UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY **5070/01**

Paper 1 Multiple Choice

October/November 2005

1 hour

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 16.
You may use a calculator.

This document consists of **14** printed pages and **2** blank pages.

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UNIVERSITY of CAMBRIDGE International Examinations

[Turn over

1 Which of the following is a pure compound?

A ethanol

B petrol

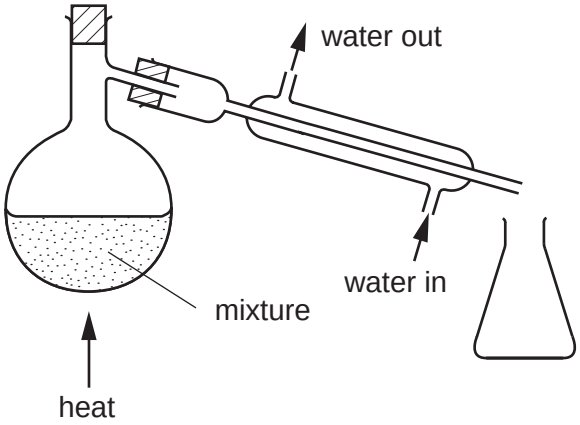
C steel

D tap water

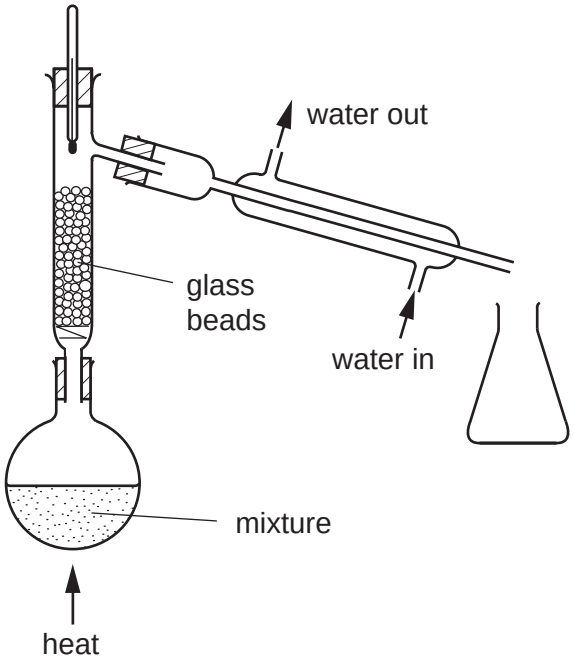
2 Substance **X** melts at 53 °C and boils at 100 °C. It does not dissolve in water and it does not react with water.

Which diagram shows the method most suitable for separating **X** from a mixture of **X** and water?

A



B



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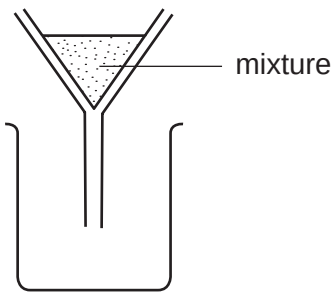
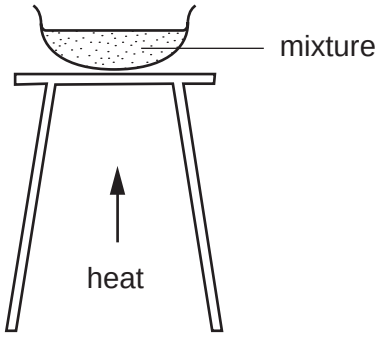
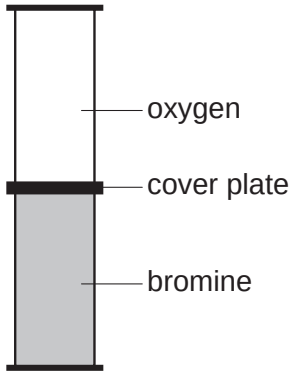


D



3 The coverplate is removed from the gas jars shown in the diagram. After several days, the colour of the gas is the same in both jars.



Which statement explains this change?

