

International General Certificate of Secondary Education  
CAMBRIDGE INTERNATIONAL EXAMINATIONS

**CHEMISTRY**

**0620/1**

PAPER 1 Multiple Choice

**OCTOBER/NOVEMBER SESSION 2002**

45 minutes

Additional materials:

Multiple Choice answer sheet

Soft clean eraser

Soft pencil (type B or HB is recommended)

**TIME** 45 minutes

**INSTRUCTIONS TO CANDIDATES**

**Do not open this booklet until you are told to do so.**

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

There are **forty** questions in 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 very carefully the instructions on the answer sheet.**

**INFORMATION FOR CANDIDATES**

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.

2

1 Heating a liquid causes it to become a vapour.

What happens to the molecules of the liquid during this process?

	the molecules become bigger	the molecules move further apart
<b>A</b>	✓	✓
<b>B</b>	✓	✗
<b>C</b>	✗	✓
<b>D</b>	✗	✗

2 Some sugar is dissolved in water.

Which diagram shows how the particles are arranged in the solution?

key

- sugar particle
- water particle

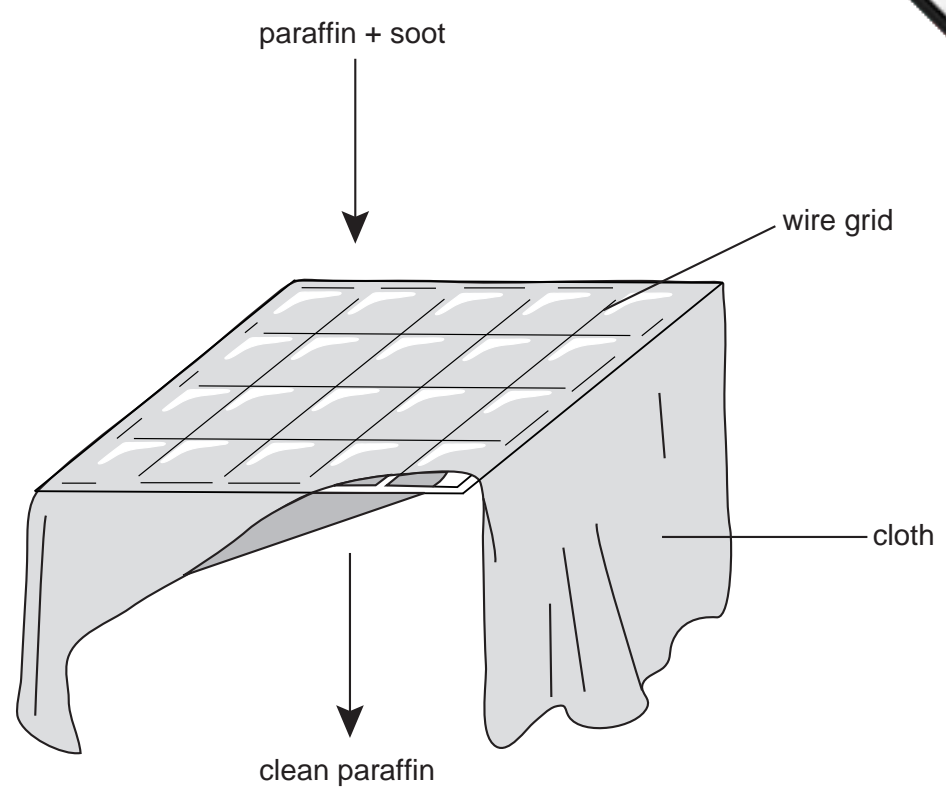
**A**                      **B**                      **C**                      **D**

3 Which stages occur in distillation?

- A** condensation then evaporation
- B** condensation then filtration
- C** evaporation then condensation
- D** filtration then evaporation

3

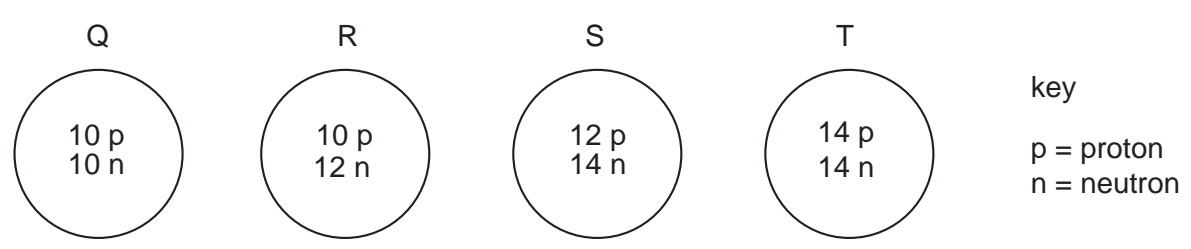
4 Some paraffin is contaminated with soot (carbon). The soot is removed as shown.



Which method is used to remove the soot?

- A cracking
- B crystallisation
- C diffusion
- D filtration

5 The diagrams show the nuclei of four different atoms.



Which two atoms are isotopes of each other?

