

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**CHEMISTRY**

**0620/01**

Paper 1 Multiple Choice

May/June 2006

**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, 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 20.

You may use a calculator.

This document consists of **18** printed pages and **2** blank pages.



1 At room temperature, in which substance are the particles furthest apart?

- A**  $\text{H}_2$                       **B**  $\text{H}_2\text{O}$                       **C**  $\text{Mg}$                       **D**  $\text{MgO}$

2 Which method can be used to obtain crystals from aqueous copper(II) sulphate?

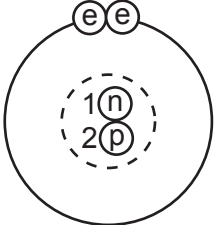
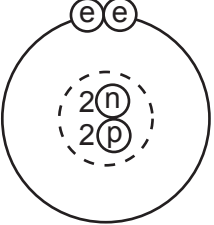
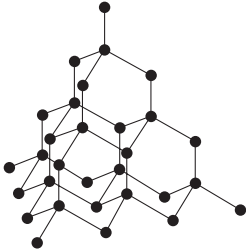
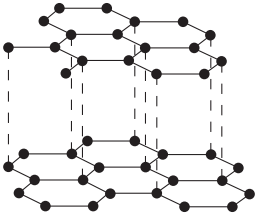
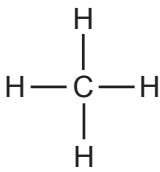
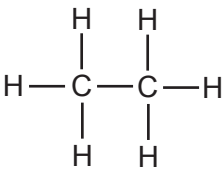
- A** chromatography  
**B** electrolysis  
**C** evaporation  
**D** neutralisation

3 Five elements have proton numbers 10, 12, 14, 16 and 18.

What are the proton numbers of the three elements that form oxides?

- A** 10, 12 and 14  
**B** 10, 14 and 18  
**C** 12, 14 and 16  
**D** 14, 16 and 18

4 The rows P, Q and R in the table show three pairs of structures.

|   |                                                                                     |                                                                                     |                                                                   |
|---|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| P |  |  | key<br>(e) electron<br>(n) neutron<br>(p) proton<br>(---) nucleus |
| Q |  |  | • atoms of the same element                                       |
| R |  |  |                                                                   |

Which pair or pairs are isotopes?

- A** P only                      **B** P and Q only                      **C** Q only                      **D** Q and R only

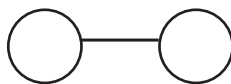
- 5 Which numbers are added to give the nucleon number of an ion?
- A number of electrons + number of neutrons  
B number of electrons + number of protons  
C number of electrons + number of protons + number of neutrons  
D number of protons + number of neutrons
- 6 In the molecules  $\text{CH}_4$ ,  $\text{HCl}$  and  $\text{H}_2\text{O}$ , which atoms use **all** of their outer shell electrons in bonding?
- A C and Cl  
B C and H  
C Cl and H  
D H and O
- 7 Which change to an atom occurs when it forms a positive ion?
- A It gains an electron.  
B It gains a proton.  
C It loses an electron.  
D It loses a proton.
- 8 For which compound is the formula correct?

|   | compound        | formula              |
|---|-----------------|----------------------|
| A | ammonia         | $\text{NH}_4$        |
| B | carbon dioxide  | CO                   |
| C | potassium oxide | $\text{P}_2\text{O}$ |
| D | zinc chloride   | $\text{ZnCl}_2$      |

- 9 The diagrams show the molecules of three elements.



1



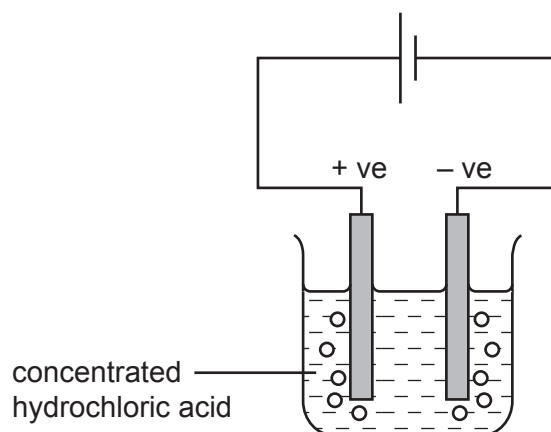
2



3

Which of these elements are present in water?

