

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**CHEMISTRY**

**0620/01**

Paper 1 Multiple Choice

October/November 2005

**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.

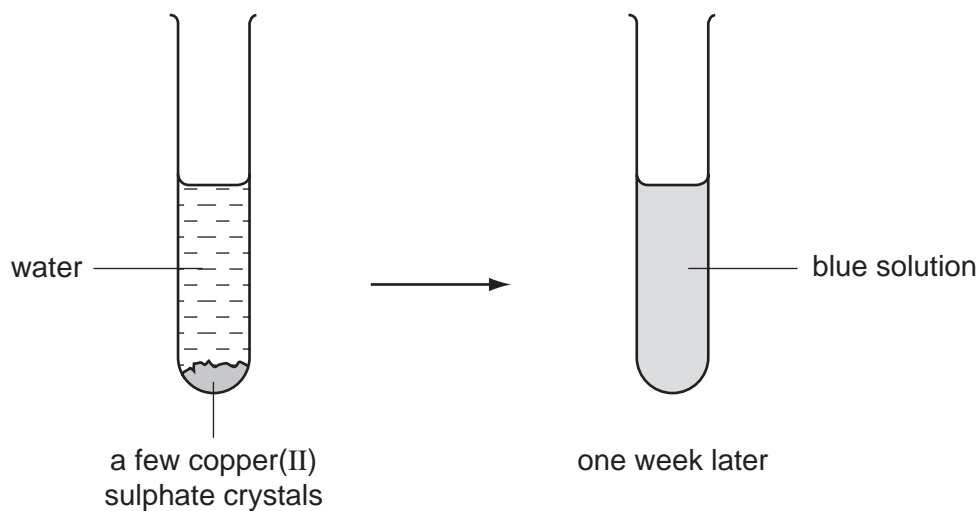
You may use a calculator.

This document consists of **17** printed pages and **3** blank pages.



2

- 1 Blue copper(II) sulphate crystals are soluble in water.



What has happened after one week?

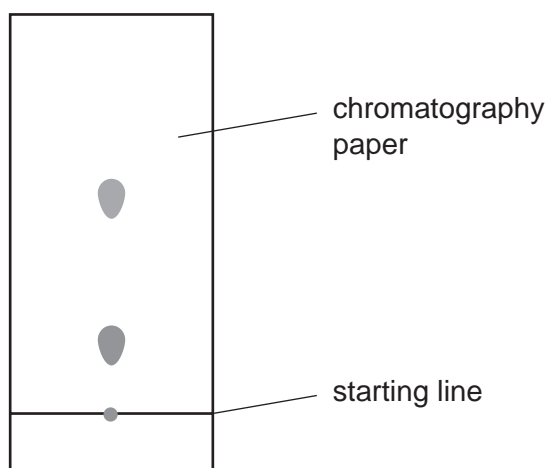
- A crystallisation
  - B diffusion
  - C distillation
  - D filtration
- 2 The reaction between solution **P** and solution **Q** is exothermic.

A student is told to test this statement by mixing equal volumes of the two solutions and measuring the temperature change.

Which two pieces of apparatus should the student use?

- A balance and clock
- B balance and thermometer
- C pipette and clock
- D pipette and thermometer

- 3 A coin is dissolved in an acid. Chromatography is used to test the solution formed. The diagram shows the chromatogram obtained.