- A Q and R
- B Q and T
- C R and S
- D S and T

6 Which atom has twice as many neutrons as protons?

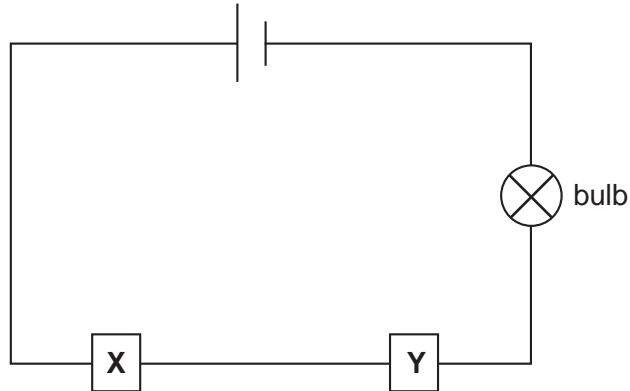
- A  ${}^1_1\text{H}$
- B  ${}^2_1\text{H}$
- C  ${}^3_1\text{H}$
- D  ${}^4_2\text{He}$

4

7 Which change takes place when an atom becomes a positive ion?

- A An electron is added.
- B An electron is removed.
- C A proton is added.
- D A proton is removed.

8 The diagram shows an electric circuit.



For which two substances at **X** and **Y** does the bulb light up?

	<b>X</b>	<b>Y</b>
<b>A</b>	copper	graphite
<b>B</b>	copper	poly(ethene)
<b>C</b>	rubber	graphite
<b>D</b>	rubber	poly(ethene)

9 One method of producing carbon dioxide is to react calcium carbonate with dilute hydrochloric acid.

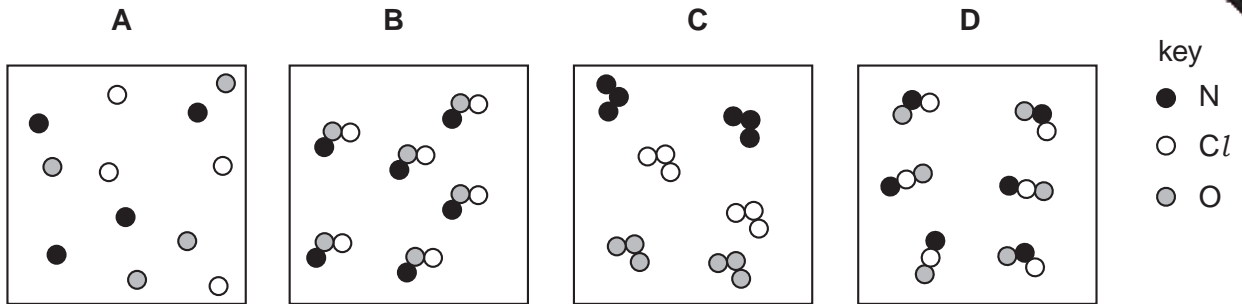
What is the balanced chemical equation for the reaction?

- A  $\text{CaCO}_3 + \text{HCl} \rightarrow \text{CaO} + \text{CO}_2 + \text{HCl}$
- B  $\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{CaCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$
- C  $\text{CaCO}_3 + 4\text{HCl} \rightarrow \text{CaCl}_4 + \text{CO}_2 + \text{H}_2 + \text{H}_2\text{O}$
- D  $\text{Ca}(\text{HCO}_3)_2 + \text{HCl} \rightarrow \text{CaCl} + 2\text{CO}_2 + \text{H}_2\text{O}$

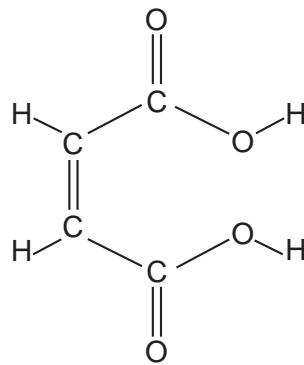
5

10 A gas has the molecular formula  $\text{NOCl}$ .

Which diagram could show molecules of the pure gas  $\text{NOCl}$ ?



11 Butenedioic acid has the structure shown.



What is the molecular formula of butenedioic acid?

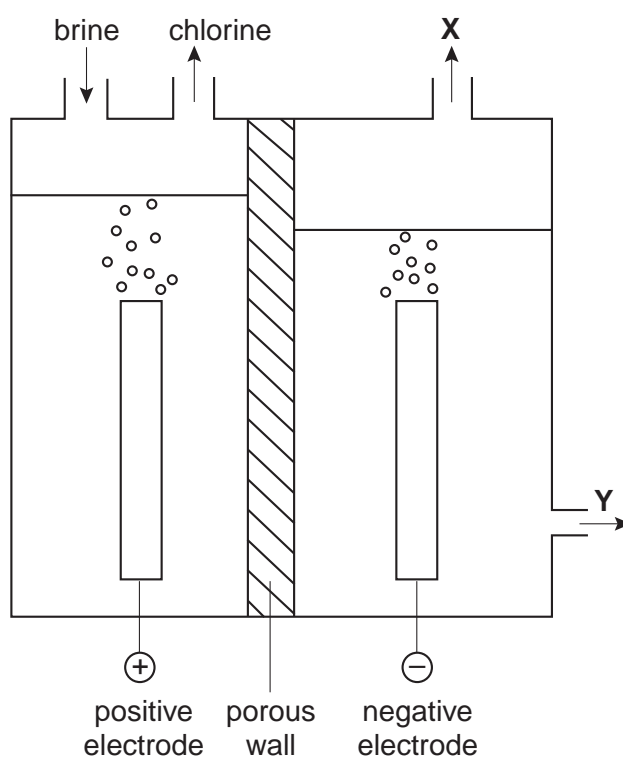
A CHO

B  $\text{C}_4\text{H}_4\text{O}_4$

C  $\text{C}_6\text{H}_4\text{O}_2$

D  $\text{C}_6\text{H}_4\text{O}_6$

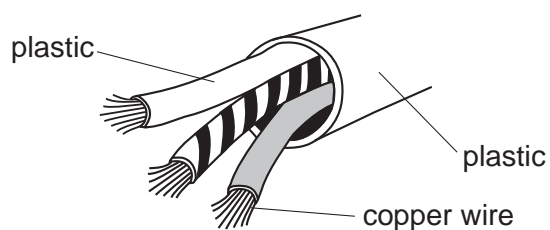
12 The diagram represents the electrolysis of brine (aqueous sodium chloride).