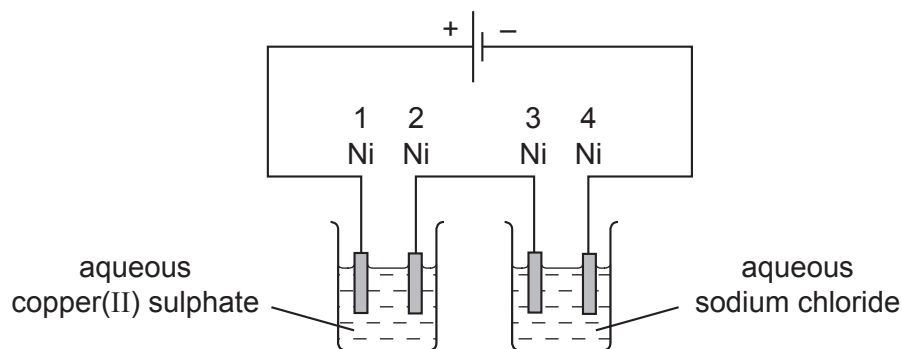
- A** 1 and 2 only  
**B** 1 and 3 only  
**C** 2 and 3 only  
**D** 1, 2 and 3
- 10 The diagram shows that two gases are formed when concentrated hydrochloric acid is electrolysed between inert electrodes.



Which line correctly describes the colours of the gases at the electrodes?

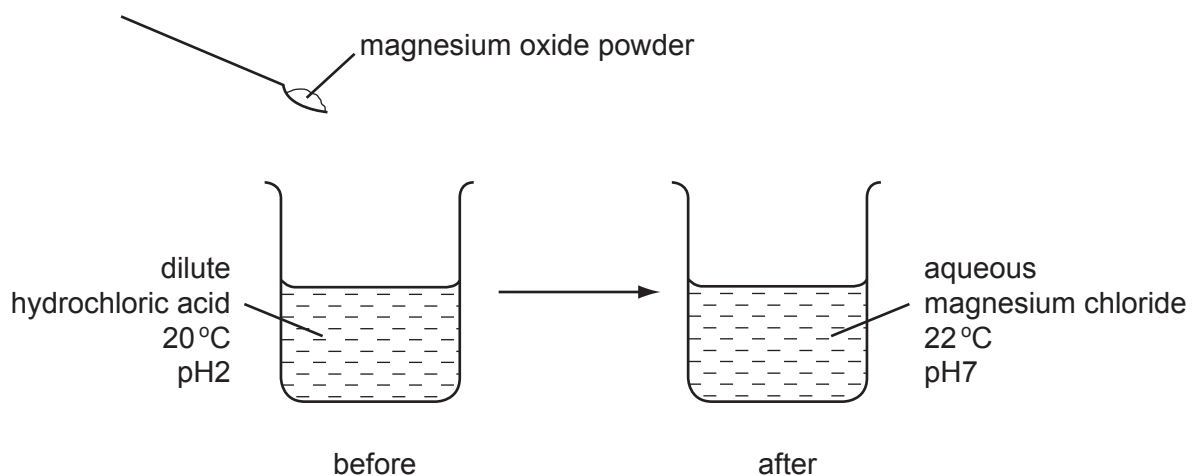
|          | anode (+ve)  | cathode (-ve) |
|----------|--------------|---------------|
| <b>A</b> | colourless   | colourless    |
| <b>B</b> | colourless   | yellow-green  |
| <b>C</b> | yellow-green | colourless    |
| <b>D</b> | yellow-green | yellow-green  |

- 11 The diagram shows an electrolysis experiment to electroplate nickel with a different metal.



Which nickel electrodes are plated with a metal?

- A** 1 only  
**B** 1 and 3 only  
**C** 2 only  
**D** 2 and 4 only
- 12 The diagram shows an experiment in which magnesium oxide powder is added to dilute hydrochloric acid.



Which terms describe the experiment?

|          | exothermic | neutralisation |
|----------|------------|----------------|
| <b>A</b> | ✓          | ✓              |
| <b>B</b> | ✓          | x              |
| <b>C</b> | x          | ✓              |
| <b>D</b> | x          | x              |

**13** Coal, methane and hydrogen are burned as fuels.

Which descriptions of this process are correct?

|          | what happens to the fuel | type of reaction |
|----------|--------------------------|------------------|
| <b>A</b> | oxidised                 | endothermic      |
| <b>B</b> | oxidised                 | exothermic       |
| <b>C</b> | reduced                  | endothermic      |
| <b>D</b> | reduced                  | exothermic       |

