**Location Entry Codes**

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As part of CIE's continual commitment to maintaining best practice in assessment, CIE uses different variants of some question papers for our most popular assessments with large and widespread candidature. The question papers are closely related and the relationships between them have been thoroughly established using our assessment expertise. All versions of the paper give assessment of equal standard.

The content assessed by the examination papers and the type of questions is unchanged.

This change means that for this component there are now two variant Question Papers, Mark Schemes and Principal Examiner's Reports where previously there was only one. For any individual country, it is intended that only one variant is used. This document contains both variants which will give all Centres access to even more past examination material than is usually the case.

The diagram shows the relationship between the Question Papers, Mark Schemes and Principal Examiners' Reports that are available.

| **Question Paper** | **Mark Scheme** | **Principal Examiner's Report** |
|---|---|---|
| Introduction | Introduction | Introduction |
| First variant Question Paper | First variant Mark Scheme | First variant Principal Examiner's Report |
| Second variant Question Paper | Second variant Mark Scheme | Second variant Principal Examiner's Report |

**Who can I contact for further information on these changes?**
Please direct any questions about this to CIE's Customer Services team at:
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The titles for the variant items should correspond with the table above, so that at the top of the first page of the relevant part of the document and on the header, it has the words:

- First variant Question Paper / Mark Scheme / Principal Examiner's Report

or

- Second variant Question Paper / Mark Scheme / Principal Examiner's Report

as appropriate.

First Variant Question Paper

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

**CHEMISTRY** **0620/11**

Paper 1 Multiple Choice **May/June 2009**

**45 Minutes**

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

*7177477880*

**READ THESE INSTRUCTIONS FIRST**

Write in soft pencil.
Do not use staples, paper clips, highlighters, 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.

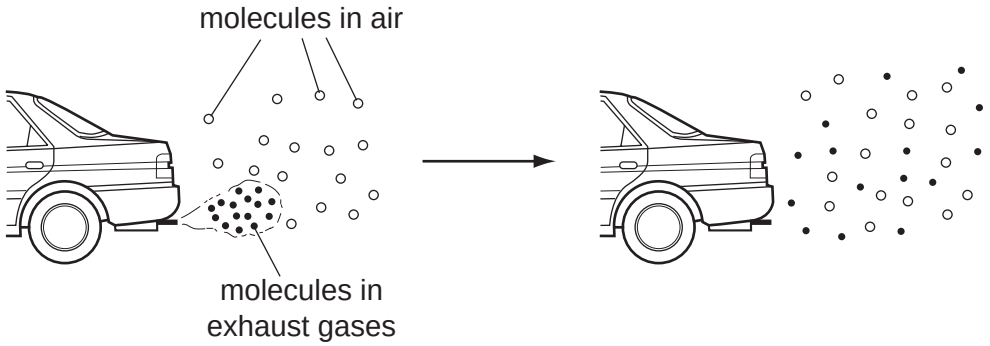
There are **forty** questions on this paper. Answer **all** questions. For each question there are four possible answers **A**, **B**, **C** and **D**.
Choose the **one** you consider correct and record your choice in **soft pencil** on the separate Answer Sheet.

**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.
You may use a calculator.

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

**1** The diagram shows how the molecules in the exhaust gases diffuse into the air.




Which statement describes what happens to these molecules next?

**A** The molecules fall to the ground because they are heavier than air molecules.

**B** The molecules go back together as they cool.

**C** The molecules spread further into the air.

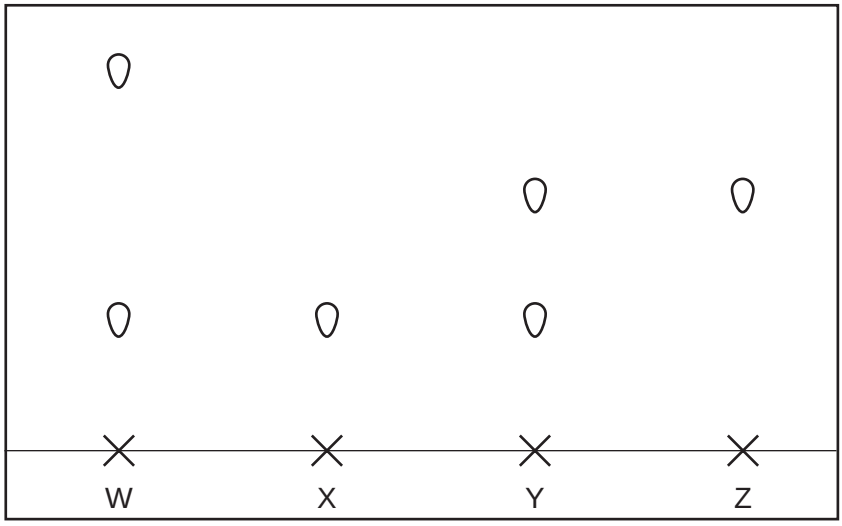
**D** The molecules stay where they are.

**2** A student takes 2 g samples of calcium carbonate and adds them to 20 $cm^3$ samples of dilute hydrochloric acid at different temperatures. She measures how long it takes for the effervescence to stop.

Which apparatus does she use?

| | balance | clock | filter funnel | measuring cylinder | thermometer |
|---|---|---|---|---|---|
| **A** | ✓ | ✓ | ✓ | ✓ | ✗ |
| **B** | ✓ | ✓ | ✗ | ✓ | ✓ |
| **C** | ✓ | ✗ | ✓ | ✓ | ✓ |
| **D** | ✗ | ✓ | ✓ | ✗ | ✓ |

**3** The diagram shows the paper chromatograms of four substances, W, X, Y and Z.




Which two substances are pure?

**A** W and X **B** W and Y **C** X and Y **D** X and Z

**4** An element S has the proton number 18. The next element in the Periodic Table is an element T.

Which statement is correct?

**A** Element T has one more electron in its outer shell than element S.

**B** Element T has one more electron shell than element S.

**C** Element T is in the same group of the Periodic Table as element S.

**D** Element T is in the same period of the Periodic Table as element S.

**5** Which numbers are added together to give the nucleon number of an ion?

**A** number of electrons + number of neutrons

**B** number of electrons + number of protons

**C** number of electrons + number of protons + number of neutrons

**D** number of protons + number of neutrons

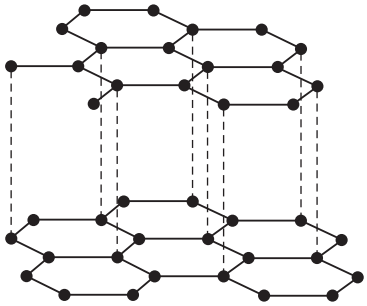
**6** The electronic configuration of an ion is 2.8.8.

What could this ion be?