What are products **X** and **Y**?

	<b>X</b>	<b>Y</b>
<b>A</b>	hydrogen	aqueous sodium hydroxide
<b>B</b>	hydrogen	hydrochloric acid
<b>C</b>	oxygen	aqueous sodium hydroxide
<b>D</b>	oxygen	hydrochloric acid

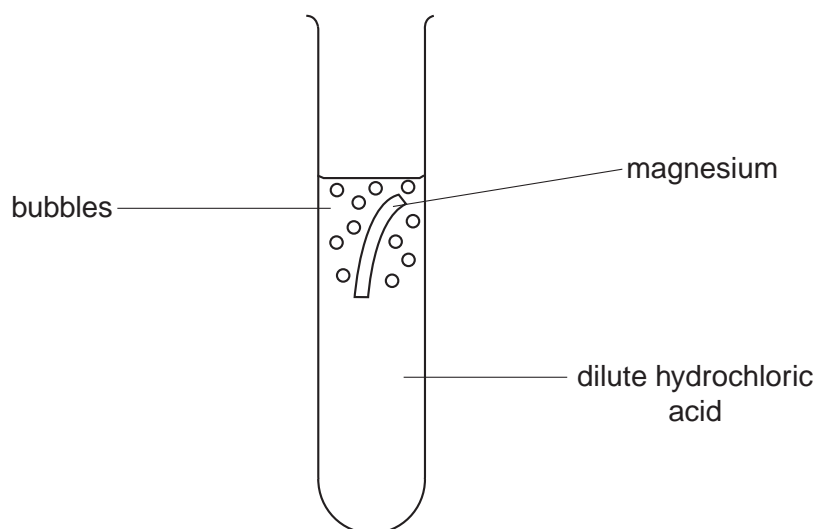
13 Copper wires in an electricity cable are covered in plastic.



Why is plastic used?

- A** It is an insulator.
- B** It is a polymer.
- C** It is hard.

- 14 A piece of magnesium is dropped into a test-tube containing dilute hydrochloric acid.



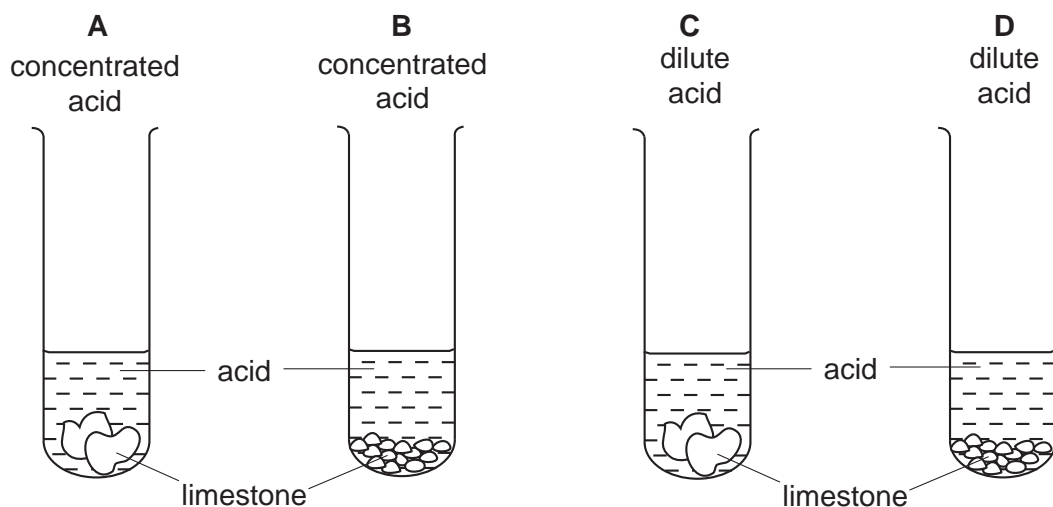
Why does the test-tube become warm?

- A Hydrogen is produced.
  - B The magnesium neutralises the acid.
  - C The reaction is endothermic.
  - D The reaction is exothermic.
- 15 An explosion in a coal mine was caused by the ignition of a mixture of methane and air.

Why did the mixture explode?

- A The heat absorbed by burning decreased the rate of burning.
- B The heat absorbed by burning increased the rate of burning.
- C The heat liberated by burning decreased the rate of burning.
- D The heat liberated by burning increased the rate of burning.

- 16 The diagram shows an experiment to compare the speed of reaction when limestone is added to acid.



In which test-tube is the reaction most rapid?