**14** Two reactions involving water are shown.

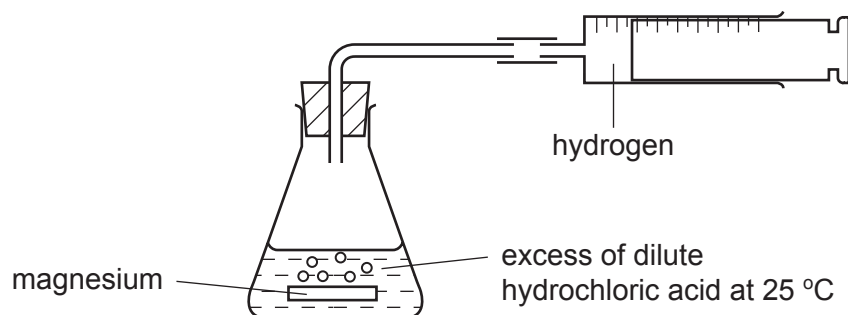
**X**             $\text{FeSO}_4 + \text{water} \rightarrow \text{hydrated iron(II) sulphate}$

**Y**             $\text{Fe} + \text{O}_2 + \text{water} \rightarrow \text{rust}$

Which of these reactions are reversible by heating?

|          | <b>X</b> | <b>Y</b> |
|----------|----------|----------|
| <b>A</b> | ✓        | ✓        |
| <b>B</b> | ✓        | x        |
| <b>C</b> | x        | ✓        |
| <b>D</b> | x        | x        |

15 The diagram shows a speed of reaction experiment.

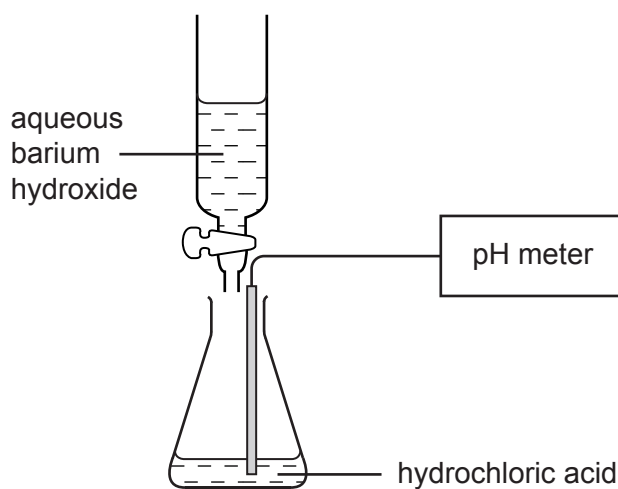


Increasing the concentration of the acid and increasing the temperature both affect the speed of reaction.

Which line of the table is correct?

|          | increase concentration of acid | increase temperature       |
|----------|--------------------------------|----------------------------|
| <b>A</b> | decrease speed of reaction     | decrease speed of reaction |
| <b>B</b> | decrease speed of reaction     | increase speed of reaction |
| <b>C</b> | increase speed of reaction     | decrease speed of reaction |
| <b>D</b> | increase speed of reaction     | increase speed of reaction |

16 Barium hydroxide is an alkali. It reacts with hydrochloric acid.



What happens to the pH of a solution of hydrochloric acid as an excess of aqueous barium hydroxide is added?

- A** The pH decreases from 14 but becomes constant at 7.
- B** The pH decreases from 14 to about 1.
- C** The pH increases from 1 but becomes constant at 7.
- D** The pH increases from 1 to about 14.

**17** Element X is at the left-hand side of the Periodic Table.

Which line in the table shows the correct type and property of the oxide of X?

|          | type of oxide | property of oxide |
|----------|---------------|-------------------|
| <b>A</b> | metallic      | acidic            |
| <b>B</b> | metallic      | basic             |
| <b>C</b> | non-metallic  | acidic            |
| <b>D</b> | non-metallic  | basic             |

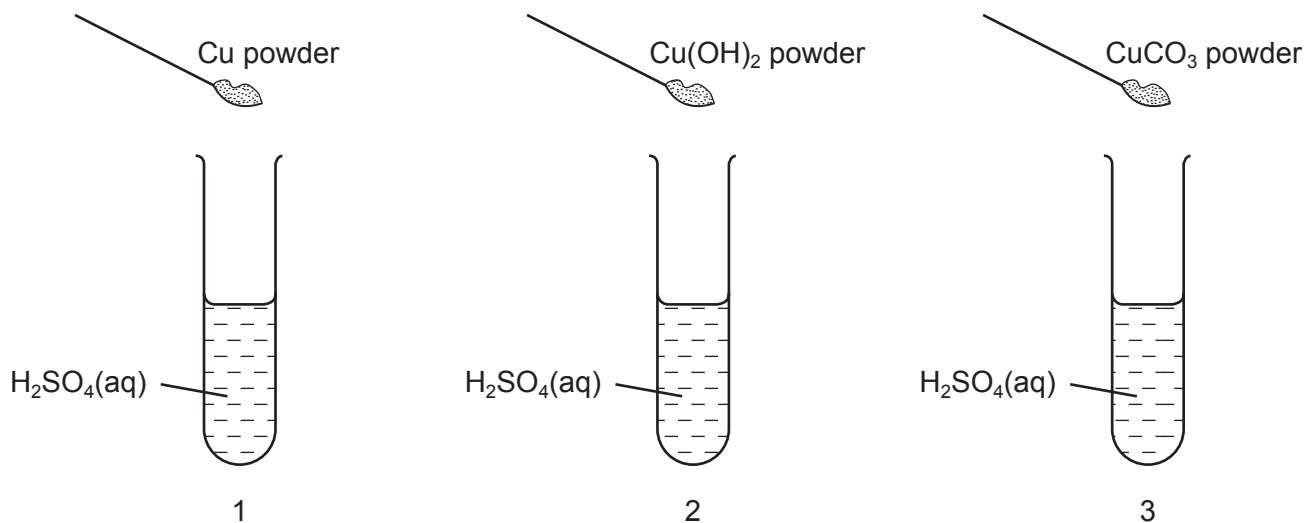
**18** The diagram shows the positions of some elements in the Periodic Table.