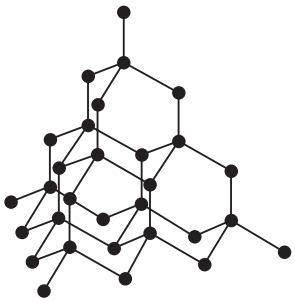
| | $S^{2-}$ | $Ca^{2+}$ |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

**7** The diagrams show the structures of two forms, P and Q, of a solid element.

P



Q



What are suitable uses of P and Q, based on their structures?

| | use of solid P | use of solid Q |
|---|---|---|
| **A** | drilling | drilling |
| **B** | drilling | lubricating |
| **C** | lubricating | drilling |
| **D** | lubricating | lubricating |

**8** Element V forms an acidic, covalent oxide.

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

| | 1 | 2 | 6 | 7 |
|---|---|---|---|---|
| **A** | ✓ | ✗ | ✗ | ✗ |
| **B** | ✓ | ✓ | ✗ | ✗ |
| **C** | ✗ | ✗ | ✗ | ✓ |
| **D** | ✗ | ✗ | ✓ | ✓ |

**9** When sodium chloride is formed from its elements, each chlorine atom ……1…… one ……2…….

Which words correctly complete gaps 1 and 2?

| | 1 | 2 |
|---|---|---|
| **A** | gains | electron |
| **B** | gains | proton |
| **C** | loses | electron |
| **D** | loses | proton |

**10** Nitrogen and hydrogen react together to form ammonia.

$$N_2 + 3H_2 \rightarrow 2NH_3$$

When completely converted, 7 tonnes of nitrogen gives 8.5 tonnes of ammonia.

How much nitrogen will be needed to produce 34 tonnes of ammonia?

**A** 7 tonnes **B** 8.5 tonnes **C** 28 tonnes **D** 34 tonnes

**11** Which relative molecular mass, $M_r$, is **not** correct for the molecule given?

| | molecule | $M_r$ |
|---|---|---|
| **A** | ammonia, $NH_3$ | 17 |
| **B** | carbon dioxide, $CO_2$ | 44 |
| **C** | methane, $CH_4$ | 16 |
| **D** | oxygen, $O_2$ | 16 |

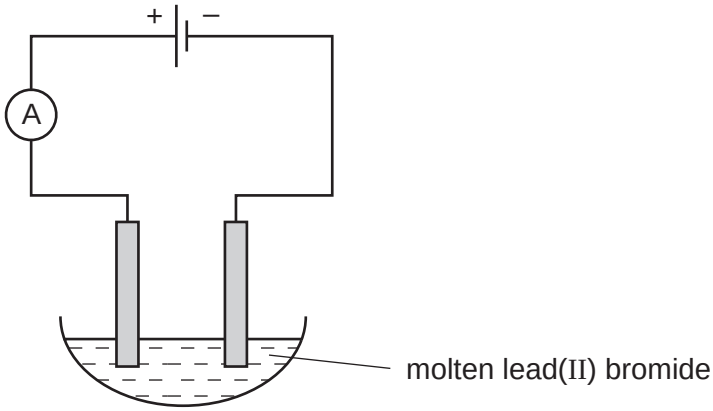
**12** Aluminium is extracted from its oxide by electrolysis.

The oxide is dissolved in ……1…… cryolite and aluminium is deposited at the ……2……

Which words correctly complete gaps 1 and 2?

| | 1 | 2 |
|---|---|---|
| **A** | aqueous | cathode |
| **B** | aqueous | anode |
| **C** | molten | cathode |
| **D** | molten | anode |

**13** Molten lead(II) bromide is electrolysed as shown.




Which ions are discharged at each electrode?

| | positive electrode | negative electrode |
|---|---|---|
| **A** | $Pb^{+}$ | $Br^{2-}$ |
| **B** | $Pb^{2+}$ | $Br^{-}$ |
| **C** | $Br^{2-}$ | $Pb^{+}$ |
| **D** | $Br^{-}$ | $Pb^{2+}$ |

**14** Which of these elements could be formed at the anode when a molten salt is electrolysed?

**A** copper

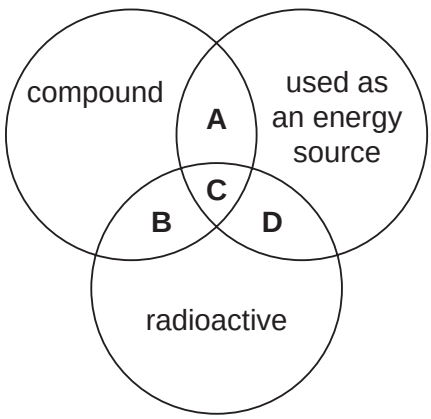
**B** iodine

**C** lithium

**D** strontium

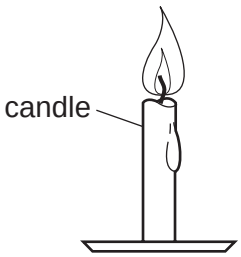
**15** The diagram shows some properties that substances may have.

To which labelled part of the diagram does $^{235}U$ belong?

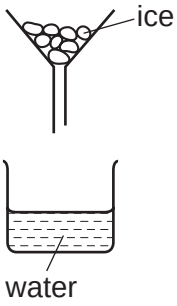


**16** Which diagram shows a process in which an endothermic change is taking place?

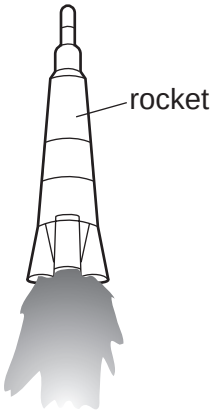
**A**



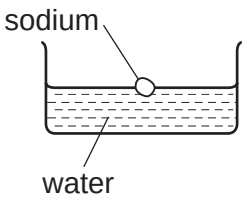

**B**




**C**




**D**




**17** The equation shows a reaction that is reversed by changing the conditions.

forward reaction

$$CuSO_4.5H_2O \rightarrow CuSO_4 + 5H_2O$$

How can the forward reaction be reversed?

| | by adding water | by heating |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

**18** The reactions shown may occur in the air during a thunder storm.

$$N_2 + O_2 \rightarrow 2NO$$

$$2NO + O_2 \rightarrow 2NO_2$$

$$NO + O_3 \rightarrow NO_2 + O_2$$

Which line shows what happens to the reactant molecules in each of these reactions?

| | $N_2$ | NO | $O_3$ |
|---|---|---|---|
| **A** | oxidised | oxidised | oxidised |
| **B** | oxidised | oxidised | reduced |
| **C** | reduced | reduced | oxidised |
| **D** | reduced | reduced | reduced |

**19** Which does **not** increase the speed of a reaction?

**A** adding a catalyst

**B** increasing the concentration of one of the reactants

**C** increasing the particle size of one of the reactants

**D** increasing the temperature

**20** Aqueous sodium hydroxide is added to a solution of a salt. A blue precipitate is formed which does not dissolve in excess.