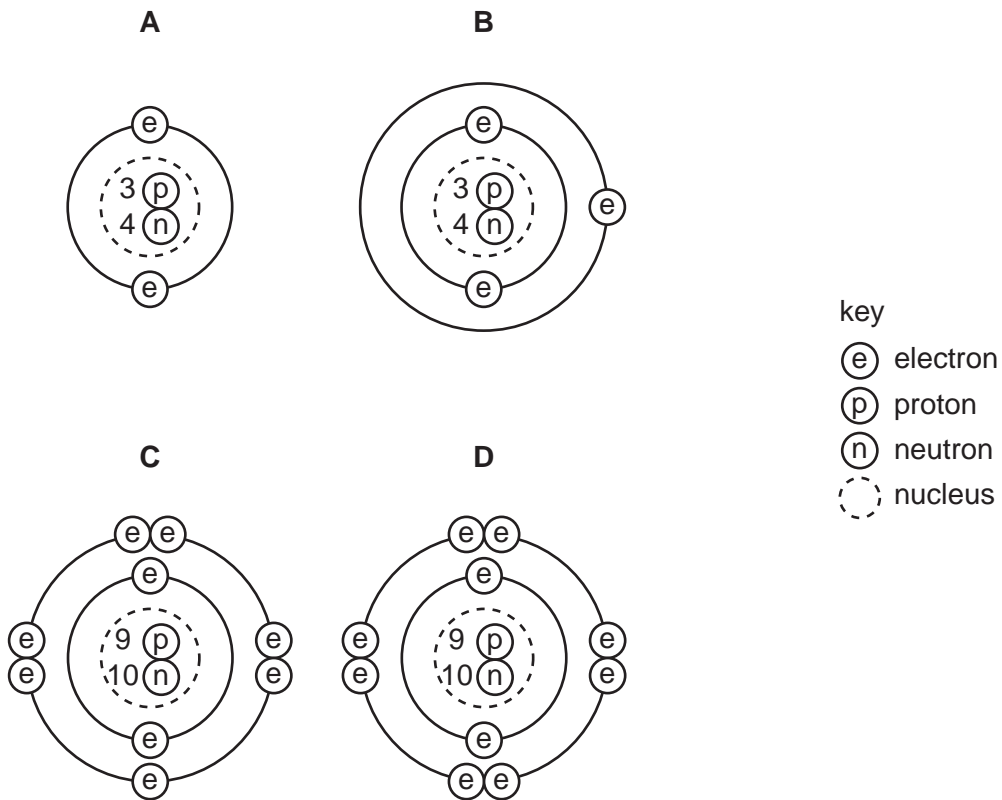
What is the coin made from?

- A** a metal element  
**B** a non-metal element  
**C** a mixture of metals  
**D** a mixture of non-metals
- 4 What do the nuclei in hydrogen molecules contain?
- A** electrons and neutrons  
**B** electrons and protons  
**C** neutrons only  
**D** protons only
- 5 Which statements about isotopic atoms of the same element are correct?

|          | different number of electrons | different number of neutrons |
|----------|-------------------------------|------------------------------|
| <b>A</b> | ✓                             | ✓                            |
| <b>B</b> | ✓                             | x                            |
| <b>C</b> | x                             | ✓                            |
| <b>D</b> | x                             | x                            |

4

6 Which diagram shows a positively charged ion?



7 Bottles of sodium hydroxide, sodium chloride and sugar have lost their labels.

Students test a sample from each bottle. Their results are shown in the table.

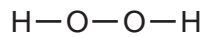
| bottle | addition of water          | conductivity of solution     |
|--------|----------------------------|------------------------------|
| 1      | forms an alkaline solution | conducts electricity         |
| 2      | forms a neutral solution   | conducts electricity         |
| 3      | forms a neutral solution   | does not conduct electricity |

What are the correct labels for each bottle?

|          | bottle 1         | bottle 2         | bottle 3         |
|----------|------------------|------------------|------------------|
| <b>A</b> | sodium hydroxide | sodium chloride  | sugar            |
| <b>B</b> | sodium hydroxide | sugar            | sodium chloride  |
| <b>C</b> | sodium chloride  | sugar            | sodium hydroxide |
| <b>D</b> | sugar            | sodium hydroxide | sodium chloride  |

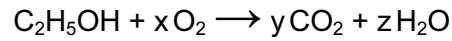
5

- 8 The diagram shows the structure of hydrogen peroxide.



What is the total number of electrons used for bonding in this molecule?

