Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CHEMISTRY **0620/01**

Paper 1 Multiple Choice (Core) **For Examination from 2016**

SPECIMEN PAPER

45 minutes

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is 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 18.
Electronic calculators may be used.

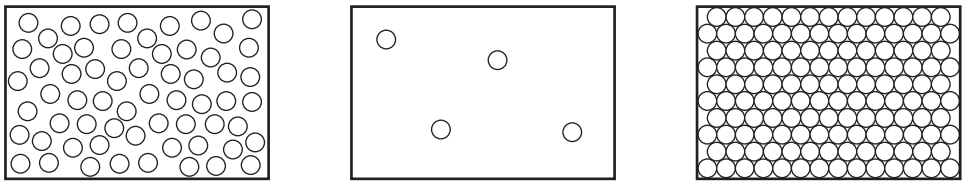
The syllabus is accredited for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **18** printed pages.

CAMBRIDGE International Examinations

[Turn over

1 The diagrams show the arrangement of particles in three different physical states of substance X.



state 1 state 2 state 3

Which statement about the physical states of substance X is correct?

A Particles in state 1 vibrate about fixed positions.

B State 1 changes to state 2 by diffusion.

C State 2 changes directly to state 3 by condensation.

D The substance in state 3 has a fixed volume.

2 What is always true for a pure substance?

A It always boils at 100 °C.

B It contains only one type of atom.

C It has a sharp melting point.

D It is solid at room temperature.

3 Element Y has a nucleon number of 19 and a proton number of 9.

Which group in the Periodic Table does it belong to?

A I **B** III **C** VII **D** VIII

4 The nucleon number and proton number of the lithium atom are shown by the symbol $^{7}_{3}\text{Li}$.

What is the correct symbol for the lithium ion in lithium chloride?

A $^{6}_{2}\text{Li}^{-}$ **B** $^{6}_{3}\text{Li}^{+}$ **C** $^{7}_{3}\text{Li}^{+}$ **D** $^{7}_{3}\text{Li}^{-}$

5 What is the relative molecular mass, M_r, of HNO_3?

A 5 **B** 31 **C** 32 **D** 63

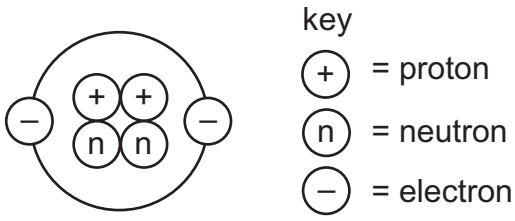
6 The table shows the structure of different atoms and ions.

particle	proton number	nucleon number	number of protons	number of neutrons	number of electrons
Mg	12	24	12	W	12
Mg^{2+}	X	24	12	12	10
F	9	19	9	Y	9
F^-	9	19	9	10	Z

What are the values of W, X, Y and Z?

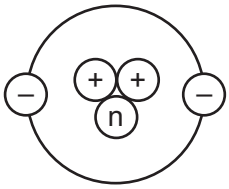
	W	X	Y	Z
A	10	10	9	9
B	10	12	10	9
C	12	10	9	10
D	12	12	10	10

7 The diagram shows the structure of an atom.



Which diagram shows the structure of an isotope of this atom?

A



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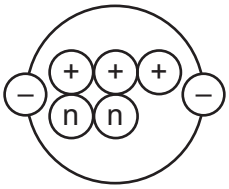

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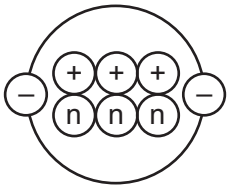

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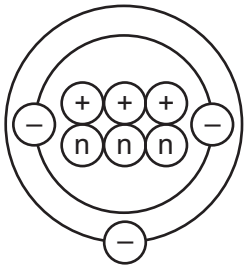


8 Which two elements react together to form an ionic compound?

element	electronic structure
R	2,4
T	2,8
X	2,8,1
Z	2,8,7

A R and T **B** T and X **C** X and Z **D** Z and R

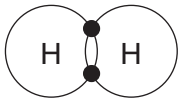
9 Element X forms an acidic, covalent oxide.