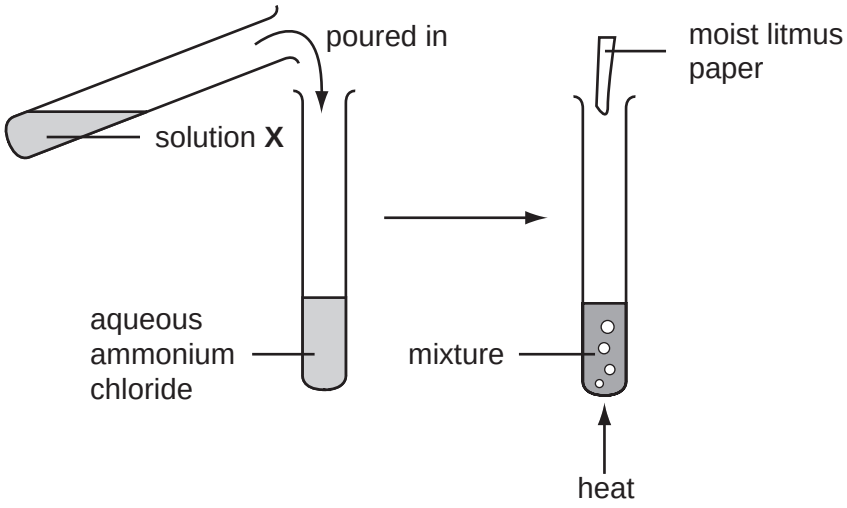
A Oxygen and bromine gases have equal densities.

B Oxygen and bromine molecules are in random motion.

C Oxygen and bromine molecules diffuse at the same rate.

D Equal volumes of oxygen and bromine contain equal numbers of molecules.

4 The diagrams show an experiment with aqueous ammonium chloride.



A gas, **Y**, is produced and the litmus paper changes colour.

What are solution **X** and gas **Y**?

	solution **X**	gas **Y**
A	aqueous sodium hydroxide	ammonia
B	aqueous sodium hydroxide	chlorine
C	dilute sulphuric acid	ammonia
D	dilute sulphuric acid	chlorine

5 Which two gases each change the colour of damp red litmus paper?

A ammonia and chlorine

B ammonia and hydrogen chloride

C carbon dioxide and chlorine

D carbon dioxide and sulphur dioxide

6 The atoms $^{31}_{15}P$ and $^{32}_{16}S$ have the same

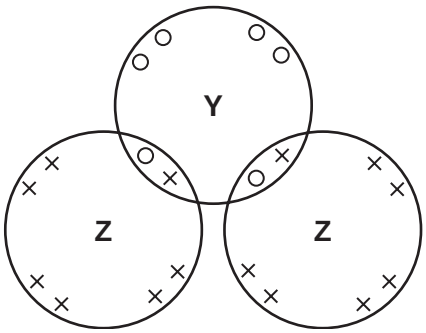
A nucleon number.

B number of electrons.

C number of neutrons.

D number of protons.

7 The diagram shows the arrangement of electrons in a molecule of compound $\mathbf{YZ_2}$.



key

○ outer electron of a **Y** atom

× outer electron of a **Z** atom

What are elements **Y** and **Z**?

	Y	**Z**
A	calcium	chlorine
B	carbon	oxygen
C	oxygen	hydrogen
D	sulphur	chlorine

8 Which **two** statements about a covalent bond are correct?

1 It can be formed between two metal atoms.

2 It can be formed between two non-metal atoms.

3 It is formed by the transfer of electrons between atoms.

4 It is formed by sharing electrons between atoms.

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

9 Which statement explains why sodium chloride, NaC*l*, has a lower melting point than magnesium oxide, MgO?

A Sodium chloride is covalent but magnesium oxide is ionic.

B Sodium is more reactive than magnesium.

C The attraction between Na^+ and Cl^- is weaker than that between Mg^{2+} and O^{2-}.

D The melting point of sodium is lower than that of magnesium.

