UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY **5070/01**

Paper 1 Multiple Choice

May/June 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.

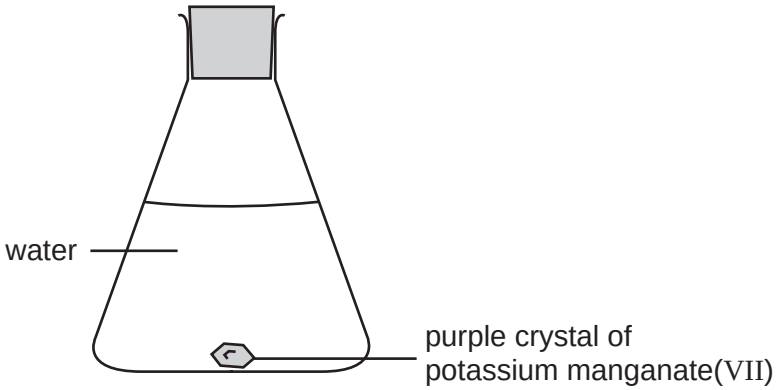
There are **forty** questions on this paper. Answer **all** questions.
For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the separate answer sheet.

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 20.

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

1 The experiment is set up as shown and left until there is no further change.



What is observed?

A a colourless layer below a purple layer

B a colourless liquid with the purple crystal unchanged

C a purple layer below a colourless layer

D a uniformly purple solution

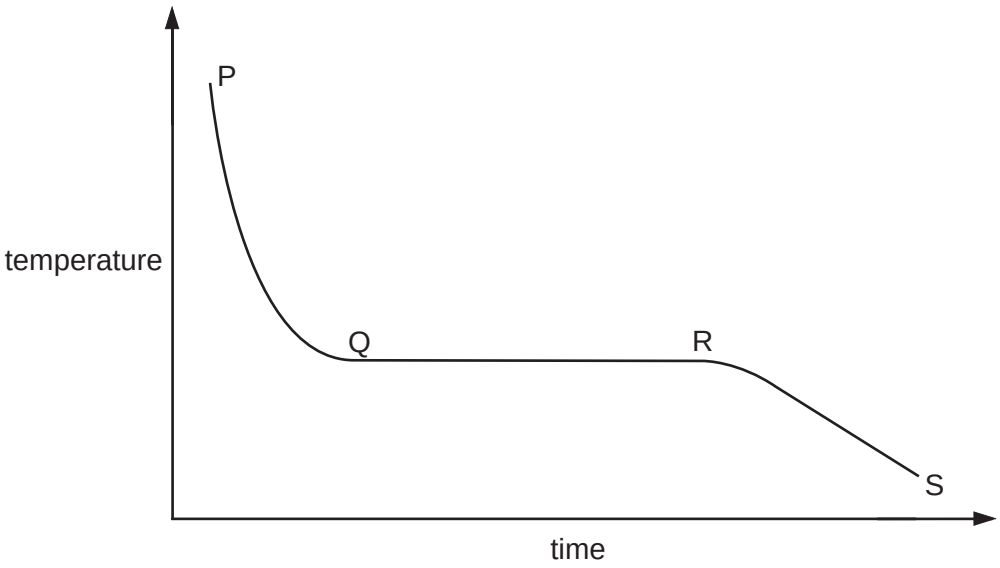
2 A student adds aqueous sodium hydroxide or aqueous ammonia to aqueous solutions of four different metal compounds.

Which solution contains Zn^{2+} ions?

solution	add a few drops of NaOH(aq)	add excess NaOH(aq)	add a few drops of NH_3(aq)	add excess NH_3(aq)
A	ppt	ppt dissolves	ppt	ppt dissolves
B	ppt	ppt dissolves	ppt	ppt
C	ppt	ppt	no ppt	no ppt
D	no ppt	no ppt	no ppt	no ppt

3 A sample of a pure compound is heated until it is completely molten and the compound is allowed to cool until it is completely solid again.

The graph shows how the temperature of the compound changes with time.



When are liquid and solid both present?