Which row shows how many electrons there could be in the outer shell of an atom of X?

	1	2	6	7
A	✓	✓	×	×
B	✓	×	✓	×
C	×	×	✓	✓
D	×	✓	×	✓

10 Which diagram does **not** show the outer shell electrons in the molecule correctly?

A



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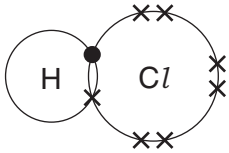

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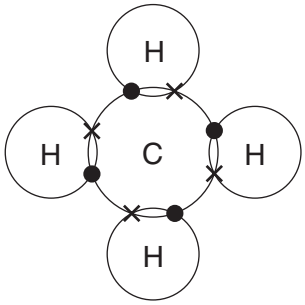

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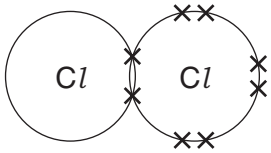


11 The chemical formulae of two substances, W and X, are given.

W $NaAlSi_3O_8$

X $CaAl_2Si_2O_8$

Which statements are correct?

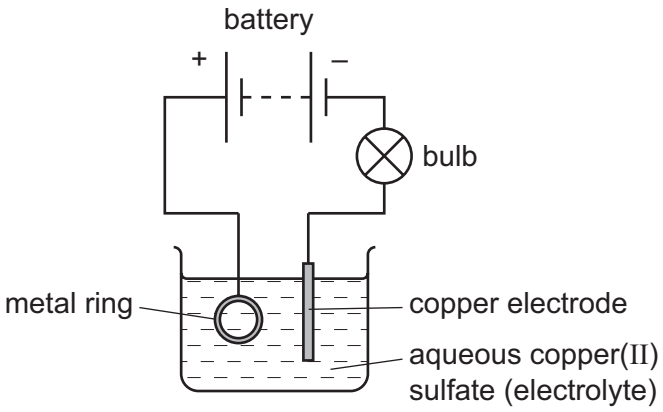
1 W and X contain the same amount of oxygen.

2 W contains three times as much silicon as X.

3 X contains twice as much aluminium as W.

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

12 The diagram shows apparatus used in an attempt to electroplate a metal ring with copper.



The experiment did not work.

Which change is needed in the experiment to make it work?

A Add solid copper(II) sulfate to the electrolyte.

B Increase the temperature of the electrolyte.

C Replace the copper electrode with a carbon electrode.

D Reverse the connections to the battery.

13 Three electrolysis cells are set up. Each cell has inert electrodes.

The electrolytes are listed below.

cell 1	aqueous sodium chloride
cell 2	dilute sulfuric acid
cell 3	molten lead(II) bromide

In which of these cells is a gas formed at **both** electrodes?

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

14 Which process is **not** exothermic?

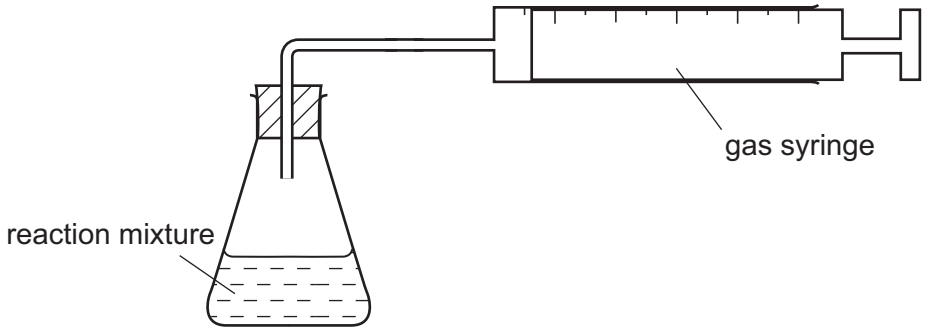
A burning a fossil fuel

B obtaining lime from limestone

C radioactive decay of ^{235}U

D reacting hydrogen with oxygen

15 The apparatus shown can be used to measure the rate of some chemical reactions.



For which two reactions would this apparatus be suitable?