- 17 Which properties does a transition element have?

	density	melting point
<b>A</b>	high	high
<b>B</b>	high	low
<b>C</b>	low	high
<b>D</b>	low	low

- 18 Which metals can be obtained by heating their oxides with carbon?

	copper	iron	magnesium
<b>A</b>	X	✓	✓
<b>B</b>	✓	✓	X
<b>C</b>	X	X	✓
<b>D</b>	✓	X	X

- 19 Aqueous lead(II) nitrate is added to a solution containing iodide ions. Lead(II) iodide is formed.

Which type of reaction takes place?

- A** neutralisation  
**B** oxidation  
**C** precipitation



20 Which element reacts with dilute sulphuric acid to produce hydrogen?

- A carbon
- B chlorine
- C copper
- D zinc

21 For which pH change is there the largest increase in acidity?

	initial pH	final pH
A	1	3
B	2	6
C	3	1
D	6	2

22 Which statement about the electrical conductivity of non-metals and the charge on their ions is correct?

	electrical conductivity	charge on ions
A	good	positive
B	good	negative
C	poor	positive
D	poor	negative

23 The corrosion of iron and its extraction from hematite are important processes.

Which terms describe the corrosion of iron and its extraction from hematite?

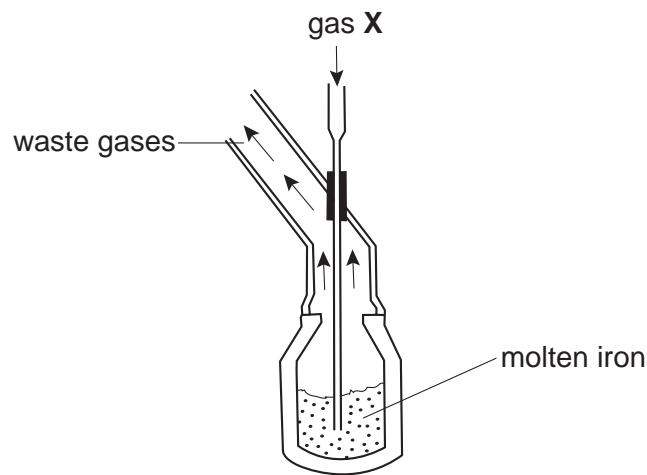
	corrosion	extraction
A	oxidation	oxidation
B	oxidation	reduction
C	reduction	oxidation
D	reduction	reduction

- 24 A few drops of aqueous bromine are added to separate aqueous solutions of potassium chloride, potassium bromide and potassium iodide.

Which solutions do **not** remove the colour of the bromine?

- A KBr and KCl only
  - B KBr and KI only
  - C KCl and KI only
  - D KBr, KCl and KI
- 25 Which metal produces a solution of a metal hydroxide when added to water?
- A calcium
  - B copper
  - C iron
  - D zinc
- 26 A highly reactive metal is likely to
- A form negative ions,
  - B occur naturally as an element,
  - C occur only as an oxide,
  - D oxidise rapidly in air.

27 The diagram shows the manufacture of steel.



What could gas **X** be?

- A carbon dioxide
- B chlorine
- C hydrogen
- D oxygen

28 A student writes the following statements.

- 1 Aluminium is used in the manufacture of aircraft bodies.
- 2 Aluminium is used to make stainless steel.
- 3 Mild steel is used in the manufacture of car bodies.

Which statements are correct?

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

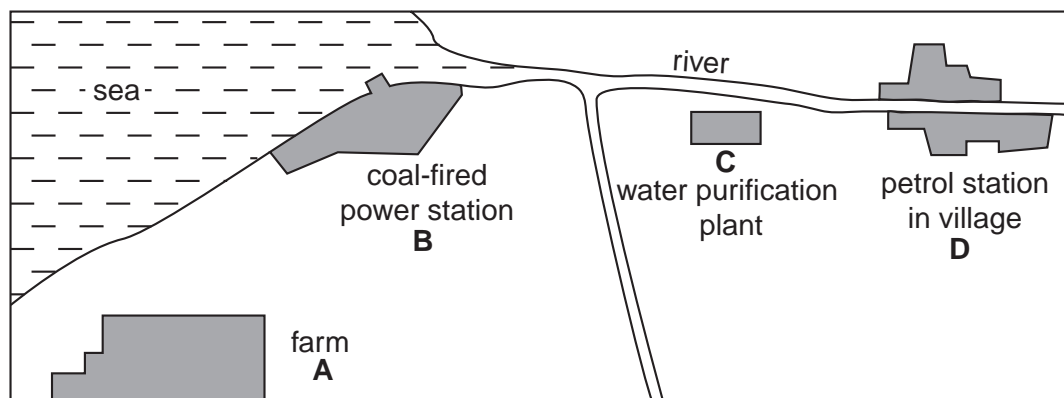
29 Which substance is used in the purification of water?

- A calcium sulphate
- B carbon dioxide
- C chlorine
- D sodium chloride

30 Which pollutant, found in car exhaust fumes, does **not** come from the fuel?

- A carbon monoxide
- B hydrocarbons
- C lead compounds
- D nitrogen oxides

31 Which place on the map is most likely to be producing large quantities of sulphur dioxide?



32 Why does a bicycle chain that is coated with oil **not** rust?

- A Oil dissolves any rust that forms.
- B Oil reacts with rust causing oxidation.
- C Oil reacts with oxygen so no rust forms.
- D Oil stops oxygen and water getting to the chain.