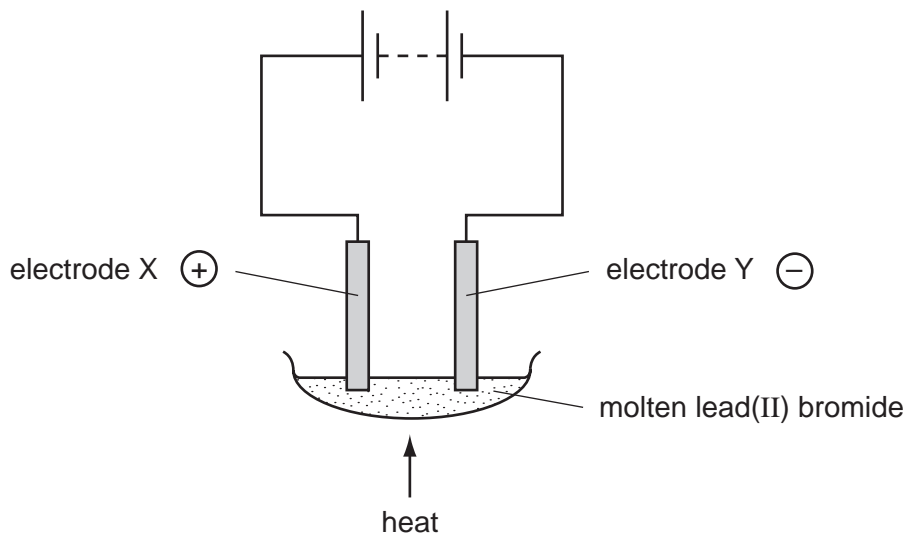
- A** 3                      **B** 4                      **C** 6                      **D** 8
- 9 The equation shows the reaction that occurs when ethanol burns in air.



Which values of x, y and z are needed to balance this equation?

|          | x | y | z |
|----------|---|---|---|
| <b>A</b> | 2 | 2 | 2 |
| <b>B</b> | 2 | 2 | 3 |
| <b>C</b> | 2 | 3 | 3 |
| <b>D</b> | 3 | 2 | 3 |

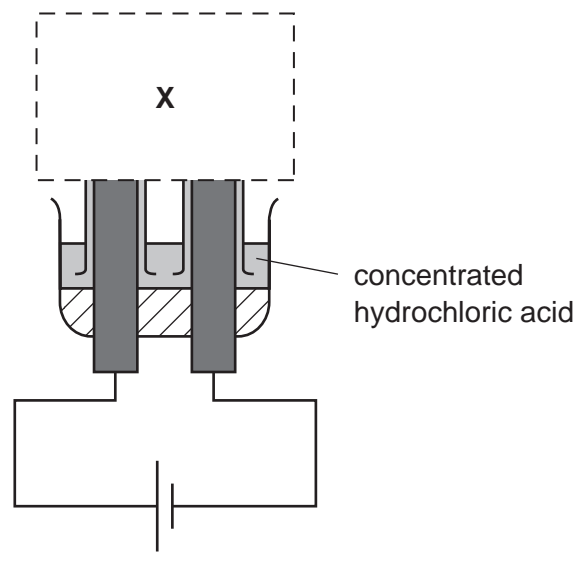
- 10 The diagram shows the electrolysis of molten lead(II) bromide.



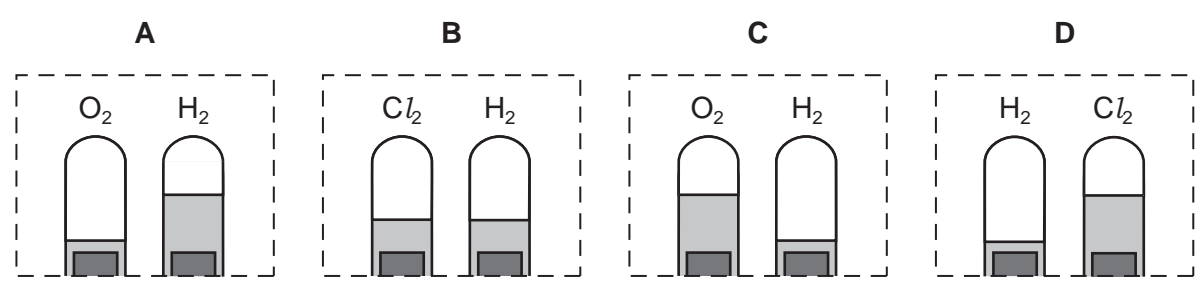
What is seen at each electrode?

|          | electrode X   | electrode Y   |
|----------|---------------|---------------|
| <b>A</b> | brown gas     | silvery metal |
| <b>B</b> | brown metal   | green gas     |
| <b>C</b> | green gas     | brown metal   |
| <b>D</b> | silvery metal | brown gas     |

11 The diagram shown is not complete.



What should be shown at X when the solution has been electrolysed for some time?



12 Which process is endothermic?

- A burning hydrogen to form water
- B condensing steam to water
- C melting ice to form water
- D reacting sodium with water

13 The elements  $H_2$  and  $^{235}U$  are both used as fuels.

In these processes, the reactions are .....1..... and .....2..... oxidised.