10 Four substances have the following electrical properties.

substance	property
W	does not conduct under any conditions
X	conducts only in aqueous solution
Y	conducts in both the molten and solid states
Z	conducts in both the molten and aqueous states

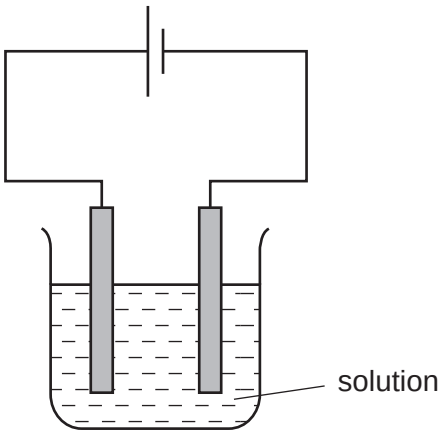
What are these four substances?

	W	**X**	**Y**	**Z**
A	HC*l*	S	NaC*l*	Pb
B	Pb	HC*l*	NaC*l*	S
C	S	HC*l*	Pb	NaC*l*
D	S	NaC*l*	HC*l*	Pb

11 What is the ratio of the volume of 2 g of hydrogen to the volume of 16 g of methane, both volumes at r.t.p.?

A 1 to 1 **B** 1 to 2 **C** 1 to 8 **D** 2 to 1

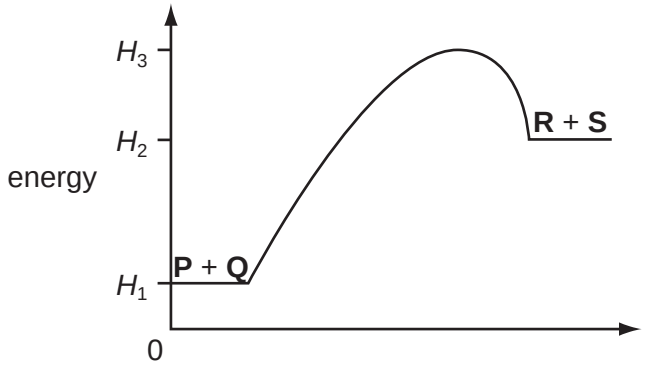
12 The diagram shows the electrolysis of a concentrated aqueous solution containing both copper(II) ions and sodium ions.



Which metal is deposited at the negative electrode and why?

	metal deposited	reason
A	copper	copper is less reactive than sodium
B	copper	copper is more reactive than hydrogen
C	sodium	copper is less reactive than hydrogen
D	sodium	copper is more reactive than sodium

13 The energy profile diagram below is for a reaction **P** + **Q** → **R** + **S**.



Which statement is correct?

A The activation energy of the reaction is ($H_3 - H_1$).

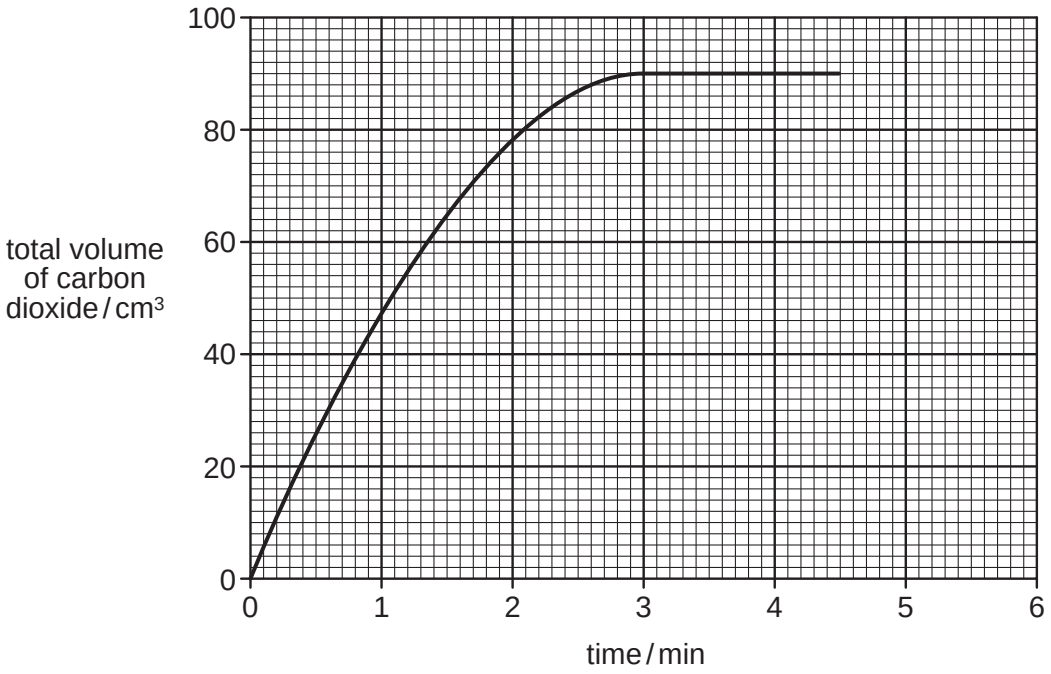
B The activation energy of the reaction is ($H_3 - H_2$).