[illegible]

Which elements form ionic bonds with oxygen?

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

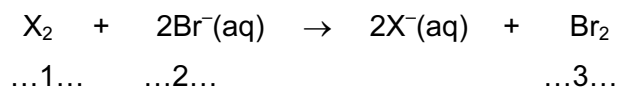
- 19 The diagrams show three experiments using dilute sulphuric acid. Three different powders are added to the acid.



The mixtures are stirred.

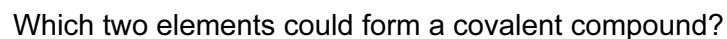
Which test-tubes then contain  $\text{Cu}^{2+}(\text{aq})$  ions?

- A** 1 and 2 only  
**B** 1 and 3 only  
**C** 2 and 3 only  
**D** 1, 2 and 3
- 20 The equation shows the reaction between a halogen and aqueous bromide ions.



Which words should be written in gaps 1, 2 and 3?

|          | 1        | 2          | 3          |
|----------|----------|------------|------------|
| <b>A</b> | chlorine | brown      | colourless |
| <b>B</b> | chlorine | colourless | brown      |
| <b>C</b> | iodine   | brown      | colourless |
| <b>D</b> | iodine   | colourless | brown      |



- 22** A student is asked to complete two sentences.

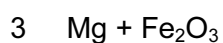
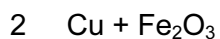
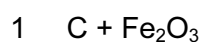
Which words correctly complete the gaps?

**23** The diagram shows three balloons held by children.



- 0620/01/M/J/06

24 Three mixtures are made.



The mixtures are heated strongly.

Which of the elements C, Cu and Mg are reactive enough to reduce the iron oxide to iron?

- A C and Cu only
- B C and Mg only
- C Cu and Mg only
- D C, Cu and Mg

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

- A Their densities are low.
- B Their melting points are high.
- C They act as catalysts.
- D They conduct electricity.

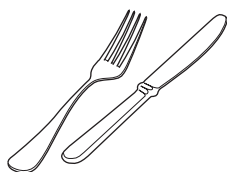
26 Copper, iron and zinc are all used to make things.

Which of these three metals are also used in the form of alloys?

|   | copper | iron | zinc |
|---|--------|------|------|
| A | ✓      | ✓    | ✓    |
| B | ✓      | ✓    | x    |
| C | x      | ✓    | ✓    |
| D | x      | x    | ✓    |