Which words correctly complete gaps 1 and 2?

|   | 1           | 2                 |
|---|-------------|-------------------|
| A | endothermic | both elements are |
| B | endothermic | only hydrogen is  |
| C | exothermic  | both elements are |
| D | exothermic  | only hydrogen is  |

- 14 Why does the powdering of calcium carbonate increase the speed of its reaction with acid?
- A It increases the mass of calcium carbonate.
  - B It increases the surface area of the calcium carbonate.
  - C The powder becomes more concentrated.
  - D The powder floats on top of the acid.
- 15 Which process does **not** involve either oxidation or reduction?
- A burning methane in the air
  - B extracting iron from hematite
  - C heating copper(II) oxide with carbon
  - D reacting sodium carbonate with dilute hydrochloric acid
- 16 An excess of acid in the stomach causes indigestion that can be cured by an anti-indigestion tablet.

What should the tablet contain to decrease the acidity?

- A an acidic substance
  - B an alkaline substance
  - C a neutral substance
  - D Universal Indicator
- 17 A solution is made by adding sodium oxide to water.

Which pH change can occur?

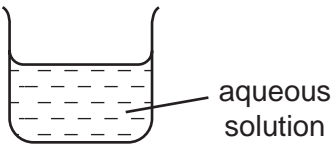
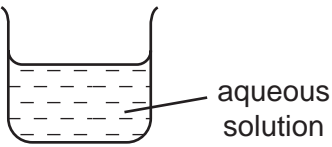
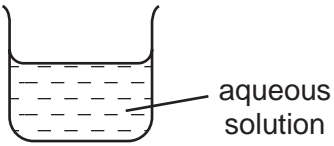
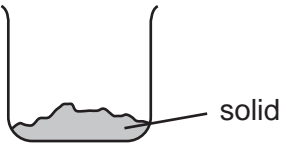
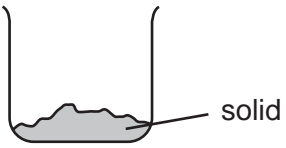
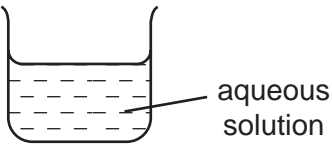
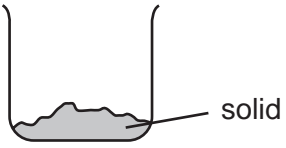
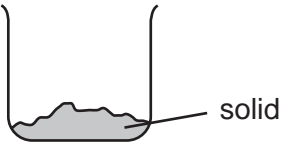
|   | pH change |   |    |
|---|-----------|---|----|
| A | 1         | → | 7  |
| B | 7         | → | 1  |
| C | 7         | → | 12 |
| D | 12        | → | 7  |

- 18 Which element has an oxide that forms a salt with an alkali?

- A N
- B Na
- C Ne
- D Ni

- 19 Pure zinc sulphate can be prepared by adding an excess of either zinc carbonate or zinc hydroxide to dilute sulphuric acid.

In which form are these zinc compounds used?

|          | zinc carbonate  | zinc hydroxide   |
|----------|---|--|
| <b>A</b> |  <p>aqueous solution</p> |  <p>aqueous solution</p> |
| <b>B</b> |  <p>aqueous solution</p> |  <p>solid</p>            |
| <b>C</b> |  <p>solid</p>            |  <p>aqueous solution</p> |
| <b>D</b> |  <p>solid</p>          |  <p>solid</p>          |

- 20 Which aqueous ion causes a yellow precipitate to form when acidified aqueous lead(II) nitrate is added to it?

- A chloride
- B iodide
- C nitrate
- D sulphate

- 21 Which information about an element can be used to predict its chemical properties?

- A colour of its compounds
- B density
- C melting point
- D position in the Periodic Table



22 The table shows some properties of four gases.

Which gas is most suitable for filling weather balloons?

|          | density compared with air | chemical reactivity |
|----------|---------------------------|---------------------|
| <b>A</b> | higher                    | reactive            |
| <b>B</b> | higher                    | unreactive          |
| <b>C</b> | lower                     | reactive            |
| <b>D</b> | lower                     | unreactive          |

23 A data book gives the following information about an element.

|                     |                                   |
|---------------------|-----------------------------------|
| appearance          | silver-grey solid                 |
| melting point       | 63°C                              |
| density             | 0.86 g/cm <sup>3</sup>            |
| reaction with water | vigorous reaction with cold water |

Where is the element likely to be found in the Periodic Table?