reaction 1 $AgNO_3(aq) + HCl(aq) \rightarrow AgCl(s) + HNO_3(aq)$

reaction 2 $2H_2O_2(aq) \rightarrow 2H_2O(l) + O_2(g)$

reaction 3 $MgO(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2O(l)$

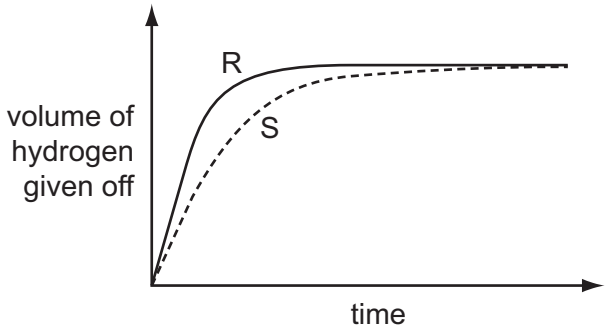
reaction 4 $ZnCO_3(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + CO_2(g) + H_2O(l)$

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

16 A student investigates the rate of reaction between magnesium and excess sulfuric acid.

The volume of hydrogen given off in the reaction is measured over time.

The graph shows the results of two experiments, R and S.



Which change in conditions would cause the difference between R and S?

A A catalyst is added in S.

B The acid is more concentrated in R than in S.

C The magnesium is less finely powdered in R than in S.

D The temperature in R is lower than in S.

17 When pink cobalt(II) chloride crystals are heated they form steam and a blue solid.

When water is added to the blue solid, it turns pink and becomes hot.

Which terms describe the pink cobalt(II) chloride crystals and the reactions?

	pink cobalt(II) chloride	reactions
A	aqueous	irreversible
B	anhydrous	reversible
C	hydrated	irreversible
D	hydrated	reversible

18 The red colour in some pottery glazes may be formed as a result of the reactions shown.

$$CuCO_3 \xrightarrow{\text{heat}} CuO + CO_2$$

$$CuO + SnO \longrightarrow Cu + SnO_2$$

These equations show that .....1..... is oxidised and .....2..... is reduced.

Which substances correctly complete gaps 1 and 2 in the above sentence?

	1	2
A	CO_2	SnO_2
B	$CuCO_3$	CuO
C	CuO	SnO
D	SnO	CuO

19 Carbon dioxide gas reacts with aqueous sodium hydroxide.

Which type of reaction takes place?

A decomposition

B fermentation

C neutralisation

D oxidation

20 An aqueous solution of the organic compound methylamine has a pH greater than 7.

Which statement about methylamine is correct?

A It neutralises an aqueous solution of sodium hydroxide.

B It reacts with copper(II) carbonate to give carbon dioxide.

C It reacts with hydrochloric acid to form a salt.

D It turns blue litmus red.

21 A solution contains barium ions and silver ions and one type of anion.

What could the anion be?

A chloride only

B nitrate only

C sulfate only

D chloride or nitrate or sulfate

22 A mixture containing two anions was tested and the results are shown below.

test	result
dilute nitric acid added	effervescence of a gas which turned limewater milky
dilute nitric acid added, followed by aqueous silver nitrate	yellow precipitate formed

Which anions were present?

A carbonate and chloride

B carbonate and iodide

C sulfate and chloride

D sulfate and iodide

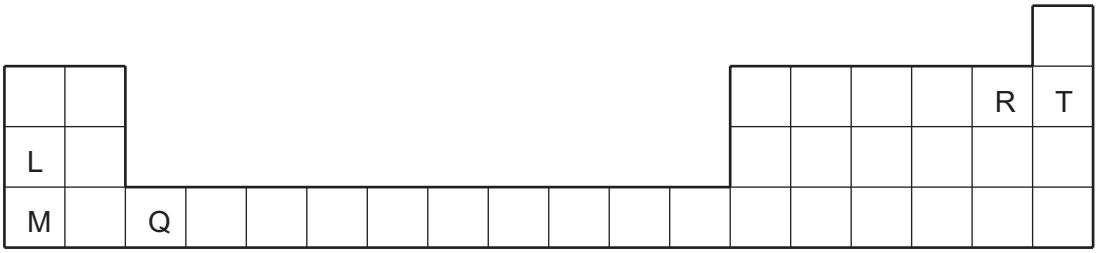
23 Astatine is an element in Group VII of the Periodic Table. It has only ever been produced in very small amounts.