27 Which diagram shows a common use of stainless steel?

A



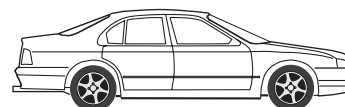
B



C

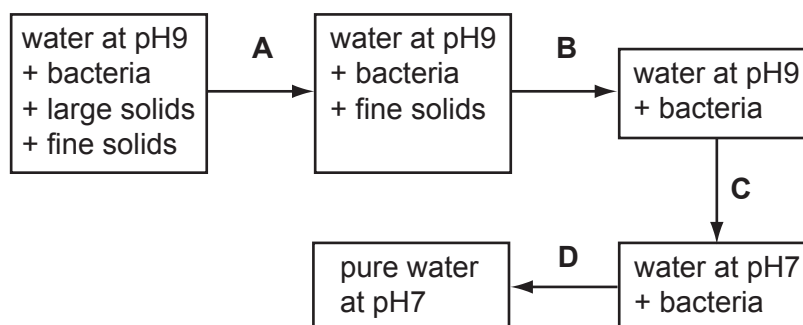


D



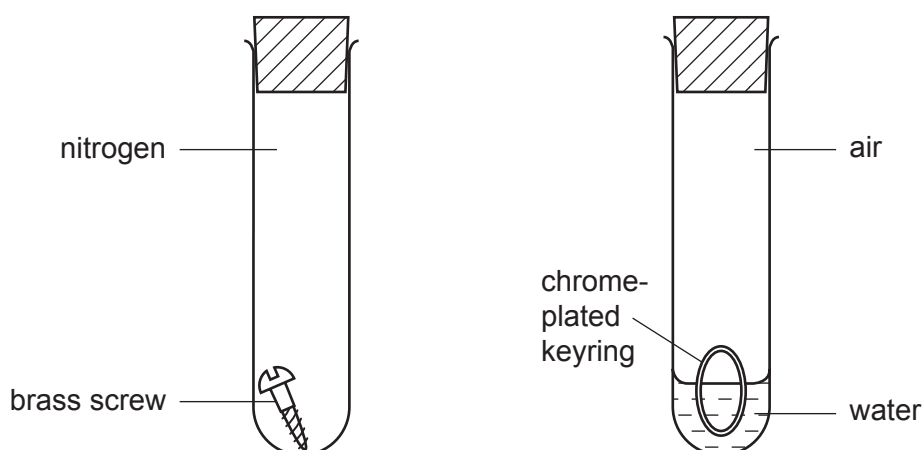
28 The diagram shows stages in the purification of water.

Which stage uses chlorine?



29 In experiments on rusting, some students are each given two metal objects to study.

One student set up his apparatus as shown.



Which objects rusted?

|          | brass screw | chrome-plated keyring |
|----------|-------------|-----------------------|
| <b>A</b> | ✓           | ✓                     |
| <b>B</b> | ✓           | x                     |
| <b>C</b> | x           | ✓                     |
| <b>D</b> | x           | x                     |

30 Which substance is **not** a pollutant of clean air?

- A** argon
- B** carbon monoxide
- C** nitrogen dioxide
- D** sulphur dioxide

31 Which metallic element is needed in a complete fertiliser?

- A calcium
- B magnesium
- C potassium
- D sodium

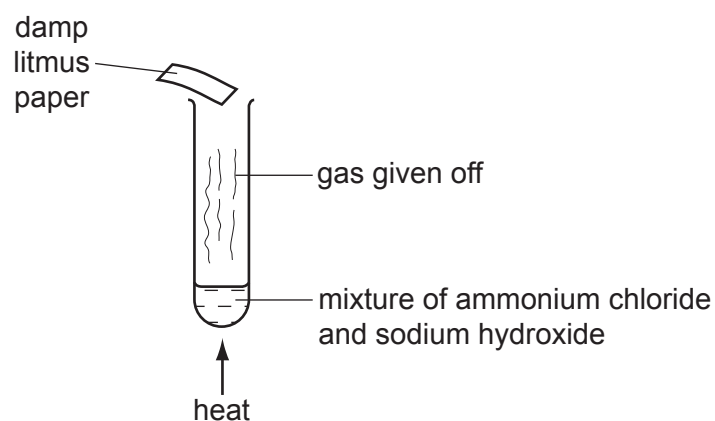
32 A newspaper article claims that carbon dioxide is formed as follows.

- 1 during respiration
- 2 when calcium carbonate reacts with hydrochloric acid
- 3 when methane burns in air

Which statements are correct?

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

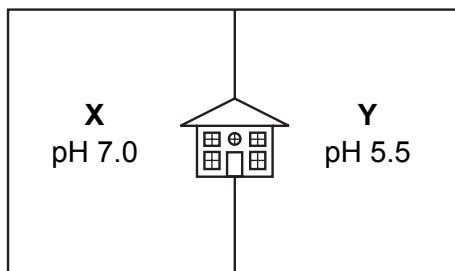
33 The diagram shows an experiment.



What is the name of the gas and the final colour of the litmus paper?

|   | gas      | colour |
|---|----------|--------|
| A | ammonia  | blue   |
| B | ammonia  | red    |
| C | chlorine | white  |
| D | chlorine | red    |

- 34 The diagram shows the pH values of the soil in **X** and **Y**, two parts of the garden of a house.

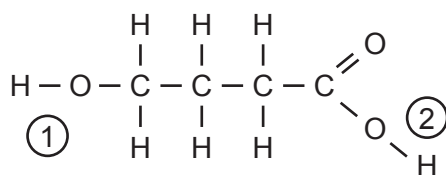


The house owner wishes to use lime to neutralise the soil in one part of the garden.

To which part should the lime be added, and why?

|          | part of garden | because lime is |
|----------|----------------|-----------------|
| <b>A</b> | <b>X</b>       | acidic          |
| <b>B</b> | <b>X</b>       | basic           |
| <b>C</b> | <b>Y</b>       | acidic          |
| <b>D</b> | <b>Y</b>       | basic           |

- 35 In the molecule shown, the two  $\text{-OH}$  groups are numbered.