- A** Group 0
- B** Group I
- C** Group VII
- D** transition elements

24 Calcium, on the left of Period 3 of the Periodic Table, is more metallic than bromine on the right of this Period.

Why is this?

Calcium has

- A** fewer electrons.
- B** fewer protons.
- C** fewer full shells of electrons.
- D** fewer outer shell electrons.

- 25 Brass, an alloy of copper with another element, is used to make the contact pins and plugs because it is harder than copper.

In brass, the other element is a .....X..... that .....Y..... with the copper.

What are X and Y?

|   | X         | Y      |
|---|-----------|--------|
| A | metal     | mixes  |
| B | metal     | reacts |
| C | non-metal | mixes  |
| D | non-metal | reacts |

- 26 A student added dilute hydrochloric acid to four metals and recorded his results. Not all of his results are correct.

|   | results   |               |
|---|-----------|---------------|
|   | metal     | gas given off |
| 1 | copper    | yes           |
| 2 | iron      | yes           |
| 3 | magnesium | no            |
| 4 | zinc      | yes           |

Which two results are correct?

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

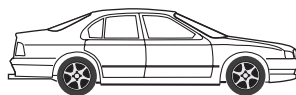
- 27 Which of the following is made from stainless steel?

A



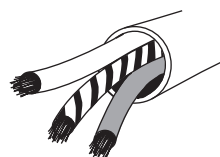
aircraft frames

B



car bodies

C



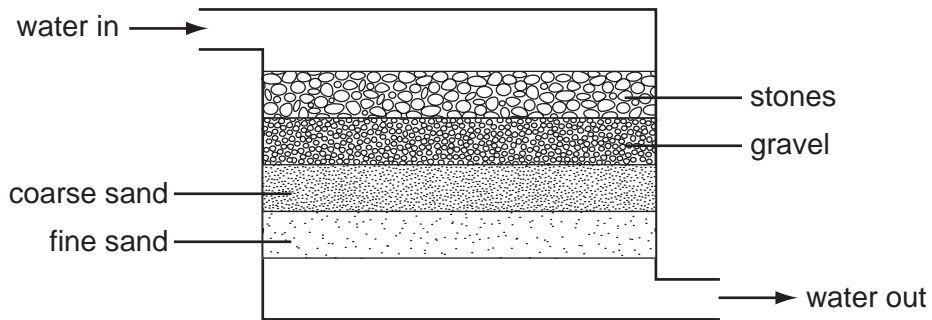
electrical cables

D



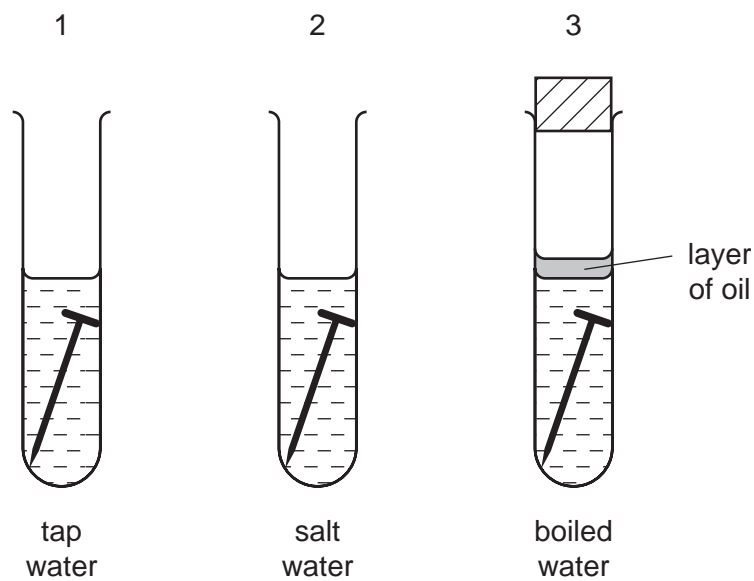
knives and forks

28 What is the purpose of the fine sand filter in the purification of the water?



- A to allow particles to settle
  - B to sort particles into layers
  - C to trap large particles
  - D to trap small particles
- 29 What is formed when ethane burns incompletely but **not** when it burns completely?
- A carbon dioxide
  - B carbon monoxide
  - C ethene
  - D hydrogen