C ΔH is ($H_1 - H_2$).

D ΔH is ($H_1 - H_3$).

14 The rate of the reaction between a given mass of calcium carbonate and an excess of hydrochloric acid is studied by collecting the carbon dioxide in a graduated syringe.

The results are shown in the graph.



How much time is required for half the calcium carbonate to react?

A 0.95 min **B** 1.5 min **C** 2.0 min **D** 3.0 min

15 Ammonia is made by a reversible reaction between nitrogen and hydrogen.

The equation for the reaction is shown.

$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g) \qquad \Delta H \text{ is negative}$$

What is the effect of increasing the pressure in this process?

A Less ammonia is formed.

B Less heat is produced.

C More ammonia is formed.

D The reaction slows down.

16 Separate samples of hydrogen peroxide are added to aqueous potassium iodide and to acidified potassium dichromate(VI). The iodide ions are oxidised and dichromate(VI) ions are reduced.

What colour changes are seen?

	potassium iodide	acidified potassium dichromate(VI)
A	colourless to brown	purple to colourless
B	brown to colourless	purple to colourless
C	colourless to brown	orange to green
D	brown to colourless	orange to green

17 In which line in the table is **all** the information correct?

	reaction at electrode	electrode	product
A	$2X^- \rightarrow X_2 + 2e^-$	cathode	metal
B	$X^+ + e^- \rightarrow X$	anode	metal
C	$2X^- \rightarrow X_2 + 2e^-$	anode	non-metal
D	$X^+ + e^- \rightarrow X$	cathode	non-metal

18 Which two reagents could be used to prepare the insoluble salt copper(II) carbonate?

A $CuO(s) + Na_2CO_3(aq)$

B $CuO(s) + MgCO_3(s)$

C $CuSO_4(aq) + Na_2CO_3(aq)$

D $CuSO_4(aq) + MgCO_3(s)$

19 Which statement does **not** describe a property of a weak acid in solution?

A It forms a salt with sodium hydroxide.

B It has a pH of between 8 and 9.

C It is only partly dissociated into ions.

D It reacts with sodium carbonate to give off carbon dioxide.

20 Which products are formed when dilute hydrochloric acid reacts with the substances shown in the table?

	substance	products
A	iron	iron(II) chloride + hydrogen only
B	iron(II) carbonate	iron(II) chloride + carbon dioxide gas only
C	iron(II) oxide	iron(II) chloride + oxygen gas only
D	iron(II) sulphate	iron(II) chloride + sulphur dioxide only

21 Which pollutant increases the growth of algae in rivers and streams?

A chlorine

B heavy metal ions

C nitrate ions

D sulphur dioxide

22 When chlorine water is added to a colourless solution of **X**, a dark brown solution is obtained.

What is **X**?

A KC*l* **B** KI **C** NaBr **D** NaF

23 Many properties of an element and its compounds can be predicted from the position of the element in the Periodic Table.

What property could **not** be predicted in this way?

A the acidic or basic nature of its oxide

B the formula of its oxide

C the number of isotopes it has

D its metallic or non-metallic properties

24 The element with a proton number 12 has similar chemical properties to the element with the proton number

A 2. **B** 11. **C** 13. **D** 20.