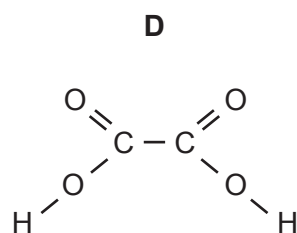
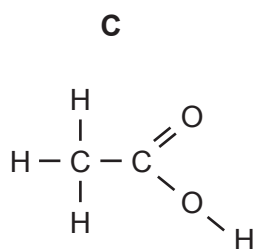
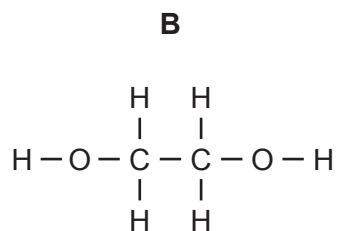
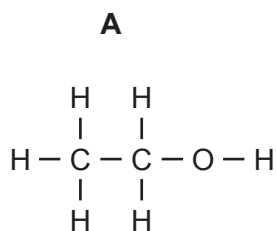


Which of these  $\text{-OH}$  groups react with aqueous sodium hydroxide?

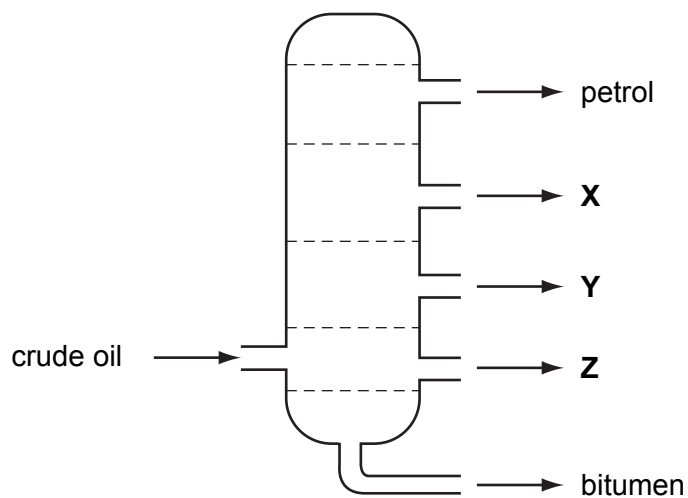
|          | ① | ② |
|----------|---|---|
| <b>A</b> | ✓ | ✓ |
| <b>B</b> | ✓ | x |
| <b>C</b> | x | ✓ |
| <b>D</b> | x | x |

36 When a suitable catalyst is used, ethene reacts with steam.

What is the structure of the compound formed?



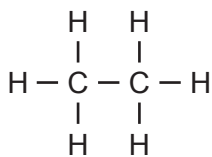
37 The diagram shows the separation of crude oil into fractions.



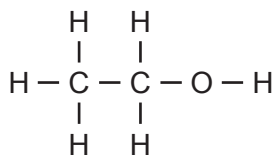
What could **X**, **Y** and **Z** represent?

|          | <b>X</b>        | <b>Y</b>        | <b>Z</b>        |
|----------|-----------------|-----------------|-----------------|
| <b>A</b> | diesel          | lubricating oil | paraffin        |
| <b>B</b> | lubricating oil | diesel          | paraffin        |
| <b>C</b> | lubricating oil | paraffin        | diesel          |
| <b>D</b> | paraffin        | diesel          | lubricating oil |

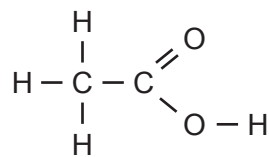
38 Which of the compounds shown are used as fuels?



1



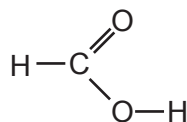
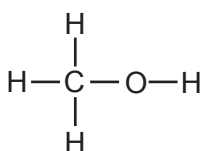
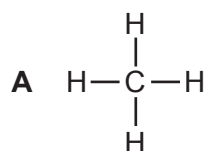
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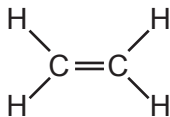
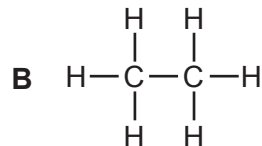
3

|          | 1 | 2 | 3 |
|----------|---|---|---|
| <b>A</b> | ✓ | ✓ | ✓ |
| <b>B</b> | ✓ | ✓ | x |
| <b>C</b> | ✓ | x | ✓ |
| <b>D</b> | x | ✓ | ✓ |

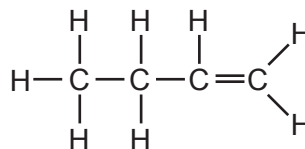
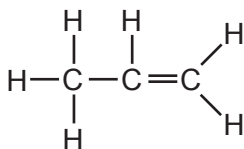
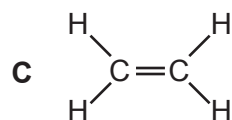
39 Which set of diagrams shows three substances that are all in the same homologous series?