Aluminium foil is added to the mixture and the mixture is warmed. A gas is produced that turns damp red litmus paper blue.

What is the name of the salt?

**A** ammonium nitrate

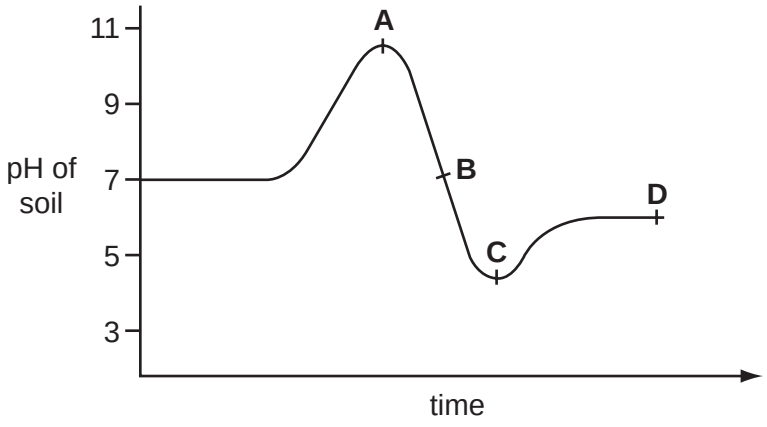
**B** ammonium sulfate

**C** copper(II) nitrate

**D** copper(II) sulfate

**21** The graph shows how the pH of soil in a field changed over time.

At which point was the soil neutral?




**22** An element E is burned in air. A white solid oxide is formed.

The oxide is tested with damp red litmus paper. The paper turns blue.

What is element E?

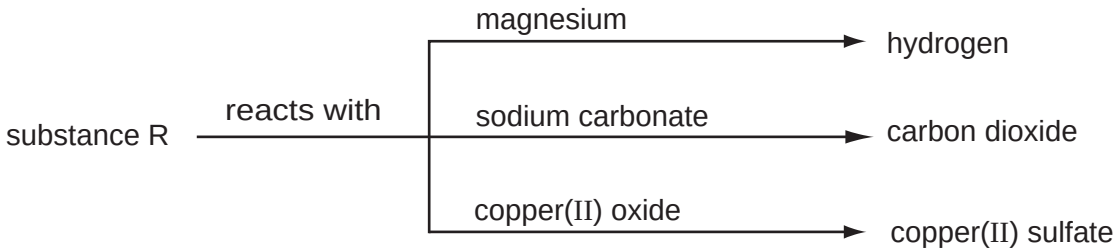
**A** calcium

**B** carbon

**C** iodine

**D** sulfur

**23** Some reactions of a substance, R, are shown in the diagram.




What type of substance is R**?**

**A** an acid

**B** a base

**C** an element

**D** a salt

**24** Which statement describes the trends going down group VII of the Periodic Table?

**A** The boiling point and melting point both decrease.

**B** The boiling point and melting point both increase.

**C** The boiling point decreases but the melting point increases.

**D** The boiling point increases but the melting point decreases.

**25** An inert atmosphere is needed in a lamp to lengthen the useful life of the metal filament.

Why is argon, rather than helium, used for this purpose?

| | argon is more abundant in the air | argon is less dense than helium |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |



**[Turn over**

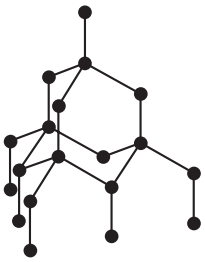
**26** The sulfate of element F is green.

Which other properties is element F likely to have?

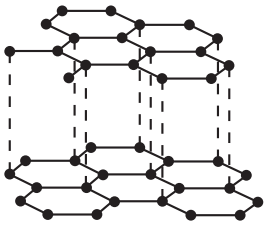
| | density | melting point |
|---|---|---|
| **A** | high | high |
| **B** | high | low |
| **C** | low | high |
| **D** | low | low |

**27** Which diagram represents the structure of an alloy?

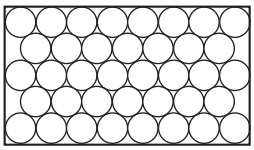
**A**



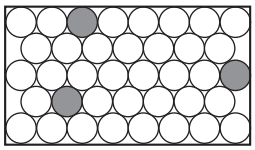
**B**



**C**



**D**



**28** In a blast furnace, iron(III) oxide is converted to iron and carbon monoxide is converted to carbon dioxide.

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

What happens to each of these reactants?

**A** Both iron(III) oxide and carbon monoxide are oxidised.

**B** Both iron(III) oxide and carbon monoxide are reduced.

**C** Iron(III) oxide is oxidised and carbon monoxide is reduced.

**D** Iron(III) oxide is reduced and carbon monoxide is oxidised.

**29** The table gives information about three different metals G, H and J.

| metal | does it react with | |
|---|---|---|
| | water | steam |
| G | ✗ | ✗ |
| H | ✓ | ✓ |
| J | ✗ | ✓ |

key

✓ = does react

✗ = does not react

What is the order of reactivity of these metals?

| | most reactive → | | least reactive |
|---|---|---|---|
| **A** | G | H | J |
| **B** | H | G | J |
| **C** | H | J | G |
| **D** | J | H | G |

**30** Which property do all metals have?

**A** They are hard.

**B** They conduct electricity.

**C** They form acidic oxides.

**D** They react with water.

**31** Stainless steel is an alloy of iron and other metals. It is strong and does not rust but it costs much more than normal steel.

What is **not** made from stainless steel?

**A** cutlery

**B** pipes in a chemical factory

**C** railway lines

**D** saucepans

**32** Substance K reacts with sodium carbonate to form a gas.

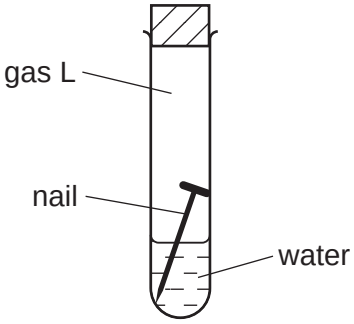
The gas turns limewater cloudy.

What is substance K and which process takes place in the reaction?

| | K | process |
|---|---|---|
| **A** | ethanol | combustion |
| **B** | ethanol | neutralisation |
| **C** | hydrochloric acid | combustion |
| **D** | hydrochloric acid | neutralisation |

**33** An iron nail is placed in a closed test-tube, containing gas L.

The nail rusts.




What is gas L?