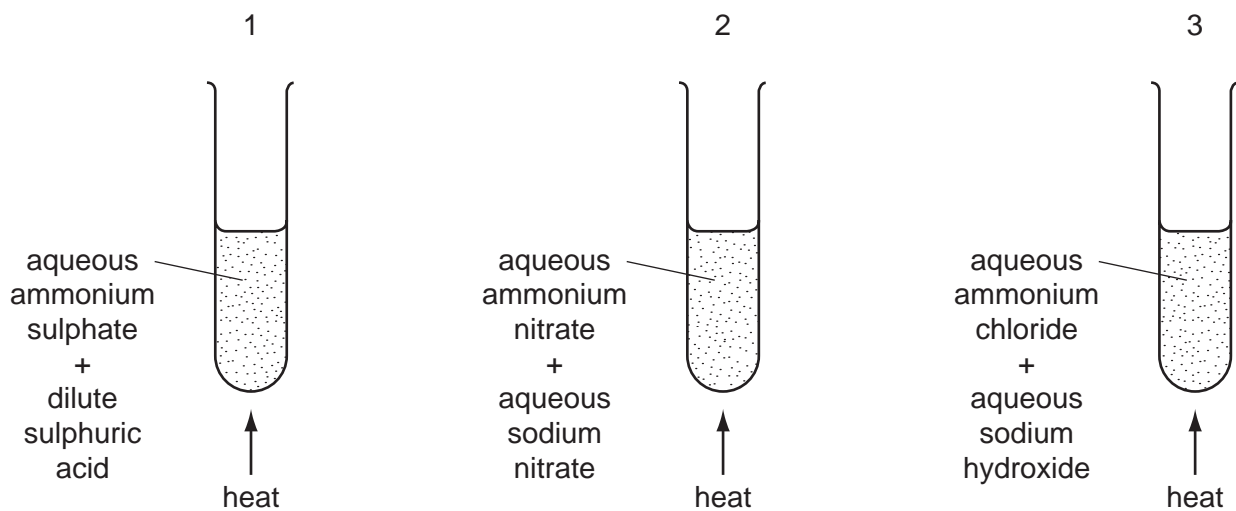
30 The diagrams show experiments to investigate rusting of iron nails.



In which test-tubes do the nails rust?

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

31 The diagrams show three experiments.



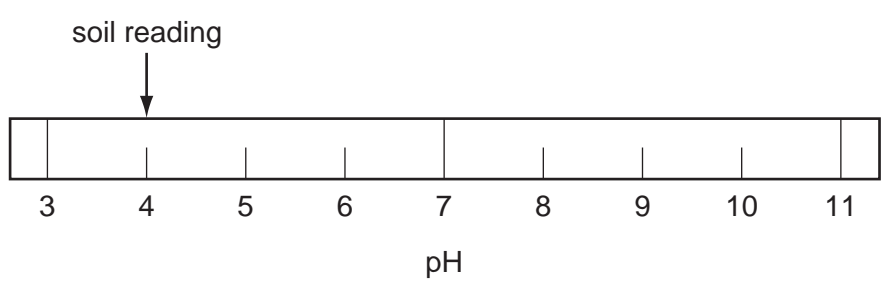
In which experiments is ammonia formed?

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

32 In which process is carbon dioxide **not** formed?

- A blast furnace extraction of iron
- B burning of natural gas
- C heating lime
- D oxy-acetylene welding

33 The diagram shows the results of a pH test on a sample of garden soil.



What could be added to the soil to change its pH to 7?

- A ammonium nitrate
- B lime
- C sand
- D sodium chloride



36 The table shows the composition of natural gas.

| gas      | % of natural gas |
|----------|------------------|
| <b>X</b> | 93.1             |
| ethane   | 3.4              |
| nitrogen | 2.3              |

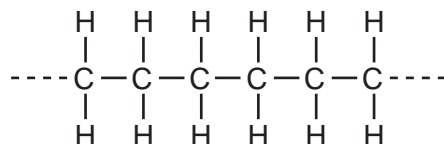
What is **X**?