25 What is the mass of aluminium in 204 g of aluminium oxide, Al_2O_3?

A 26 g **B** 27 g **C** 54 g **D** 108 g

26 Which process does **not** result in the formation of **both** carbon dioxide and water?

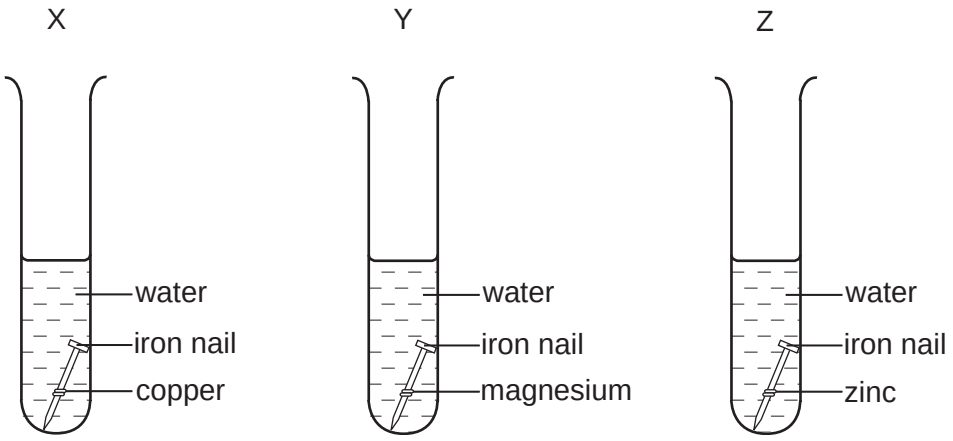
A addition of a dilute acid to a carbonate

B burning ethanol

C burning methane

D heating crystals of hydrated sodium carbonate

27 Experiments are set up to investigate the sacrificial protection of iron.



In which test-tubes will the iron rust?

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

28 One mole of compound **X** gives three moles of ions in aqueous solution. **X** reacts with ammonium carbonate to give an acidic gas.

What is compound **X**?

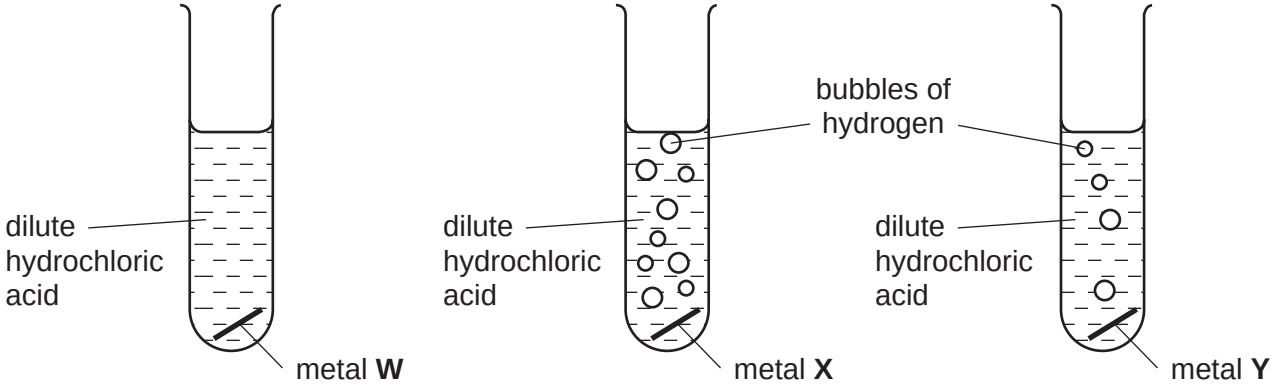
A calcium hydroxide

B ethanoic acid

C sodium hydroxide

D sulphuric acid

29 The diagrams show the reactions of three different metals with dilute hydrochloric acid.



What are metals **W**, **X** and **Y**?

	W	**X**	**Y**
A	copper	magnesium	zinc
B	copper	zinc	magnesium
C	magnesium	zinc	copper
D	zinc	magnesium	copper

30 Which statements about the pollutant carbon monoxide are correct?

1 It is a colourless, odourless gas.

2 It is formed by incomplete combustion of natural gas.

3 It reacts with haemoglobin in the blood.

A 1 and 2 only

B 1 and 3 only

C 2 and 3 only

D 1, 2 and 3

31 Which gas is **not** produced when hydrocarbons are burnt in the internal combustion engine?

A carbon dioxide

B carbon monoxide

C hydrogen

D nitrogen oxides

32 Cholesterol is an organic molecule that occurs in the blood stream.

What type of compound is cholesterol?