**A** carbon dioxide

**B** hydrogen

**C** nitrogen

**D** oxygen

**34** Which statements are correct?

1 Carbon monoxide is responsible for the production of ‘acid rain’.

2 Oxides of nitrogen are present in car exhausts.

3 Sulfur dioxide can be produced by the combustion of fossil fuels.

**A** 1 and 2 only

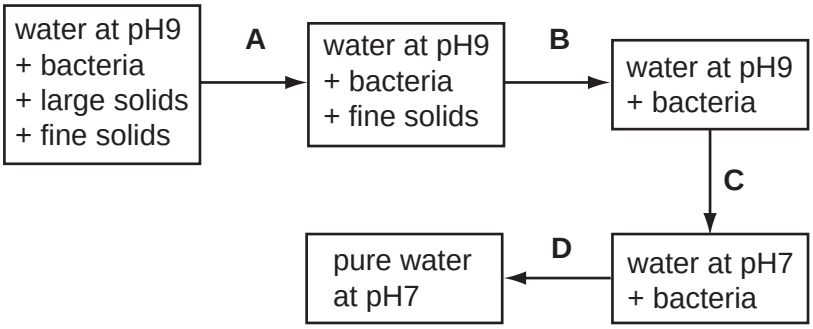
**B** 1 and 3 only

**C** 2 and 3 only

**D** 1, 2 and 3

**35** The diagram shows stages in the purification of water.

Which stage uses chlorine?




**36** Which element is **not** added to a fertiliser?

**A** aluminium

**B** nitrogen

**C** phosphorus

**D** potassium

**37** A compound has the formula $CH_3CH_2CH{=}CH_2$.

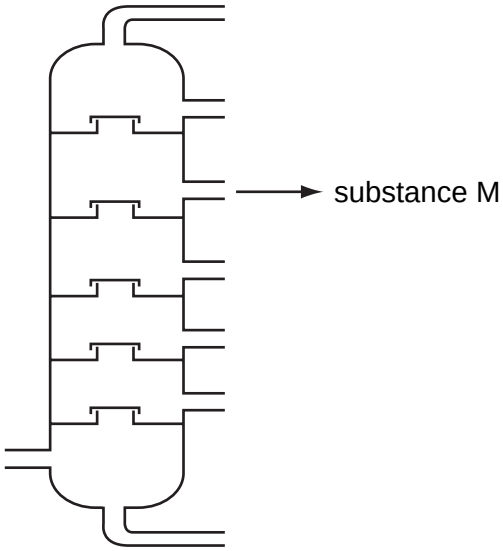
Which row in the table shows the type of compound and the colour change when aqueous bromine is added?

| | type of compound | colour change |
|---|---|---|
| **A** | saturated | brown to colourless |
| **B** | saturated | colourless to brown |
| **C** | unsaturated | brown to colourless |
| **D** | unsaturated | colourless to brown |



[Turn over

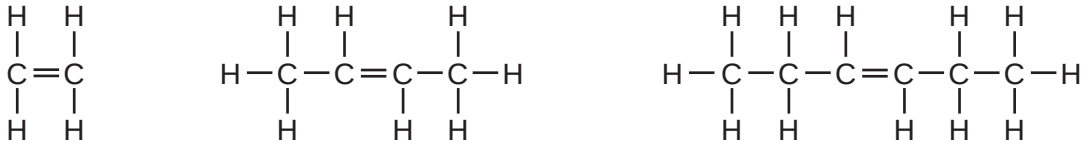
**38** The diagram shows an industrial process. Substance M is one of the substances produced by this process and is used as aircraft fuel.




What is this process and what is substance M?

| | process | substance M |
|---|---|---|
| **A** | fractional distillation | paraffin |
| **B** | fractional distillation | petrol |
| **C** | thermal decomposition | paraffin |
| **D** | thermal decomposition | petrol |

**39** 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.

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

**A** C–O **B** C=O **C** C=C **D** O–H

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**DATA SHEET**
**The Periodic Table of the Elements**

| | Group | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | | | | | | | | | III | IV | V | VI | VII | 0 |
| | | | | | | | | | | | | | | | | 4 He Helium 2 |
| | | | | | | 1 H Hydrogen 1 | | | | | | | | | | |
| | 7 Li Lithium 3 | 9 Be Beryllium 4 | | | | | | | | | 11 B Boron 5 | 12 C Carbon 6 | 14 N Nitrogen 7 | 16 O Oxygen 8 | 19 F Fluorine 9 | 20 Ne Neon 10 |
| | 23 Na Sodium 11 | 24 Mg Magnesium 12 | | | | | | | | | 27 Al Aluminium 13 | 28 Si Silicon 14 | 31 P Phosphorus 15 | 32 S Sulfur 16 | 35.5 Cl Chlorine 17 | 40 Ar Argon 18 |
| | 39 K Potassium 19 | 40 Ca Calcium 20 | 45 Sc Scandium 21 | 48 Ti Titanium 22 | 51 V Vanadium 23 | 52 Cr Chromium 24 | 55 Mn Manganese 25 | 56 Fe Iron 26 | 59 Co Cobalt 27 | 59 Ni Nickel 28 | 64 Cu Copper 29 | 65 Zn Zinc 30 | 70 Ga Gallium 31 | 73 Ge Germanium 32 | 75 As Arsenic 33 | 79 Se Selenium 34 | 80 Br Bromine 35 | 84 Kr Krypton 36 |
| | 85 Rb Rubidium 37 | 88 Sr Strontium 38 | 89 Y Yttrium 39 | 91 Zr Zirconium 40 | 93 Nb Niobium 41 | 96 Mo Molybdenum 42 | Tc Technetium 43 | 101 Ru Ruthenium 44 | 103 Rh Rhodium 45 | 106 Pd Palladium 46 | 108 Ag Silver 47 | 112 Cd Cadmium 48 | 115 In Indium 49 | 119 Sn Tin 50 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 127 I Iodine 53 | 131 Xe Xenon 54 |
| | 133 Cs Caesium 55 | 137 Ba Barium 56 | 139 La Lanthanum 57 * | 178 Hf Hafnium 72 | 181 Ta Tantalum 73 | 184 W Tungsten 74 | 186 Re Rhenium 75 | 190 Os Osmium 76 | 192 Ir Iridium 77 | 195 Pt Platinum 78 | 197 Au Gold 79 | 201 Hg Mercury 80 | 204 Tl Thallium 81 | 207 Pb Lead 82 | 209 Bi Bismuth 83 | Po Polonium 84 | At Astatine 85 | Rn Radon 86 |
| | Fr Francium 87 | 226 Ra Radium 88 | 227 Ac Actinium 89 † | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *58-71 Lanthanoid series | 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | Pm Promethium 61 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 159 Tb Terbium 65 | 162 Dy Dysprosium 66 | 165 Ho Holmium 67 | 167 Er Erbium 68 | 169 Tm Thulium 69 | 173 Yb Ytterbium 70 | 175 Lu Lutetium 71 |
| †90-103 Actinoid series | 232 Th Thorium 90 | Pa Protactinium 91 | 238 U Uranium 92 | Np Neptunium 93 | Pu Plutonium 94 | Am Americium 95 | Cm Curium 96 | Bk Berkelium 97 | Cf Californium 98 | Es Einsteinium 99 | Fm Fermium 100 | Md Mendelevium 101 | No Nobelium 102 | Lr Lawrencium 103 |

Key: a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure (r.t.p.).