33 Which two other compounds should be added to ammonium sulphate to make a complete NPK fertiliser?

- A  $\text{KNO}_3$ ,  $\text{Na}_2\text{HPO}_4$
- B  $\text{K}_2\text{SO}_4$ ,  $\text{KNO}_3$
- C  $\text{NaCl}$ ,  $\text{Ca}_3(\text{PO}_4)_2$
- D  $\text{NH}_4\text{Cl}$ ,  $\text{Na}_2\text{HPO}_4$

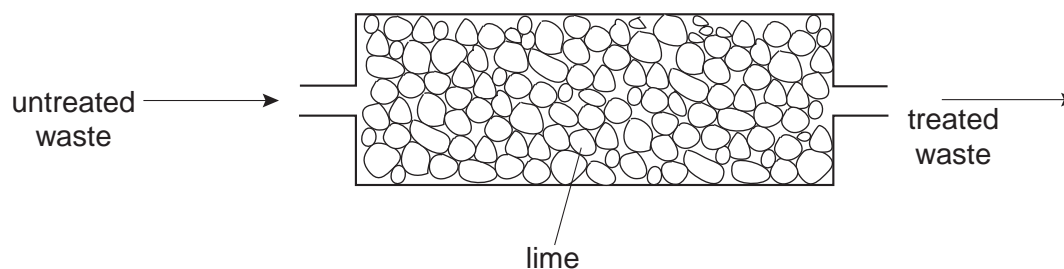
34 Two uses of oxygen are

- 1 burning acetylene in welding,
- 2 helping the breathing of hospital patients.

Which of these uses form carbon dioxide?

	use 1	use 2
<b>A</b>	✓	✓
<b>B</b>	✓	X
<b>C</b>	X	✓
<b>D</b>	X	X

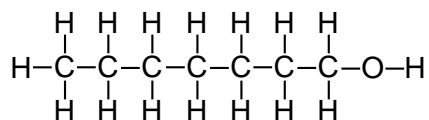
35 Lime is used to treat an industrial waste.



Which pH change occurs in the treatment?

	<u>untreated waste</u>	→	<u>treated waste</u>
<b>A</b>	acidic	→	neutral
<b>B</b>	alkaline	→	acidic
<b>C</b>	alkaline	→	neutral
<b>D</b>	neutral	→	acidic

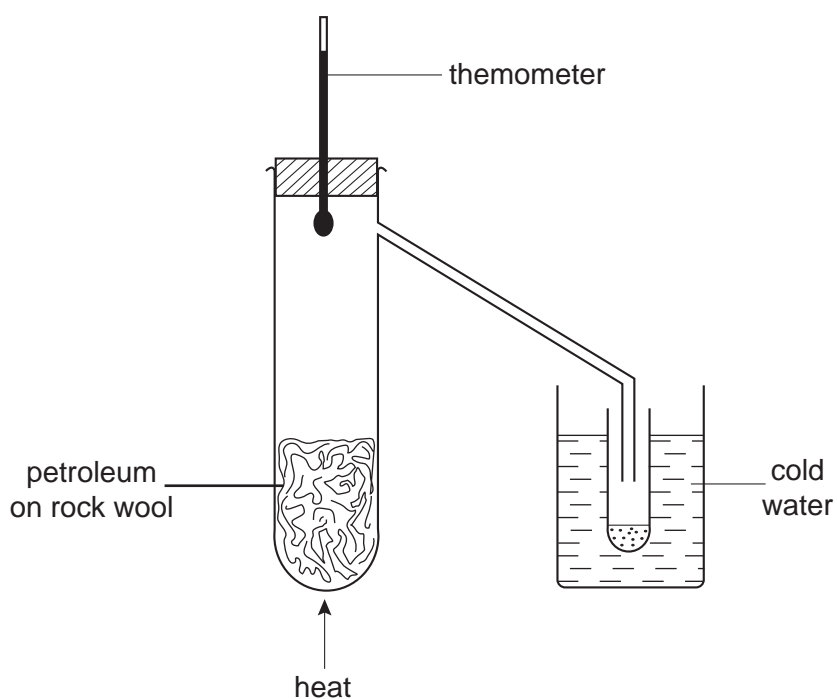
36 A compound **Q** has the structure shown.



What is the name of **Q**?

- A** heptane
- B** heptanoic acid
- C** heptanol

37 A student sets up the apparatus shown to separate petroleum into its different liquid



Why does this method of separation work?

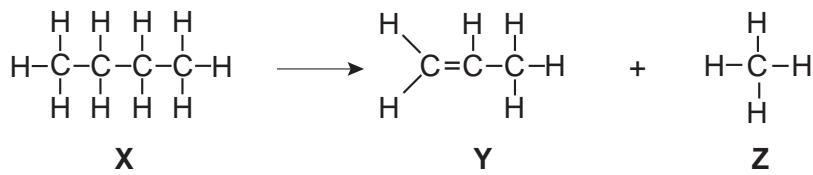
The liquids in petroleum have different

- A boiling points,
- B densities,
- C functional groups,
- D melting points.

38 Which row in the table correctly shows properties of decane?

	burns	is unsaturated
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

39 The equation shows the cracking of a hydrocarbon.



Which compounds are unsaturated?

