are both normally manufactured by electrolysis.

- 23 A household cleaning compound is used to remove calcium carbonate from bathroom surfaces.

The compound reacts with the calcium carbonate to form a soluble salt, carbon dioxide and water.

What is the pH of this cleaning compound?

- A pH 2 B pH 7 C pH 10 D pH 14

- 24 Dilute hydrochloric acid is added separately to samples of copper, copper(II) oxide and copper(II) carbonate.

Which row correctly shows whether copper(II) chloride is produced?

	Cu	CuO	CuCO ₃
A	✓	✓	✓
B	x	✓	x
C	✓	x	✓
D	x	✓	✓

key

✓ = copper(II) chloride produced

x = copper(II) chloride not produced

- 25 Which ions are present when hydrochloric acid has exactly neutralised aqueous sodium hydroxide?

- A Na⁺, Cl⁻, H⁺ and OH⁻
 B Na⁺, Cl⁻ and H⁺ only
 C Na⁺ and Cl⁻ only
 D H⁺ and OH⁻ only

- 26 Which experiment will result in the formation of a white precipitate?

- A aqueous barium nitrate added to aqueous sodium chloride
 B aqueous sodium carbonate added to aqueous calcium chloride
 C carbon dioxide passed through aqueous potassium chloride
 D dilute hydrochloric acid added to aqueous ammonia

- 27 Which statement about both the Group I and Group VII elements is correct?

- A They conduct electricity when molten.
 B They form covalent compounds when bonded to non-metals.
 C They exist as diatomic molecules.
 D When Group I elements combine with Group VII elements, ionic compounds form.

28 The elements helium, argon and neon are noble gases.

Which statement is correct?

- A All these elements have eight electrons in their outer shell.
- B Argon is used to react with impurities in the manufacture of steel.
- C Helium is used in balloons as it is more dense than air.
- D Neon is used in light bulbs to give an inert atmosphere.

29 Which row shows the correct catalyst for each industrial process?

	manufacture of sulfuric acid	manufacture of ammonia	manufacture of margarine
A	nickel	iron	vanadium(V) oxide
B	nickel	vanadium(V) oxide	iron
C	vanadium(V) oxide	iron	nickel
D	vanadium(V) oxide	nickel	iron

30 In the solid state, germanium has the same structure as diamond.

What is the likely melting point of germanium?

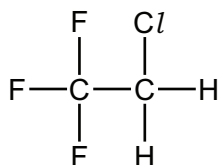
- A above 800 °C
- B between 100 °C and 800 °C
- C 100 °C
- D below 100 °C

31 Aluminium is a metal that is often used to make caps for bottles. When thrown away and buried in the soil, the caps do not corrode.

Why is this?

- A Aluminium does not react with acids.
- B Aluminium does not react with alkalis.
- C Aluminium is alloyed with other metals.
- D Aluminium is protected by a layer of oxide.

- 32 Which statement about Group I metals is correct?
- A They are hard compared with most other metals.
 - B They form coloured compounds.
 - C They have high densities compared with most other metals.
 - D They only form ions with a charge of +1.
- 33 CFC compounds were used as aerosol propellants. The structure of one CFC compound is shown.