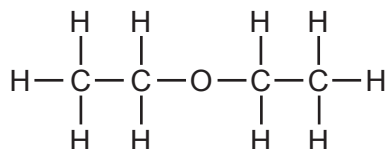
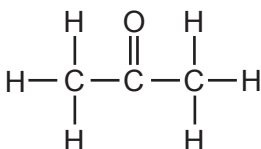
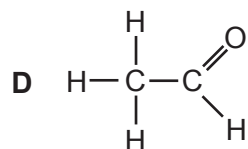
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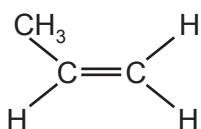
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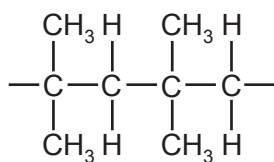


40 The diagram shows the structure of a small molecule.

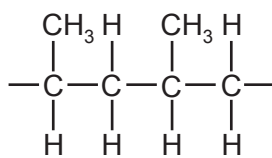


Which chain-like molecule is formed when these small molecules link together?

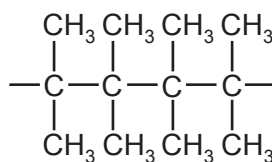
**A**



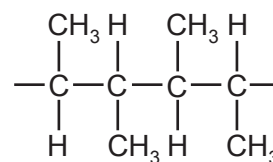
**B**



**C**



**D**



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DATA SHEET  
The Periodic Table of the Elements