- A ethanol
- B ethene
- C methane
- D propane

37 Which pair of compounds belong to the same homologous series?

- A  $\text{CH}_3\text{CH}_3$  and  $\text{CH}_3\text{CH}_2\text{CH}_3$
- B  $\text{CH}_3\text{CH}_2\text{OH}$  and  $\text{CH}_3\text{OCH}_2\text{CH}_3$
- C  $\text{CH}_2\text{CHCH}_2\text{CH}_3$  and  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_3$
- D  $\text{CH}_3\text{CH}_2\text{OH}$  and  $\text{CH}_2\text{CHCH}_2\text{OH}$

38 The diagram shows the structure of an important product.

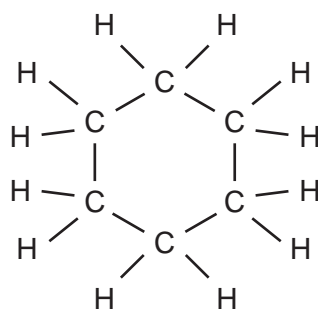


This product is formed by .....1..... of an .....2.....

Which words correctly complete gaps 1 and 2?

|          | 1                       | 2      |
|----------|-------------------------|--------|
| <b>A</b> | addition polymerisation | alkane |
| <b>B</b> | addition polymerisation | alkene |
| <b>C</b> | cracking                | alkane |
| <b>D</b> | cracking                | alkene |

39 An organic compound has the structure shown.



From knowledge of the properties of alkanes and alkenes, which reactions would be predicted for this compound?

|          | burn | decolourise aqueous bromine |
|----------|------|-----------------------------|
| <b>A</b> | ✓    | ✓                           |
| <b>B</b> | ✓    | x                           |
| <b>C</b> | x    | ✓                           |
| <b>D</b> | x    | x                           |

40 Ethanol can be formed by

- 1 fermentation,
- 2 reaction between steam and ethene.

Which of these processes uses a catalyst?