Second Variant Question Paper

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

**CHEMISTRY** **0620/12**

Paper 1 Multiple Choice **May/June 2009**

**45 minutes**

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

*6562648243*

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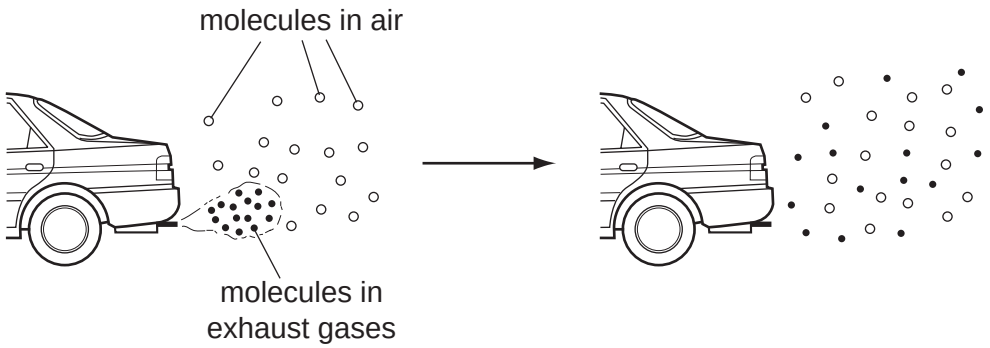
A copy of the Periodic Table is printed on page 16.
You may use a calculator.

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




UNIVERSITY of CAMBRIDGE International Examinations

**1** The diagram shows how the molecules in the exhaust gases diffuse into the air.




Which statement describes what happens to these molecules next?

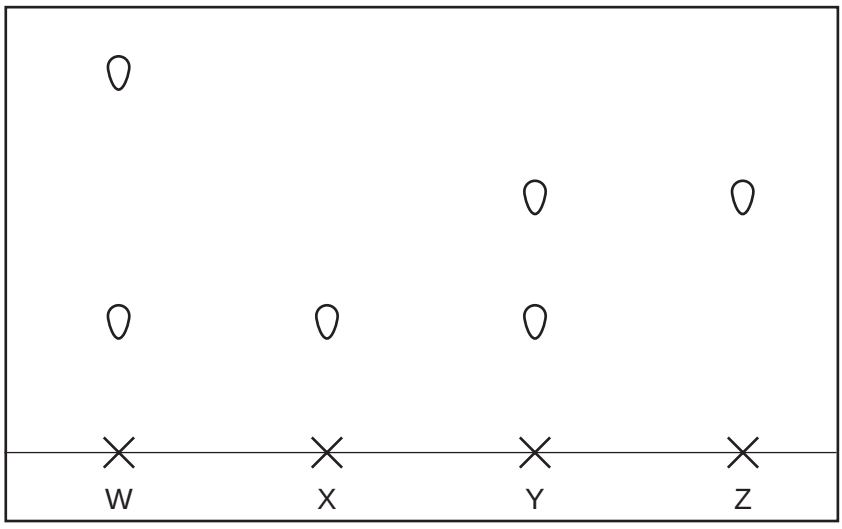
**A** The molecules fall to the ground because they are heavier than air molecules.

**B** The molecules go back together as they cool.

**C** The molecules spread further into the air.

**D** The molecules stay where they are.

**2** The diagram shows the paper chromatograms of four substances, W, X, Y and Z.




Which two substances are pure?

**A** W and X **B** W and Y **C** X and Y **D** X and Z

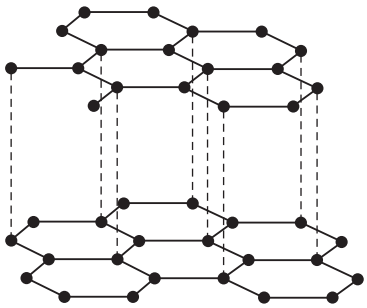
**3** A student takes 2 g samples of calcium carbonate and adds them to 20 $cm^3$ samples of dilute hydrochloric acid at different temperatures. She measures how long it takes for the effervescence to stop.

Which apparatus does she use?

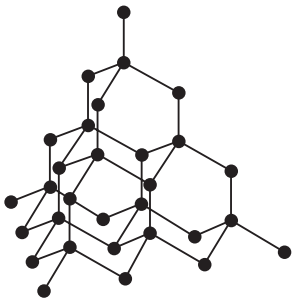
| | balance | clock | filter funnel | measuring cylinder | thermometer |
|---|---|---|---|---|---|
| **A** | ✓ | ✓ | ✓ | ✓ | ✗ |
| **B** | ✓ | ✓ | ✗ | ✓ | ✓ |
| **C** | ✓ | ✗ | ✓ | ✓ | ✓ |
| **D** | ✗ | ✓ | ✓ | ✗ | ✓ |

**4** The diagrams show the structures of two forms, P and Q, of a solid element.

P



Q



What are suitable uses of P and Q, based on their structures?

| | use of solid P | use of solid Q |
|---|---|---|
| **A** | drilling | drilling |
| **B** | drilling | lubricating |
| **C** | lubricating | drilling |
| **D** | lubricating | lubricating |

**5** An element S has the proton number 18. The next element in the Periodic Table is an element T.

Which statement is correct?

**A** Element T has one more electron in its outer shell than element S.

**B** Element T has one more electron shell than element S.

**C** Element T is in the same group of the Periodic Table as element S.

**D** Element T is in the same period of the Periodic Table as element S.



[Turn over

**6** Element V forms an acidic, covalent oxide.

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

| | 1 | 2 | 6 | 7 |
|---|---|---|---|---|
| **A** | ✓ | ✗ | ✗ | ✗ |
| **B** | ✓ | ✓ | ✗ | ✗ |
| **C** | ✗ | ✗ | ✗ | ✓ |
| **D** | ✗ | ✗ | ✓ | ✓ |

**7** Which numbers are added together to give the nucleon number of an ion?

**A** number of electrons + number of neutrons

**B** number of electrons + number of protons

**C** number of electrons + number of protons + number of neutrons

**D** number of protons + number of neutrons

**8** When sodium chloride is formed from its elements, each chlorine atom ……1…… one …….2…….

Which words correctly complete gaps 1 and 2?

| | 1 | 2 |
|---|---|---|
| **A** | gains | electron |
| **B** | gains | proton |
| **C** | loses | electron |
| **D** | loses | proton |

**9** The electronic configuration of an ion is 2.8.8.

What could this ion be?

| | $S^{2-}$ | $Ca^{2+}$ |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

**10** Nitrogen and hydrogen react together to form ammonia.

$$N_2 + 3H_2 \rightarrow 2NH_3$$

When completely converted, 7 tonnes of nitrogen gives 8.5 tonnes of ammonia.