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

40 A student states that

*ethanol reacts with water to form beer and wine;*

*ethanol and water are used as solvents in industry.*

Which of the underlined words are correct?

	reacts	solvents
A	✓	✓
B	✓	X
C	X	✓
D	X	X

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

I	II	III	IV	V	VI	VII	0	
7 <b>Li</b> Lithium	9 <b>Be</b> Beryllium	1 <b>H</b> Hydrogen					4 <b>He</b> Helium	2
23 <b>Na</b> Sodium	24 <b>Mg</b> Magnesium	11 <b>B</b> Boron	12 <b>C</b> Carbon	14 <b>N</b> Nitrogen	16 <b>O</b> Oxygen	19 <b>F</b> Fluorine	20 <b>Ne</b> Neon	
39 <b>K</b> Potassium	40 <b>Ca</b> Calcium	27 <b>Al</b> Aluminium	28 <b>Si</b> Silicon	31 <b>P</b> Phosphorus	32 <b>S</b> Sulphur	35.5 <b>Cl</b> Chlorine	40 <b>Ar</b> Argon	
85 <b>Rb</b> Rubidium	88 <b>Sr</b> Strontium	70 <b>Ga</b> Gallium	73 <b>Ge</b> Germanium	75 <b>As</b> Arsenic	79 <b>Se</b> Selenium	80 <b>Br</b> Bromine	84 <b>Kr</b> Krypton	
133 <b>Cs</b> Caesium	137 <b>Ba</b> Barium	115 <b>In</b> Indium	119 <b>Sn</b> Tin	122 <b>Sb</b> Antimony	128 <b>Te</b> Tellurium	127 <b>I</b> Iodine	131 <b>Xe</b> Xenon	
87 <b>Fr</b> Francium	226 <b>Ra</b> Radium	204 <b>Tl</b> Thallium	207 <b>Pb</b> Lead	209 <b>Bi</b> Bismuth	210 <b>Po</b> Polonium	210 <b>At</b> Astatine	222 <b>Rn</b> Radon	
		65 <b>Zn</b> Zinc	64 <b>Cu</b> Copper	59 <b>Ni</b> Nickel	63 <b>Ag</b> Silver	78 <b>Hg</b> Mercury	86	
		56 <b>Fe</b> Iron	58 <b>Co</b> Cobalt	59 <b>Ni</b> Nickel	78 <b>Pt</b> Platinum	80 <b>Au</b> Gold		
		44 <b>Ru</b> Ruthenium	45 <b>Rh</b> Rhodium	46 <b>Pd</b> Palladium	77 <b>Ir</b> Iridium	79 <b>Au</b> Gold		
		26 <b>Fe</b> Iron	27 <b>Co</b> Cobalt	28 <b>Ni</b> Nickel	47 <b>Ag</b> Silver	80 <b>Hg</b> Mercury		
		44 <b>Ru</b> Ruthenium	45 <b>Rh</b> Rhodium	46 <b>Pd</b> Palladium	77 <b>Ir</b> Iridium	80 <b>Hg</b> Mercury		
		101 <b>Ru</b> Ruthenium	103 <b>Rh</b> Rhodium	106 <b>Pd</b> Palladium	195 <b>Pt</b> Platinum	197 <b>Au</b> Gold		
		44 <b>Ru</b> Ruthenium	45 <b>Rh</b> Rhodium	46 <b>Pd</b> Palladium	77 <b>Ir</b> Iridium	80 <b>Hg</b> Mercury		
		186 <b>Re</b> Rhenium	187 <b>Os</b> Osmium	192 <b>Pt</b> Platinum	195 <b>Pt</b> Platinum	197 <b>Au</b> Gold		
		186 <b>Re</b> Rhenium	187 <b>Os</b> Osmium	192 <b>Pt</b> Platinum	195 <b>Pt</b> Platinum	197 <b>Au</b> Gold		
		75 <b>Re</b> Rhenium	77 <b>Ir</b> Iridium	78 <b>Pt</b> Platinum	79 <b>Au</b> Gold	80 <b>Hg</b> Mercury		
		75 <b>Re</b> Rhenium	77 <b>Ir</b> Iridium	78 <b>Pt</b> Platinum	79 <b>Au</b> Gold	80 <b>Hg</b> Mercury		
		184 <b>W</b> Tungsten	186 <b>Re</b> Rhenium	192 <b>Pt</b> Platinum	195 <b>Pt</b> Platinum	197 <b>Au</b> Gold		
		184 <b>W</b> Tungsten	186 <b>Re</b> Rhenium	192 <b>Pt</b> Platinum	195 <b>Pt</b> Platinum	197 <b>Au</b> Gold		
		73 <b>Ta</b> Tantalum	74 <b>W</b> Tungsten	76 <b>Os</b> Osmium	77 <b>Ir</b> Iridium	79 <b>Au</b> Gold		
		73 <b>Ta</b> Tantalum	74 <b>W</b> Tungsten	76 <b>Os</b> Osmium	77 <b>Ir</b> Iridium	79 <b>Au</b> Gold		
		181 <b>Ta</b> Tantalum	184 <b>W</b> Tungsten	192 <b>Pt</b> Platinum	195 <b>Pt</b> Platinum	197 <b>Au</b> Gold		