What are the likely properties of astatine?

	colour	state	reaction with aqueous potassium iodide
A	black	solid	no reaction
B	dark brown	gas	brown colour
C	green	solid	no reaction
D	yellow	liquid	brown colour

24 The diagram shows the positions of elements L, M, Q, R and T in the Periodic Table.

These letters are not the chemical symbols of the elements.



Which statement about the properties of these elements is correct?

A L reacts more vigorously with water than does M.

B L, M and Q are all metals.

C T exists as diatomic molecules.

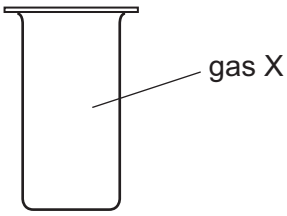
D T is more reactive than R.

25 The table compares the properties of Group I elements with those of transition elements.

Which entry in the table is correct?

	property	Group I elements	transition elements
A	catalytic activity	low	high
B	density	high	low
C	electrical conductivity	low	low
D	melting point	high	low

26 X is a monatomic gas.



Which statement about gas X is correct?

A X burns in air.

B X is coloured.

C X is unreactive.

D X will displace iodine from potassium iodide.

27 Aluminium is an important metal with many uses.

Some of its properties are listed.

1 It is a good conductor of heat.

2 It has a low density.

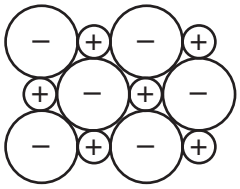
3 It has an oxide layer that prevents corrosion.

Which set of properties help to explain the use of aluminium for cooking and storing food?

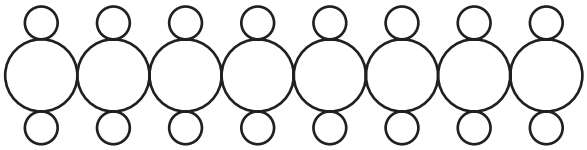
A 1 only **B** 1 and 2 only **C** 2 and 3 only **D** 1, 2 and 3

28 Which diagram could represent the structure of an alloy?

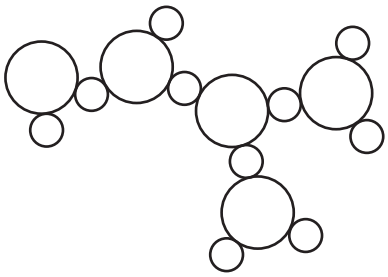
A



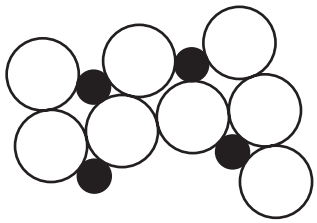
B



C



D



29 The table shows the results of adding three metals, P, Q and R, to dilute hydrochloric acid and to water.

metal	dilute hydrochloric acid	water
P	hydrogen produced	hydrogen produced
Q	no reaction	no reaction
R	hydrogen produced	no reaction

What is the order of reactivity of the metals?

	most reactive ⟶		least reactive
A	P	R	Q
B	P	Q	R
C	R	Q	P
D	R	P	Q

30 The table gives the composition of the atmosphere of four newly discovered planets.

planet	composition of atmosphere
W	argon, carbon dioxide and oxygen
X	argon, nitrogen and oxygen
Y	argon, carbon dioxide and methane
Z	methane, nitrogen and oxygen

On which planets is the greenhouse effect likely to occur?