How much nitrogen will be needed to produce 34 tonnes of ammonia?

**A** 7 tonnes **B** 8.5 tonnes **C** 28 tonnes **D** 34 tonnes

**11** Which relative molecular mass, $M_r$, is **not** correct for the molecule given?

| | molecule | $M_r$ |
|---|---|---|
| **A** | ammonia, $NH_3$ | 17 |
| **B** | carbon dioxide, $CO_2$ | 44 |
| **C** | methane, $CH_4$ | 16 |
| **D** | oxygen, $O_2$ | 16 |

**12** Which of these elements could be formed at the anode when a molten salt is electrolysed?

**A** copper

**B** iodine

**C** lithium

**D** strontium

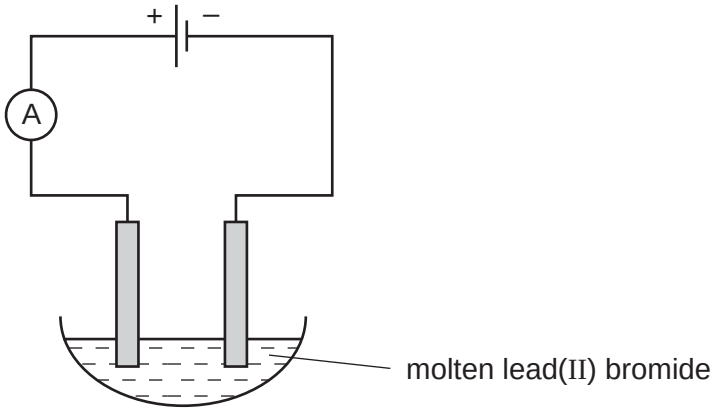
**13** Aluminium is extracted from its oxide by electrolysis.

The oxide is dissolved in ……1…… cryolite and aluminium is deposited at the ……2……

Which words correctly complete gaps 1 and 2?

| | 1 | 2 |
|---|---|---|
| **A** | aqueous | cathode |
| **B** | aqueous | anode |
| **C** | molten | cathode |
| **D** | molten | anode |

**14** Molten lead(II) bromide is electrolysed as shown.

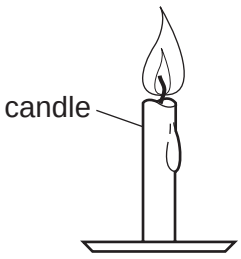



Which ions are discharged at each electrode?

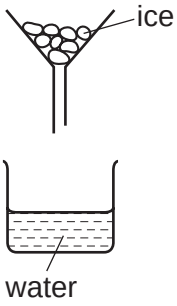
| | positive electrode | negative electrode |
|---|---|---|
| **A** | $Pb^{+}$ | $Br^{2-}$ |
| **B** | $Pb^{2+}$ | $Br^{-}$ |
| **C** | $Br^{2-}$ | $Pb^{+}$ |
| **D** | $Br^{-}$ | $Pb^{2+}$ |

**15** Which diagram shows a process in which an endothermic change is taking place?

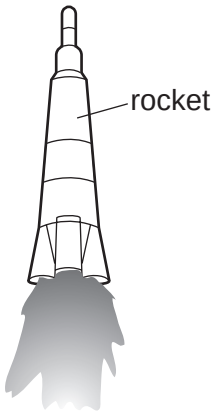
**A**



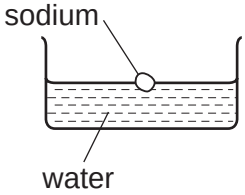

**B**




**C**

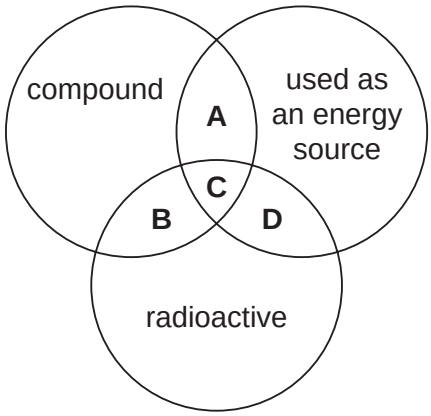



**D**



**16** The diagram shows some properties that substances may have.

To which labelled part of the diagram does $^{235}U$ belong?




**17** The equation shows a reaction that is reversed by changing the conditions.

$$CuSO_4.5H_2O \xrightarrow{\text{forward reaction}} CuSO_4 + 5H_2O$$

How can the forward reaction be reversed?

| | by adding water | by heating |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

**18** Which does **not** increase the speed of a reaction?

**A** adding a catalyst

**B** increasing the concentration of one of the reactants

**C** increasing the particle size of one of the reactants

**D** increasing the temperature

**19** The reactions shown may occur in the air during a thunder storm.

$N_2 + O_2 \rightarrow 2NO$

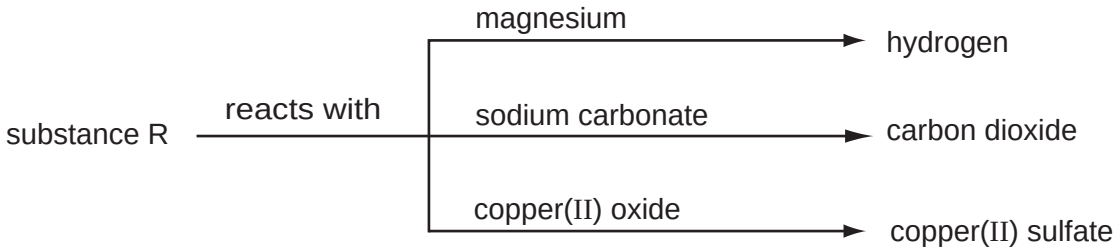
$2NO + O_2 \rightarrow 2NO_2$

$NO + O_3 \rightarrow NO_2 + O_2$

Which line shows what happens to the reactant molecules in each of these reactions?

| | $N_2$ | NO | $O_3$ |
|---|---|---|---|
| **A** | oxidised | oxidised | oxidised |
| **B** | oxidised | oxidised | reduced |
| **C** | reduced | reduced | oxidised |
| **D** | reduced | reduced | reduced |

**20** Some reactions of a substance, R, are shown in the diagram.




What type of substance is R?