		181 <b>Ta</b> Tantalum	184 <b>W</b> Tungsten	192 <b>Pt</b> Platinum	195 <b>Pt</b> Platinum	197 <b>Au</b> Gold		
		41 <b>Nb</b> Niobium	42 <b>Mo</b> Molybdenum	44 <b>Ru</b> Ruthenium	45 <b>Rh</b> Rhodium	47 <b>Ag</b> Silver		
		41 <b>Nb</b> Niobium	42 <b>Mo</b> Molybdenum	44 <b>Ru</b> Ruthenium	45 <b>Rh</b> Rhodium	47 <b>Ag</b> Silver		
		91 <b>Zr</b> Zirconium	92 <b>Nb</b> Niobium	101 <b>Ru</b> Ruthenium	103 <b>Rh</b> Rhodium	106 <b>Pd</b> Palladium		
		91 <b>Zr</b> Zirconium	92 <b>Nb</b> Niobium	101 <b>Ru</b> Ruthenium	103 <b>Rh</b> Rhodium	106 <b>Pd</b> Palladium		
		22 <b>Ti</b> Titanium	23 <b>V</b> Vanadium	26 <b>Fe</b> Iron	27 <b>Co</b> Cobalt	29 <b>Cu</b> Copper		
		22 <b>Ti</b> Titanium	23 <b>V</b> Vanadium	26 <b>Fe</b> Iron	27 <b>Co</b> Cobalt	29 <b>Cu</b> Copper		
		48 <b>Ti</b> Titanium	51 <b>V</b> Vanadium	56 <b>Fe</b> Iron	59 <b>Co</b> Cobalt	64 <b>Cu</b> Copper		
		48 <b>Ti</b> Titanium	51 <b>V</b> Vanadium	56 <b>Fe</b> Iron	59 <b>Co</b> Cobalt	64 <b>Cu</b> Copper		
		22 <b>Ti</b> Titanium	23 <b>V</b> Vanadium	26 <b>Fe</b> Iron	27 <b>Co</b> Cobalt	29 <b>Cu</b> Copper		
		22 <b>Ti</b> Titanium	23 <b>V</b> Vanadium	26 <b>Fe</b> Iron	27 <b>Co</b> Cobalt	29 <b>Cu</b> Copper		
		91 <b>Zr</b> Zirconium	93 <b>Nb</b> Niobium	101 <b>Ru</b> Ruthenium	103 <b>Rh</b> Rhodium	106 <b>Pd</b> Palladium		
		91 <b>Zr</b> Zirconium	93 <b>Nb</b> Niobium	101 <b>Ru</b> Ruthenium	103 <b>Rh</b> Rhodium	106 <b>Pd</b> Palladium		
		40 <b>Zr</b> Zirconium	41 <b>Nb</b> Niobium	44 <b>Ru</b> Ruthenium	45 <b>Rh</b> Rhodium	47 <b>Ag</b> Silver		
		40 <b>Zr</b> Zirconium	41 <b>Nb</b> Niobium	44 <b>Ru</b> Ruthenium	45 <b>Rh</b> Rhodium	47 <b>Ag</b> Silver		
		178 <b>Hf</b> Hafnium	181 <b>Ta</b> Tantalum	190 <b>Os</b> Osmium	192 <b>Ir</b> Iridium	197 <b>Au</b> Gold		
		178 <b>Hf</b> Hafnium	181 <b>Ta</b> Tantalum	190 <b>Os</b> Osmium	192 <b>Ir</b> Iridium	197 <b>Au</b> Gold		
		72 <b>Hf</b> Hafnium	73 <b>Ta</b> Tantalum	76 <b>Os</b> Osmium	77 <b>Ir</b> Iridium	79 <b>Au</b> Gold		
		72 <b>Hf</b> Hafnium	73 <b>Ta</b> Tantalum	76 <b>Os</b> Osmium	77 <b>Ir</b> Iridium	79 <b>Au</b> Gold		
		139 <b>La</b> Lanthanum	140 <b>Ce</b> Cerium	144 <b>Nd</b> Neodymium	150 <b>Sm</b> Samarium	157 <b>Gd</b> Gadolinium		
		139 <b>La</b> Lanthanum	140 <b>Ce</b> Cerium	144 <b>Nd</b> Neodymium	150 <b>Sm</b> Samarium	157 <b>Gd</b> Gadolinium		
		57 <b>La</b> Lanthanum	58 <b>Ce</b> Cerium	60 <b>Nd</b> Neodymium	62 <b>Sm</b> Samarium	64 <b>Gd</b> Gadolinium		
		57 <b>La</b> Lanthanum	58 <b>Ce</b> Cerium	60 <b>Nd</b> Neodymium	62 <b>Sm</b> Samarium	64 <b>Gd</b> Gadolinium		
		227 <b>Ac</b> Actinium	232 <b>Th</b> Thorium	238 <b>U</b> Uranium	244 <b>Pu</b> Plutonium	254 <b>Cm</b> Curium		
		227 <b>Ac</b> Actinium	232 <b>Th</b> Thorium	238 <b>U</b> Uranium	244 <b>Pu</b> Plutonium	254 <b>Cm</b> Curium		
		89 <b>Ac</b> Actinium	90 <b>Th</b> Thorium	92 <b>U</b> Uranium	94 <b>Pu</b> Plutonium	96 <b>Cm</b> Curium		
		89 <b>Ac</b> Actinium	90 <b>Th</b> Thorium	92 <b>U</b> Uranium	94 <b>Pu</b> Plutonium	96 <b>Cm</b> Curium		
		88 <b>Ra</b> Radium	90 <b>Th</b> Thorium	92 <b>U</b> Uranium	94 <b>Pu</b> Plutonium	96 <b>Cm</b> Curium		