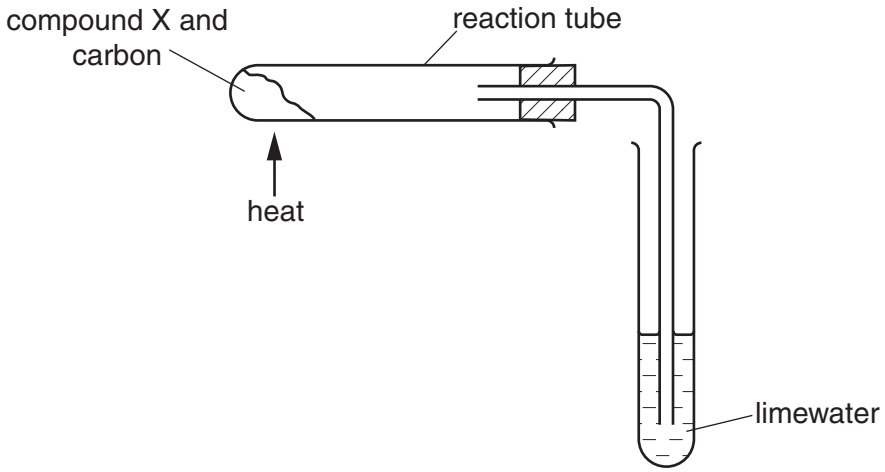
A W only

B W, X and Z

C W and Y only

D W, Y and Z

31 Compound X is heated with carbon using the apparatus shown.



A brown solid is formed in the reaction tube and the limewater turns cloudy.

What is compound X?

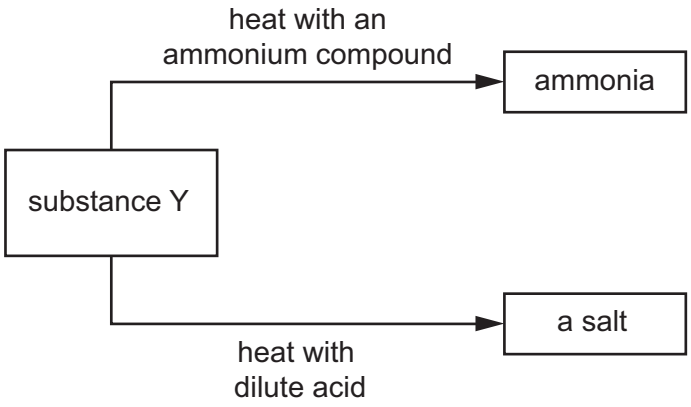
A calcium oxide

B copper(II) oxide

C magnesium oxide

D sodium oxide

32 The diagram shows some reactions of substance Y.



Which type of substance is Y?

A an alcohol

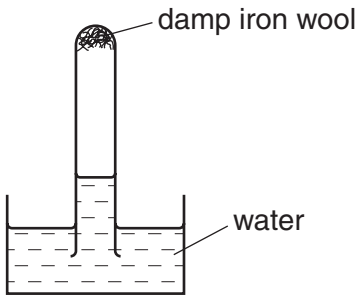
B a base

C a catalyst

D a metal

33 A test-tube containing damp iron wool is inverted in water.

After three days, the water level inside the test-tube has risen.



Which statement explains this rise?

A Iron oxide has been formed.

B Iron wool has been reduced.

C Oxygen has been formed.

D The temperature of the water has risen.

34 Greenhouse gases may contribute to climate change.

Two of these gases are emitted into the atmosphere as a result of processes within animals.

Gas …..1….. is produced by process …..3….. .

Gas …..2….. is produced by process …..4….. .

Which row correctly complete gaps 1, 2, 3 and 4?

	1	2	3	4
A	CO	C_2H_6	digestion	respiration
B	CO	C_2H_6	respiration	digestion
C	CO_2	CH_4	digestion	respiration
D	CO_2	CH_4	respiration	digestion

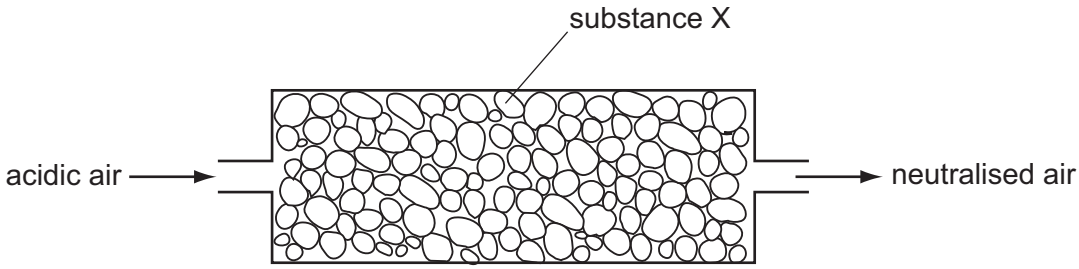
35 To grow rose plants, a fertiliser containing nitrogen, phosphorus and potassium is often used.