**A** an acid

**B** a base

**C** an element

**D** a salt

**21** An element E is burned in air. A white solid oxide is formed.

The oxide is tested with damp red litmus paper. The paper turns blue.

What is element E?

**A** calcium

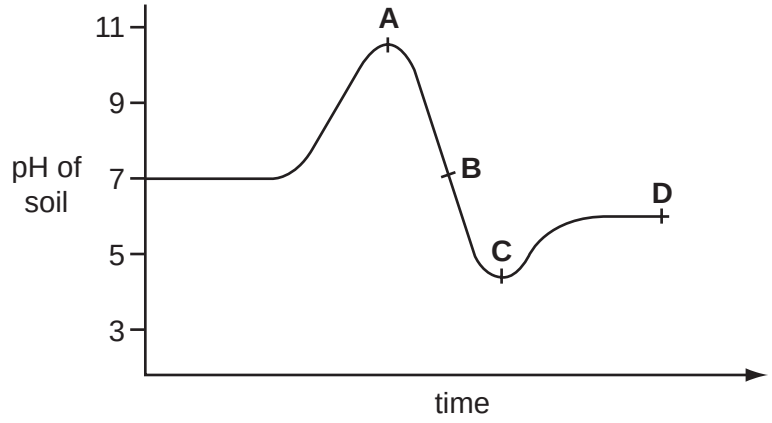
**B** carbon

**C** iodine

**D** sulfur

**22** The graph shows how the pH of soil in a field changed over time.

At which point was the soil neutral?




**23** Aqueous sodium hydroxide is added to a solution of a salt. A blue precipitate is formed which does not dissolve in excess.

Aluminium foil is added to the mixture and the mixture is warmed. A gas is produced that turns damp red litmus paper blue.

What is the name of the salt?

**A** ammonium nitrate

**B** ammonium sulfate

**C** copper(II) nitrate

**D** copper(II) sulfate

**24** Which statement describes the trends going down group VII of the Periodic Table?

**A** The boiling point and melting point both decrease.

**B** The boiling point and melting point both increase.

**C** The boiling point decreases but the melting point increases.

**D** The boiling point increases but the melting point decreases.



[Turn over

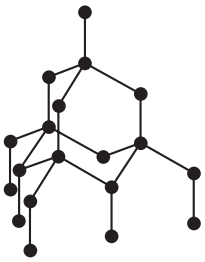
**25** The sulfate of element F is green.

Which other properties is element F likely to have?

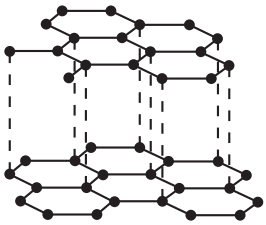
| | density | melting point |
|---|---|---|
| **A** | high | high |
| **B** | high | low |
| **C** | low | high |
| **D** | low | low |

**26** Which diagram represents the structure of an alloy?

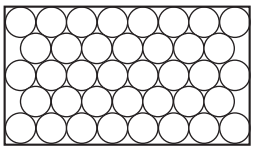
**A**



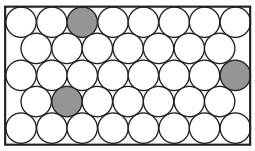
**B**



**C**



**D**



**27** An inert atmosphere is needed in a lamp to lengthen the useful life of the metal filament.

Why is argon, rather than helium, used for this purpose?

| | argon is more abundant in the air | argon is less dense than helium |
|---|---|---|
| **A** | ✓ | ✓ |
| **B** | ✓ | ✗ |
| **C** | ✗ | ✓ |
| **D** | ✗ | ✗ |

**28** In a blast furnace, iron(III) oxide is converted to iron and carbon monoxide is converted to carbon dioxide.

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

What happens to each of these reactants?

**A** Both iron(III) oxide and carbon monoxide are oxidised.

**B** Both iron(III) oxide and carbon monoxide are reduced.

**C** Iron(III) oxide is oxidised and carbon monoxide is reduced.

**D** Iron(III) oxide is reduced and carbon monoxide is oxidised.

**29** Which property do all metals have?

**A** They are hard.

**B** They conduct electricity.

**C** They form acidic oxides.

**D** They react with water.

**30** Stainless steel is an alloy of iron and other metals. It is strong and does not rust but it costs much more than normal steel.

What is **not** made from stainless steel?

**A** cutlery

**B** pipes in a chemical factory

**C** railway lines

**D** saucepans

**31** The table gives information about three different metals G, H and J.

| metal | does it react with | |
|---|---|---|
| | water | steam |
| G | ✗ | ✗ |
| H | ✓ | ✓ |
| J | ✗ | ✓ |

key

✓ = does react

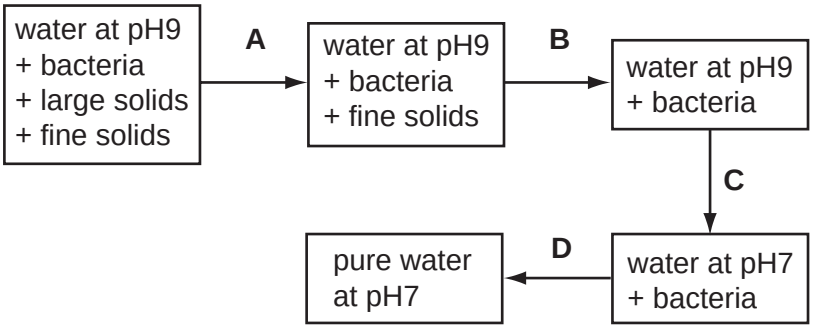
✗ = does not react

What is the order of reactivity of these metals?

| | most reactive → least reactive | | |
|---|---|---|---|
| **A** | G | H | J |
| **B** | H | G | J |
| **C** | H | J | G |
| **D** | J | H | G |

**32** The diagram shows stages in the purification of water.

Which stage uses chlorine?




**33** Which statements are correct?

1 Carbon monoxide is responsible for the production of 'acid rain'.

2 Oxides of nitrogen are present in car exhausts.

3 Sulfur dioxide can be produced by the combustion of fossil fuels.

**A** 1 and 2 only

**B** 1 and 3 only

**C** 2 and 3 only

**D** 1, 2 and 3

**34** Substance K reacts with sodium carbonate to form a gas.

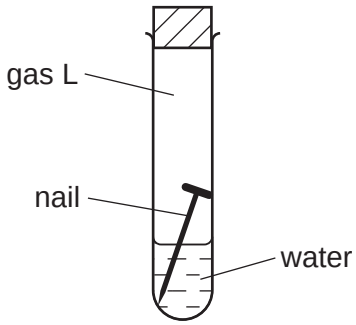
The gas turns limewater cloudy.