		88 <b>Ra</b> Radium	90 <b>Th</b> Thorium	92 <b>U</b> Uranium	94 <b>Pu</b> Plutonium	96 <b>Cm</b> Curium		
		175 <b>Lu</b> Lutetium	178 <b>Yb</b> Ytterbium	181 <b>Er</b> Erbium	187 <b>Fm</b> Fermium	198 <b>No</b> Nobelium		
		175 <b>Lu</b> Lutetium	178 <b>Yb</b> Ytterbium	181 <b>Er</b> Erbium	187 <b>Fm</b> Fermium	198 <b>No</b> Nobelium		
		71 <b>Lu</b> Lutetium	70 <b>Yb</b> Ytterbium	68 <b>Er</b> Erbium	100 <b>Fm</b> Fermium	102 <b>No</b> Nobelium		
		71 <b>Lu</b> Lutetium	70 <b>Yb</b> Ytterbium	68 <b>Er</b> Erbium	100 <b>Fm</b> Fermium	102 <b>No</b> Nobelium		
		169 <b>Tm</b> Thulium	162 <b>Dy</b> Dysprosium	167 <b>Er</b> Erbium	173 <b>Yb</b> Ytterbium	181 <b>Lu</b> Lutetium		
		169 <b>Tm</b> Thulium	162 <b>Dy</b> Dysprosium	167 <b>Er</b> Erbium	173 <b>Yb</b> Ytterbium	181 <b>Lu</b> Lutetium		
		69 <b>Tm</b> Thulium	66 <b>Dy</b> Dysprosium	68 <b>Er</b> Erbium	70 <b>Yb</b> Ytterbium	71 <b>Lu</b> Lutetium		
		69 <b>Tm</b> Thulium	66 <b>Dy</b> Dysprosium	68 <b>Er</b> Erbium	70 <b>Yb</b> Ytterbium	71 <b>Lu</b> Lutetium		
		101 <b>Md</b> Mendelevium	98 <b>Cf</b> Californium	100 <b>Fm</b> Fermium	102 <b>No</b> Nobelium	108 <b>Lr</b> Lawrencium		
		101 <b>Md</b> Mendelevium	98 <b>Cf</b> Californium	100 <b>Fm</b> Fermium	102 <b>No</b> Nobelium	108 <b>Lr</b> Lawrencium		
		101 <b>Md</b> Mendelevium	98 <b>Cf</b> Californium	100 <b>Fm</b> Fermium	102 <b>No</b> Nobelium	108 <b>Lr</b> Lawrencium		
		101 <b>Md</b> Mendelevium	98 <b>Cf</b> Californium	100 <b>Fm</b> Fermium	102 <b>No</b> Nobelium	108 <b>Lr</b> Lawrencium		
		99 <b>Es</b> Einsteinium	98 <b>Cf</b> Californium	100 <b>Fm</b> Fermium	102 <b>No</b> Nobelium	108 <b>Lr</b> Lawrencium		
		99 <b>Es</b> Einsteinium	98 <b>Cf</b> Californium	100 <b>Fm</b> Fermium	102 <b>No</b> Nobelium	108 <b>Lr</b> Lawrencium		
		99 <b>Es</b> Einsteinium	98 <b>Cf</b> Californium	100 <b>Fm</b> Fermium	102 <b>No</b> Nobelium	108 <b>Lr</b> Lawrencium		
		99 <b>Es</b> Einsteinium	98 <b>Cf</b> Californium	100 <b>Fm</b> Fermium	102 <b>No</b> Nobelium	108 <b>Lr</b> Lawrencium		
		165 <b>Ho</b> Holmium	162 <b>Dy</b> Dysprosium	167 <b>Er</b> Erbium	173 <b>Yb</b> Ytterbium	181 <b>Lu</b> Lutetium		
		165 <b>Ho</b> Holmium	162 <b>Dy</b> Dysprosium	167 <b>Er</b> Erbium	173 <b>Yb</b> Ytterbium	181 <b>Lu</b> Lutetium		
		67 <b>Ho</b> Holmium	66 <b>Dy</b> Dysprosium	68 <b>Er</b> Erbium	70 <b>Yb</b> Ytterbium	71 <b>Lu</b> Lutetium		
		67 <b>Ho</b> Holmium	66 <b>Dy</b> Dysprosium	68 <b>Er</b> Erbium	70 <b>Yb</b> Ytterbium	71 <b>Lu</b> Lutetium		
		82 <b>Pb</b> Lead	81 <b>Tl</b> Thallium	83 <b>Bi</b> Bismuth	85 <b>At</b> Astatine	86 <b>Rn</b> Radon		
		82 <b>Pb</b> Lead	81 <b>Tl</b> Thallium	83 <b>Bi</b> Bismuth	85 <b>At</b> Astatine	86 <b>Rn</b> Radon		
		82 <b>Pb</b> Lead	81 <b>Tl</b> Thallium	83 <b>Bi</b> Bismuth	85 <b>At</b> Astatine	86 <b>Rn</b> Radon		
		82 <b>Pb</b> Lead	81 <b>Tl</b> Thallium	83 <b>Bi</b> Bismuth	85 <b>At</b> Astatine	86 <b>Rn</b> Radon		

3-71 Lanthanoid series  
0-103 Actinoid series

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

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