For the best rose flowers, the fertiliser should contain a high proportion of potassium.

Which fertiliser is best for producing rose flowers?

fertiliser	proportion by mass		
	N	P	K
A	9	0	25
B	13	13	20
C	29	5	0
D	29	15	5

36 Air containing an acidic impurity was neutralised by passing it through a column containing substance X.



What is substance X?

A calcium oxide

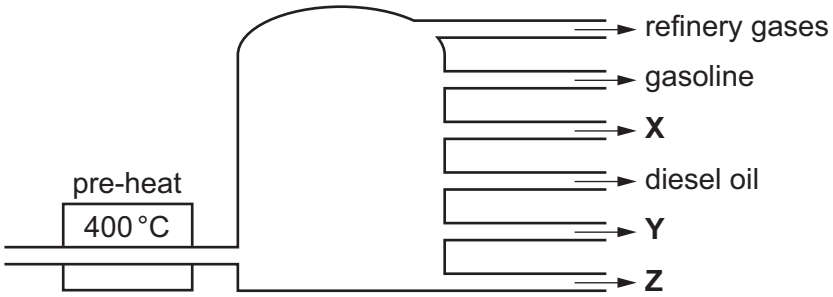
B sand

C sodium chloride

D concentrated sulfuric acid

37 In an oil refinery, petroleum is separated into useful fractions.

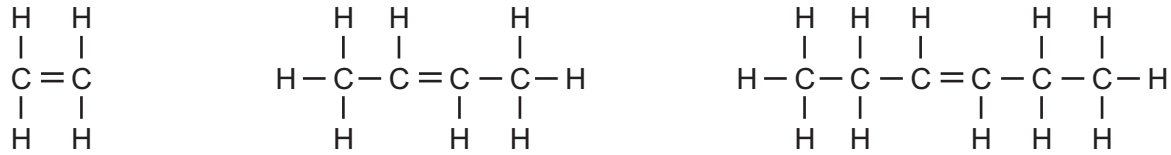
The diagram shows some of these fractions.



What are fractions X, Y and Z?

	X	Y	Z
A	fuel oil	bitumen	paraffin (kerosene)
B	fuel oil	paraffin (kerosene)	bitumen
C	paraffin (kerosene)	bitumen	fuel oil
D	paraffin (kerosene)	fuel oil	bitumen

38 The structures of three compounds are shown.



Why do these substances all belong to the same homologous series?

A They all contain an even number of carbon atoms.

B They all contain the same functional group.

C They are all hydrocarbons.

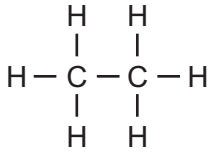
D They are all saturated.

39 Which bond is **not** in a molecule of ethanoic acid?

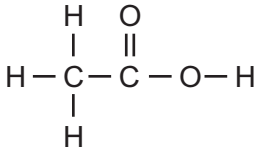
A C–O **B** C=O **C** C=C **D** O–H

40 Which structure is **incorrect**?

A



B



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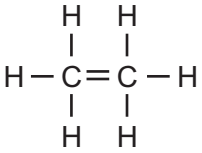

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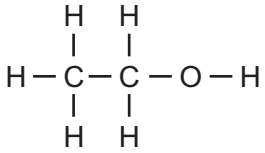

Group																		
I	II										III	IV	V	VI	VII	VIII		
																2 He helium 4		
											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20		
											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40		
3 Li lithium 7	4 Be beryllium 9										31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84		
11 Na sodium 23	12 Mg magnesium 24										49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131		
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

1 H hydrogen 1

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.)