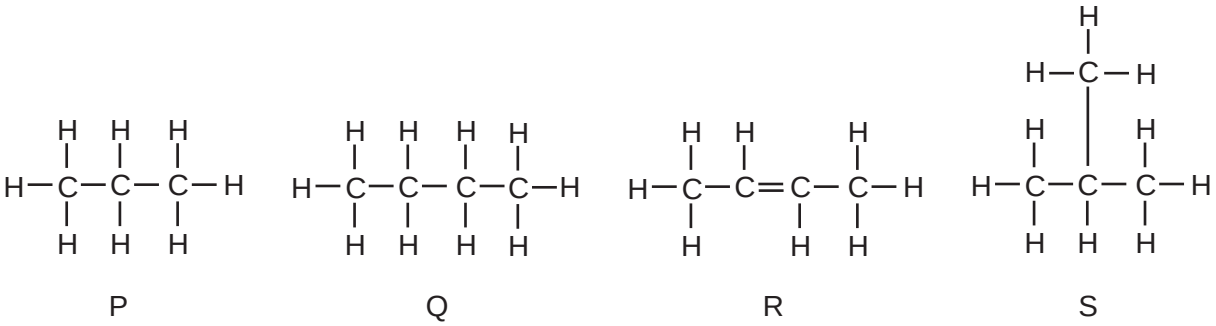
A an acid

B an alcohol

C an alkane

D an alkene

33 The diagrams show four hydrocarbons P, Q, R and S.



P Q R S

Which two hydrocarbons are isomers of each other?

A P and Q **B** P and S **C** Q and R **D** Q and S

34 When ethanol reacts with ethanoic acid, the ester ethyl ethanoate is formed.

$$C_2H_5OH + CH_3CO_2H \rightarrow CH_3CO_2C_2H_5 + H_2O$$

What is the formula of the ester formed when methanol reacts with butanoic acid ($C_3H_7CO_2H$)?

A $C_2H_5CO_2C_2H_5$

B $C_3H_7CO_2C_2H_5$

C $CH_3CO_2C_3H_7$

D $C_3H_7CO_2CH_3$

35 Which of these polymers is a protein?

A $(C_2H_3Cl)_n$

B $(C_2H_3NO)_n$

C $(C_5H_8O_2)_n$

D $(C_6H_{10}O_5)_n$

36 Which natural resource is being depleted by the manufacture of plastics?

A air

B fossil fuels

C metal ores

D water

37 Which statement is true about ethanol?

A It is formed by the catalytic addition of steam to ethene.

B It is an unsaturated compound.

C It is formed by the oxidation of ethanoic acid.

D It reacts with ethyl ethanoate to form an acid.

38 Which element is **least** likely to be found in a macromolecule?

A carbon

B hydrogen

C oxygen

D sodium

39 What is the catalyst used in the preparation of ethyl ethanoate from ethanol and ethanoic acid?

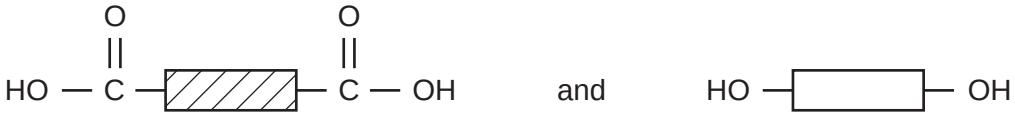
A concentrated sulphuric acid

B nickel

C vanadium(V) oxide

D yeast

40 A macromolecule is made from the two monomer molecules shown below.



What is the macromolecule?

A a carbohydrate

B a polyamide

C a polyester

D a protein

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DATA SHEET
The Periodic Table of the Elements

Group																	
I	II										III	IV	V	VI	VII	0
							1 H Hydrogen 1									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 Sulphur 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 Radius 88	227 Ac Actinium 89															

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
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

*58-71 Lanthanoid series
90-103 Actinoid series

Key

a
X
b

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.).