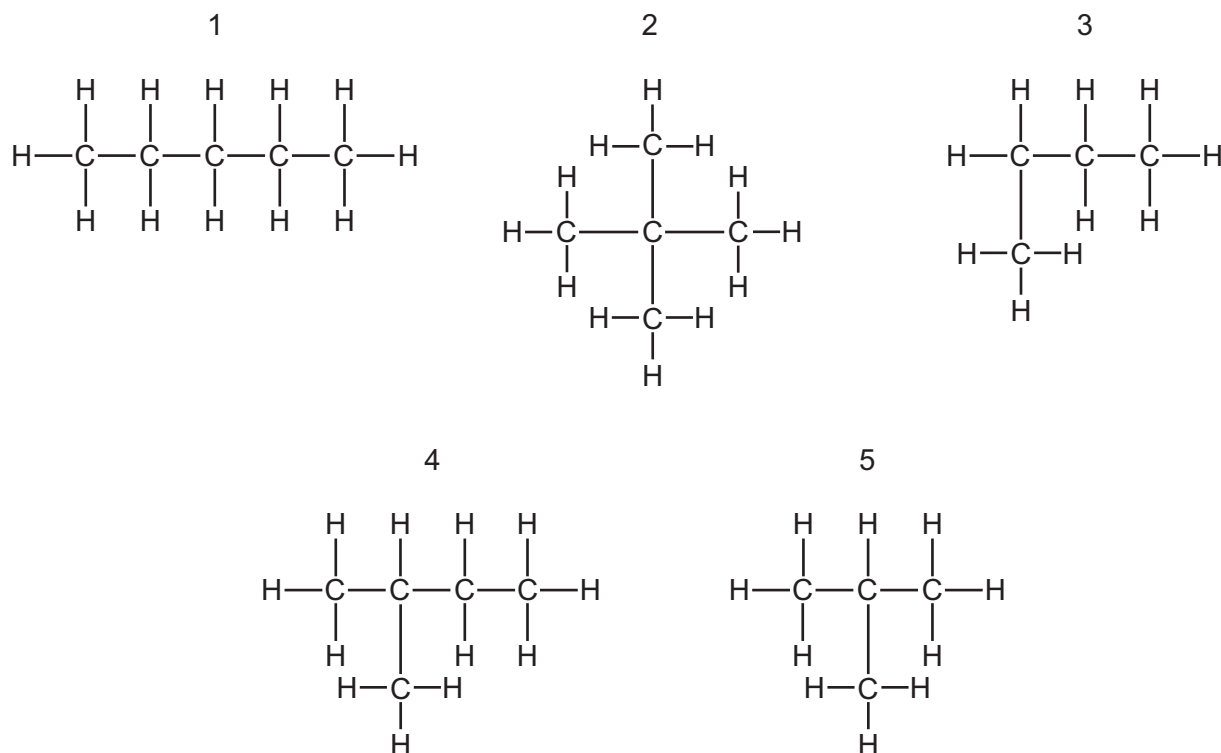
Which element in this compound causes a depletion of ozone in the atmosphere?

- A carbon
 - B chlorine
 - C fluorine
 - D hydrogen
- 34 Dry air is a mixture of gases of which 99% is nitrogen and oxygen.
- What is the main constituent of the remaining 1%?
- A argon
 - B helium
 - C hydrogen
 - D water vapour
- 35 Why is chlorine added to the water supply?
- A Chlorine is used to desalinate the water.
 - B Chlorine kills bacteria that may be present in the water.
 - C Chlorine precipitates solids that may be present in the water.
 - D Chlorine removes tastes and odours from the water.

36 When the alcohol of molecular formula $C_4H_{10}O$ is oxidised, what is the molecular formula of the acid formed?

- A $C_4H_{12}O_2$ B $C_4H_{10}O_2$ C $C_4H_8O_2$ D $C_4H_6O_2$

37 The diagrams show the structures of five hydrocarbons.



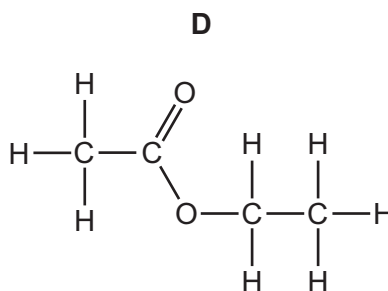
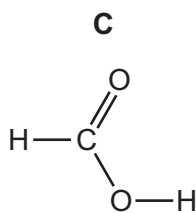
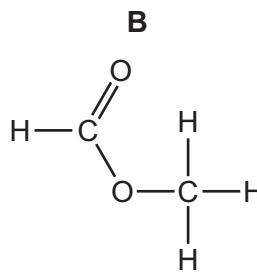
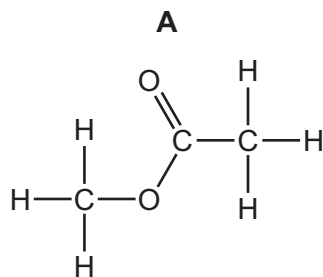
Which three hydrocarbons are isomers of each other?