| Group                                                                                                                                                   |                       |                        |                       |                       |                        |                        |                        |                      |                        |                     |                      |                       |                       |                       |                        |                        |                     |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------------------------|-----------------------|-----------------------|------------------------|------------------------|------------------------|----------------------|------------------------|---------------------|----------------------|-----------------------|-----------------------|-----------------------|------------------------|------------------------|---------------------|----------------------------------------|--|-------------------------------------|--|-------------------------------------|--|--------------------------------------|--|--------------------------------------|--|-----------------------------------|--|-------------------------------------|--|---------------------------------------|--|---------------------------------------|--|-----------------------------------|--|---------------------------------------|--|------------------------------------|--|--------------------------------------|--|
| I                                                                                                                                                       | II                    |                        |                       |                       |                        |                        |                        |                      |                        |                     |                      | III                   | IV                    | V                     | VI                     | VII                    | 0                   |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
| <div>1<br/>H<br/>Hydrogen</div>                                                                                                                         |                       |                        |                       |                       |                        |                        |                        |                      |                        |                     |                      |                       |                       |                       |                        |                        | 4<br>He<br>Helium   |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
| 7<br>Li<br>Lithium                                                                                                                                      | 9<br>Be<br>Beryllium  |                        |                       |                       |                        |                        |                        |                      |                        |                     |                      | 11<br>B<br>Boron      | 12<br>C<br>Carbon     | 14<br>N<br>Nitrogen   | 16<br>O<br>Oxygen      | 19<br>F<br>Fluorine    | 20<br>Ne<br>Neon    |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
| 23<br>Na<br>Sodium                                                                                                                                      | 24<br>Mg<br>Magnesium |                        |                       |                       |                        |                        |                        |                      |                        |                     |                      | 27<br>Al<br>Aluminium | 28<br>Si<br>Silicon   | 31<br>P<br>Phosphorus | 32<br>S<br>Sulphur     | 35.5<br>Cl<br>Chlorine | 40<br>Ar<br>Argon   |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
| 39<br>K<br>Potassium                                                                                                                                    | 40<br>Ca<br>Calcium   | 45<br>Sc<br>Scandium   | 48<br>Ti<br>Titanium  | 51<br>V<br>Vanadium   | 52<br>Cr<br>Chromium   | 55<br>Mn<br>Manganese  | 56<br>Fe<br>Iron       | 59<br>Co<br>Cobalt   | 59<br>Ni<br>Nickel     | 64<br>Cu<br>Copper  | 65<br>Zn<br>Zinc     | 70<br>Ga<br>Gallium   | 73<br>Ge<br>Germanium | 75<br>As<br>Arsenic   | 79<br>Se<br>Selenium   | 80<br>Br<br>Bromine    | 84<br>Kr<br>Krypton |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
| 85<br>Rb<br>Rubidium                                                                                                                                    | 88<br>Sr<br>Strontium | 89<br>Y<br>Yttrium     | 91<br>Zr<br>Zirconium | 93<br>Nb<br>Niobium   | 96<br>Mo<br>Molybdenum | 98<br>Tc<br>Technetium | 101<br>Ru<br>Ruthenium | 103<br>Rh<br>Rhodium | 106<br>Pd<br>Palladium | 108<br>Ag<br>Silver | 112<br>Cd<br>Cadmium | 115<br>In<br>Indium   | 119<br>Sn<br>Tin      | 122<br>Sb<br>Antimony | 128<br>Te<br>Tellurium | 127<br>I<br>Iodine     | 131<br>Xe<br>Xenon  |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
| 133<br>Cs<br>Caesium                                                                                                                                    | 137<br>Ba<br>Barium   | 139<br>La<br>Lanthanum | 178<br>Hf<br>Hafnium  | 181<br>Ta<br>Tantalum | 184<br>W<br>Tungsten   | 186<br>Re<br>Rhenium   | 190<br>Os<br>Osmium    | 192<br>Ir<br>Iridium | 195<br>Pt<br>Platinum  | 197<br>Au<br>Gold   | 201<br>Hg<br>Mercury | 204<br>Tl<br>Thallium | 207<br>Pb<br>Lead     | 209<br>Bi<br>Bismuth  | 210<br>Po<br>Polonium  | 210<br>At<br>Astatine  | 222<br>Rn<br>Radon  |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
| 87<br>Fr<br>Francium                                                                                                                                    | 88<br>Ra<br>Radium    | 89<br>Ac<br>Actinium   |                       |                       |                        |                        |                        |                      |                        |                     |                      |                       |                       |                       |                        |                        |                     |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
| *58-71 Lanthanoid series                                                                                                                                |                       |                        |                       |                       |                        |                        |                        |                      |                        |                     |                      |                       |                       |                       |                        |                        |                     |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
| †90-103 Actinoid series                                                                                                                                 |                       |                        |                       |                       |                        |                        |                        |                      |                        |                     |                      |                       |                       |                       |                        |                        |                     |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |
| <div>140<br/>Ce<br/>Cerium</div>                                                                                                                        |                       |                        |                       |                       |                        |                        |                        |                      |                        |                     |                      |                       |                       |                       |                        |                        |                     | <div>141<br/>Pr<br/>Praseodymium</div> |  | <div>144<br/>Nd<br/>Neodymium</div> |  | <div>150<br/>Sm<br/>Samarium</div>  |  | <div>157<br/>Gd<br/>Gadolinium</div> |  | <div>162<br/>Dy<br/>Dysprosium</div> |  | <div>165<br/>Ho<br/>Holmium</div> |  | <div>167<br/>Er<br/>Erbium</div>    |  | <div>169<br/>Tm<br/>Thulium</div>     |  | <div>175<br/>Lu<br/>Lutetium</div>    |  |                                   |  |                                       |  |                                    |  |                                      |  |
| <div>232<br/>Th<br/>Thorium</div>                                                                                                                       |                       |                        |                       |                       |                        |                        |                        |                      |                        |                     |                      |                       |                       |                       |                        |                        |                     | <div>238<br/>Pa<br/>Protactinium</div> |  | <div>238<br/>U<br/>Uranium</div>    |  | <div>238<br/>Np<br/>Neptunium</div> |  | <div>238<br/>Pu<br/>Plutonium</div>  |  | <div>244<br/>Am<br/>Americium</div>  |  | <div>244<br/>Cm<br/>Curium</div>  |  | <div>247<br/>Bk<br/>Berkelium</div> |  | <div>251<br/>Cf<br/>Californium</div> |  | <div>252<br/>Es<br/>Einsteinium</div> |  | <div>257<br/>Fm<br/>Fermium</div> |  | <div>261<br/>Md<br/>Mendelevium</div> |  | <div>262<br/>No<br/>Nobelium</div> |  | <div>261<br/>Lr<br/>Lawrencium</div> |  |
| <div><div>a</div><div>X</div><div>b</div></div> <div>Key</div> <div>a = relative atomic mass<br/>X = atomic symbol<br/>b = proton (atomic) number</div> |                       |                        |                       |                       |                        |                        |                        |                      |                        |                     |                      |                       |                       |                       |                        |                        |                     |                                        |  |                                     |  |                                     |  |                                      |  |                                      |  |                                   |  |                                     |  |                                       |  |                                       |  |                                   |  |                                       |  |                                    |  |                                      |  |

The volume of one mole of any gas is 24 dm<sup>3</sup> at room temperature and pressure (r.t.p.).

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