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









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

|                                |                                  | Group                          |                              |                               |                                 |                               |                                 |                               |                                 |                                    |                                    |                                  |                                    |                                 |                                     |                                |                                   |                                  |                                   |                                   |                                  |                                   |                                    |                               |                                 |                                 |                                 |                               |                                  |                                    |                                  |                                   |                                  |                                  |                                   |                                    |                                 |                                    |                                  |                                     |                                     |                                     |                                   |                                  |                               |                                    |                                     |                                 |                                   |                                  |                                     |                                   |                                    |                                   |                                   |                                  |                                   |                                    |                                |                                   |                                    |                                |                                   |                                    |                                    |                                  |                                    |                                    |
|--------------------------------|----------------------------------|--------------------------------|------------------------------|-------------------------------|---------------------------------|-------------------------------|---------------------------------|-------------------------------|---------------------------------|------------------------------------|------------------------------------|----------------------------------|------------------------------------|---------------------------------|-------------------------------------|--------------------------------|-----------------------------------|----------------------------------|-----------------------------------|-----------------------------------|----------------------------------|-----------------------------------|------------------------------------|-------------------------------|---------------------------------|---------------------------------|---------------------------------|-------------------------------|----------------------------------|------------------------------------|----------------------------------|-----------------------------------|----------------------------------|----------------------------------|-----------------------------------|------------------------------------|---------------------------------|------------------------------------|----------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-----------------------------------|----------------------------------|-------------------------------|------------------------------------|-------------------------------------|---------------------------------|-----------------------------------|----------------------------------|-------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|-----------------------------------|----------------------------------|-----------------------------------|------------------------------------|--------------------------------|-----------------------------------|------------------------------------|--------------------------------|-----------------------------------|------------------------------------|------------------------------------|----------------------------------|------------------------------------|------------------------------------|
| I                              | II                               | III                            | IV                           | V                             | VI                              | VII                           | 0                               |                               |                                 |                                    |                                    | 0                                |                                    |                                 |                                     |                                |                                   |                                  |                                   |                                   |                                  |                                   |                                    |                               |                                 |                                 |                                 |                               |                                  |                                    |                                  |                                   |                                  |                                  |                                   |                                    |                                 |                                    |                                  |                                     |                                     |                                     |                                   |                                  |                               |                                    |                                     |                                 |                                   |                                  |                                     |                                   |                                    |                                   |                                   |                                  |                                   |                                    |                                |                                   |                                    |                                |                                   |                                    |                                    |                                  |                                    |                                    |
| 7<br><b>Li</b><br>Lithium<br>3 | 9<br><b>Be</b><br>Beryllium<br>4 | 1<br><b>H</b><br>Hydrogen<br>1 | 11<br><b>B</b><br>Boron<br>5 | 12<br><b>C</b><br>Carbon<br>6 | 14<br><b>N</b><br>Nitrogen<br>7 | 16<br><b>O</b><br>Oxygen<br>8 | 19<br><b>F</b><br>Fluorine<br>9 | 20<br><b>Ne</b><br>Neon<br>10 | 23<br><b>Na</b><br>Sodium<br>11 | 24<br><b>Mg</b><br>Magnesium<br>12 | 27<br><b>Al</b><br>Aluminium<br>13 | 28<br><b>Si</b><br>Silicon<br>14 | 31<br><b>P</b><br>Phosphorus<br>15 | 32<br><b>S</b><br>Sulphur<br>16 | 35.5<br><b>Cl</b><br>Chlorine<br>17 | 40<br><b>Ar</b><br>Argon<br>18 | 39<br><b>K</b><br>Potassium<br>19 | 40<br><b>Ca</b><br>Calcium<br>20 | 45<br><b>Sc</b><br>Scandium<br>21 | 48<br><b>Ti</b><br>Titanium<br>22 | 51<br><b>V</b><br>Vanadium<br>23 | 52<br><b>Cr</b><br>Chromium<br>24 | 55<br><b>Mn</b><br>Manganese<br>25 | 56<br><b>Fe</b><br>Iron<br>26 | 59<br><b>Co</b><br>Cobalt<br>27 | 59<br><b>Ni</b><br>Nickel<br>28 | 64<br><b>Cu</b><br>Copper<br>29 | 65<br><b>Zn</b><br>Zinc<br>30 | 70<br><b>Ga</b><br>Gallium<br>31 | 73<br><b>Ge</b><br>Germanium<br>32 | 75<br><b>As</b><br>Arsenic<br>33 | 79<br><b>Se</b><br>Selenium<br>34 | 80<br><b>Br</b><br>Bromine<br>35 | 84<br><b>Kr</b><br>Krypton<br>36 | 85<br><b>Rb</b><br>Rubidium<br>37 | 88<br><b>Sr</b><br>Strontium<br>38 | 89<br><b>Y</b><br>Yttrium<br>39 | 91<br><b>Zr</b><br>Zirconium<br>40 | 93<br><b>Nb</b><br>Niobium<br>41 | 96<br><b>Mo</b><br>Molybdenum<br>42 | 101<br><b>Ru</b><br>Ruthenium<br>44 | 106<br><b>Pd</b><br>Palladium<br>46 | 112<br><b>Cd</b><br>Cadmium<br>48 | 115<br><b>In</b><br>Indium<br>49 | 119<br><b>Sn</b><br>Tin<br>50 | 122<br><b>Sb</b><br>Antimony<br>51 | 128<br><b>Te</b><br>Tellurium<br>52 | 131<br><b>Xe</b><br>Xenon<br>54 | 133<br><b>Cs</b><br>Caesium<br>55 | 137<br><b>Ba</b><br>Barium<br>56 | 139<br><b>La</b><br>Lanthanum<br>57 | 178<br><b>Hf</b><br>Hafnium<br>72 | 181<br><b>Ta</b><br>Tantalum<br>73 | 184<br><b>W</b><br>Tungsten<br>74 | 186<br><b>Re</b><br>Rhenium<br>75 | 190<br><b>Os</b><br>Osmium<br>76 | 192<br><b>Ir</b><br>Iridium<br>77 | 195<br><b>Pt</b><br>Platinum<br>78 | 197<br><b>Au</b><br>Gold<br>79 | 201<br><b>Hg</b><br>Mercury<br>80 | 204<br><b>Tl</b><br>Thallium<br>81 | 207<br><b>Pb</b><br>Lead<br>82 | 209<br><b>Bi</b><br>Bismuth<br>83 | 210<br><b>Po</b><br>Polonium<br>84 | 210<br><b>At</b><br>Astatine<br>85 | 226<br><b>Ra</b><br>Radium<br>88 | 227<br><b>Ac</b><br>Actinium<br>89 | 227<br><b>Fr</b><br>Francium<br>87 |

\*58-71 Lanthanoid series  
†90-103 Actinoid series

Key  

|   |          |
|---|----------|
| a | <b>X</b> |
| b |          |

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

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

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