- A 1, 2 and 4 B 2, 3 and 5 C 2, 3 and 4 D 3, 4 and 5

38 Which alcohol and acid will react together to make the ester $CH_3COOC_2H_5$?

- A CH_3OH and CH_3COOH
 B CH_3OH and C_2H_5COOH
 C C_2H_5OH and CH_3COOH
 D C_2H_5OH and C_2H_5COOH

39 Which compound has a pH of less than 7 in aqueous solution?



40 Which statement about polymers is correct?

- A** Nylon and *Terylene* are produced by addition polymerisation.
- B** Nylon and *Terylene* both contain the amide linkage.
- C** Simple sugars can be produced by hydrolysing proteins.
- D** Starch contains the elements carbon, hydrogen and oxygen.

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The Periodic Table of Elements

		Group																																		
I	II	III	IV	V	VI	VII	VIII																													
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18																			
Li lithium 7	Be beryllium 9	B boron 11	C carbon 12	N nitrogen 14	O oxygen 16	F fluorine 19	Ne neon 20						He helium 4																							
11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40							
Na sodium 23	Mg magnesium 24	Al aluminium 27	Si silicon 28	P phosphorus 31	S sulfur 32	Cl chlorine 35.5	Ar argon 40																													
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	
K potassium 39	Ca calcium 40	Sc scandium 45	Ti titanium 48	V vanadium 51	Cr chromium 52	Mn manganese 55	Fe iron 56	Co cobalt 59	Ni nickel 59	Cu copper 64	Zn zinc 65	Ga gallium 70	Ge germanium 73	As arsenic 75	Se selenium 79	Br bromine 80	Kr krypton 84	Rb rubidium 85	Sr strontium 88	Y yttrium 89	Zr zirconium 91	Nb niobium 93	Mo molybdenum 96	Tc technetium —	Ru ruthenium 101	Rh rhodium 103	Pd palladium 106	Ag silver 108	Cd cadmium 112	In indium 115	Sn tin 119	Sb antimony 122	Te tellurium 128	I iodine 127	Xe xenon 131	
55	56	57-71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	
Cs caesium 133	Ba barium 137	lanthanoids	Hf hafnium 178	Ta tantalum 181	W tungsten 184	Re rhenium 186	Os osmium 190	Ir iridium 192	Pt platinum 195	Au gold 197	Hg mercury 201	Tl thallium 204	Pb lead 207	Bi bismuth 209	Po polonium —	At astatine —	Rn radon —	Fr francium —	Ra radium —	actinoids	Rf rutherfordium —	Db dubnium —	Sg seaborgium —	Bh bohrium —	Hs hassium —	Mt meitnerium —	Ds darmstadtium —	Rg roentgenium —	Cn copernicium —	Fl flerovium —	Lv livermorium —	Uu ununoctium —	Uub unubium —	Uut ununium —	Uuq ununium —	Uuq ununium —

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71
	La lanthanum 139	Ce cerium 140	Pr praseodymium 141	Nd neodymium 144	Pm promethium —	Sm samarium 150	Eu europium 152	Gd gadolinium 157	Tb terbium 159	Dy dysprosium 163	Ho holmium 165	Er erbium 167	Tm thulium 169	Yb ytterbium 173	Lu lutetium 175
actinoids	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103
	Ac actinium —	Th thorium 232	Pa protactinium 231	U uranium 238	Np neptunium —	Pu plutonium —	Am americium —	Cm curium —	Bk berkelium —	Cf californium —	Es einsteinium —	Fm fermium —	Md mendelevium —	No nobelium —	Lr lawrencium —

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).