What is substance K and which process takes place in the reaction?

| | K | process |
|---|---|---|
| **A** | ethanol | combustion |
| **B** | ethanol | neutralisation |
| **C** | hydrochloric acid | combustion |
| **D** | hydrochloric acid | neutralisation |

**35** An iron nail is placed in a closed test-tube, containing gas L.

The nail rusts.




What is gas L?

**A** carbon dioxide

**B** hydrogen

**C** nitrogen

**D** oxygen

**36** A compound has the formula $CH_3CH_2CH{=}CH_2$.

Which row in the table shows the type of compound and the colour change when aqueous bromine is added?

| | type of compound | colour change |
|---|---|---|
| **A** | saturated | brown to colourless |
| **B** | saturated | colourless to brown |
| **C** | unsaturated | brown to colourless |
| **D** | unsaturated | colourless to brown |

**37** Which element is **not** added to a fertiliser?

**A** aluminium

**B** nitrogen

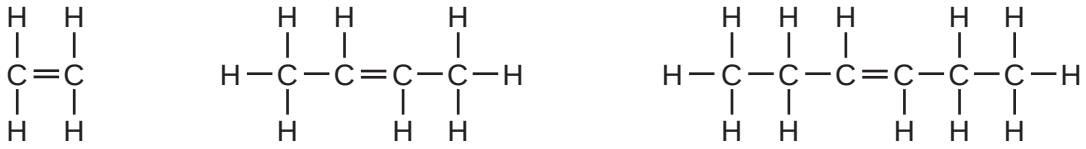
**C** phosphorus

**D** potassium



[Turn over

**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.

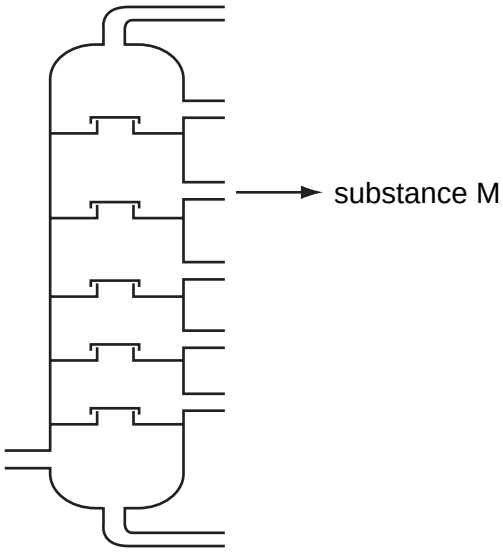
**C** They are all hydrocarbons.

**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** The diagram shows an industrial process. Substance M is one of the substances produced by this process and is used as aircraft fuel.




What is this process and what is substance M?

| | process | substance M |
|---|---|---|
| **A** | fractional distillation | paraffin |
| **B** | fractional distillation | petrol |
| **C** | thermal decomposition | paraffin |
| **D** | thermal decomposition | petrol |

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**DATA SHEET**
**The Periodic Table of the Elements**

| | Group | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | I | II | | | | | | | | | III | IV | V | VI | VII | 0 |
| | | | | | | | | | | | | | | | | 4 He Helium 2 |
| | 7 Li Lithium 3 | 9 Be Beryllium 4 | | | | | | | | | 11 B Boron 5 | 12 C Carbon 6 | 14 N Nitrogen 7 | 16 O Oxygen 8 | 19 F Fluorine 9 | 20 Ne Neon 10 |
| | 23 Na Sodium 11 | 24 Mg Magnesium 12 | | | | | | | | | 27 Al Aluminium 13 | 28 Si Silicon 14 | 31 P Phosphorus 15 | 32 S Sulfur 16 | 35.5 Cl Chlorine 17 | 40 Ar Argon 18 |
| | 39 K Potassium 19 | 40 Ca Calcium 20 | 45 Sc Scandium 21 | 48 Ti Titanium 22 | 51 V Vanadium 23 | 52 Cr Chromium 24 | 55 Mn Manganese 25 | 56 Fe Iron 26 | 59 Co Cobalt 27 | 59 Ni Nickel 28 | 64 Cu Copper 29 | 65 Zn Zinc 30 | 70 Ga Gallium 31 | 73 Ge Germanium 32 | 75 As Arsenic 33 | 79 Se Selenium 34 | 80 Br Bromine 35 | 84 Kr Krypton 36 |
| | 85 Rb Rubidium 37 | 88 Sr Strontium 38 | 89 Y Yttrium 39 | 91 Zr Zirconium 40 | 93 Nb Niobium 41 | 96 Mo Molybdenum 42 | Tc Technetium 43 | 101 Ru Ruthenium 44 | 103 Rh Rhodium 45 | 106 Pd Palladium 46 | 108 Ag Silver 47 | 112 Cd Cadmium 48 | 115 In Indium 49 | 119 Sn Tin 50 | 122 Sb Antimony 51 | 128 Te Tellurium 52 | 127 I Iodine 53 | 131 Xe Xenon 54 |
| | 133 Cs Caesium 55 | 137 Ba Barium 56 | 139 La Lanthanum 57 * | 178 Hf Hafnium 72 | 181 Ta Tantalum 73 | 184 W Tungsten 74 | 186 Re Rhenium 75 | 190 Os Osmium 76 | 192 Ir Iridium 77 | 195 Pt Platinum 78 | 197 Au Gold 79 | 201 Hg Mercury 80 | 204 Tl Thallium 81 | 207 Pb Lead 82 | 209 Bi Bismuth 83 | Po Polonium 84 | At Astatine 85 | Rn Radon 86 |
| | Fr Francium 87 | 226 Ra Radium 88 | 227 Ac Actinium 89 † | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *58-71 Lanthanoid series | 140 Ce Cerium 58 | 141 Pr Praseodymium 59 | 144 Nd Neodymium 60 | Pm Promethium 61 | 150 Sm Samarium 62 | 152 Eu Europium 63 | 157 Gd Gadolinium 64 | 159 Tb Terbium 65 | 162 Dy Dysprosium 66 | 165 Ho Holmium 67 | 167 Er Erbium 68 | 169 Tm Thulium 69 | 173 Yb Ytterbium 70 | 175 Lu Lutetium 71 |
| †90-103 Actinoid series | 232 Th Thorium 90 | Pa Protactinium 91 | 238 U Uranium 92 | Np Neptunium 93 | Pu Plutonium 94 | Am Americium 95 | Cm Curium 96 | Bk Berkelium 97 | Cf Californium 98 | Es Einsteinium 99 | Fm Fermium 100 | Md Mendelevium 101 | No Nobelium 102 | Lr Lawrencium 103 |

Key

| | |
|---|---|
| a = relative atomic mass | a |
| X = atomic symbol | X |
| b = proton (atomic) number | b |

The volume of one mole of any gas is 24 $dm^3$ at room temperature and pressure (r.t.p.).