A P to Q and R to S

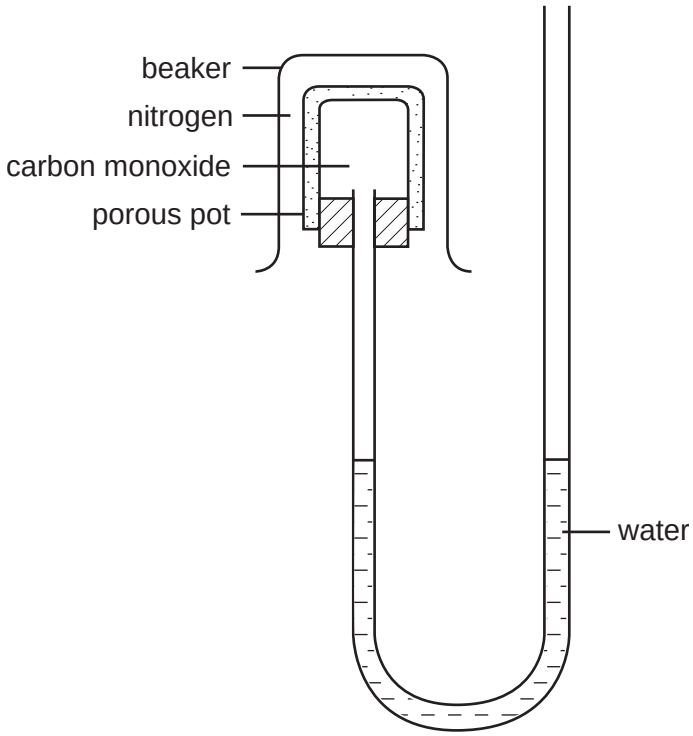
B P to Q

C Q to R

D R to S

4 A beaker of nitrogen is inverted over a porous pot containing carbon monoxide as sh

The water level does not change.



What is the reason for this?

A Both gases are diatomic.

B Nitrogen is an unreactive gas.

C The gas particles are too large to pass through the porous pot.

D The two gases have the same relative molecular mass.

5 Which statement about all the noble gases is correct?

A The number of protons in the atoms equals the number of neutrons.

B Their atoms each have a stable arrangement of electrons.

C Their atoms each have eight electrons in their outer shell.

D They exist as molecules containing two atoms.

6 A substance **Q** conducts electricity both when solid and molten.

What is **Q**?

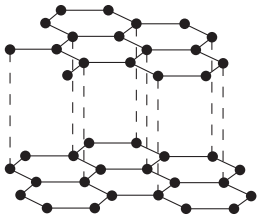
A an alloy

B a hydrocarbon

C a metal oxide

D a salt

7 The diagrams show the structures of two forms of carbon.



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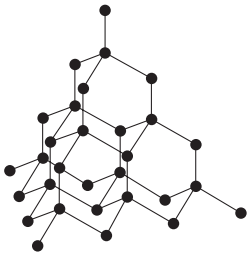


T

Which set of data is correct for these two structures?

	conducts electricity	very hard material	can be used as lubricant
A	T	T	S
B	S	T	S
C	S	S	T
D	T	S	T

8 Substance **X** has a melting point higher than 500 °C. It is insoluble both in water and in organic solvents. It conducts electricity when both solid and molten.

What is **X**?

A copper

B mercury

C poly(ethene)

D sodium chloride

9 How many moles per dm^3 of gaseous carbon dioxide are there if 4.4 g occupies 500 cm^3?

A 0.1 mol / dm^3 **B** 0.2 mol / dm^3 **C** 2.2 mol / dm^3 **D** 8.8 mol / dm^3

10 Which reactions take place during the electrolysis of aqueous copper(II) sulphate with copper electrodes?

	reaction at positive electrode	reaction at negative electrode
A	$Cu^{2+} + 2e^- \rightarrow Cu$	$Cu \rightarrow Cu^{2+} + 2e^-$
B	$4OH^- \rightarrow 2H_2O + O_2 + 4e^-$	$Cu^{2+} + 2e^- \rightarrow Cu$
C	$Cu \rightarrow Cu^{2+} + 2e^-$	$2H^+ + 2e^- \rightarrow H_2$
D	$Cu \rightarrow Cu^{2+} + 2e^-$	$Cu^{2+} + 2e^- \rightarrow Cu$

11 The heat-reflecting shields of some space rockets are gold-plated, using electrolysis.

Which electrodes and electrolyte would be used to gold-plate the heat shield?

	negative electrode	positive electrode	electrolyte
A	carbon	heat shield	gold compound
B	gold	heat shield	copper compound
C	heat shield	carbon	copper compound
D	heat shield	gold	gold compound

12 The reaction $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$ is exothermic because

A more bonds are broken than are formed.

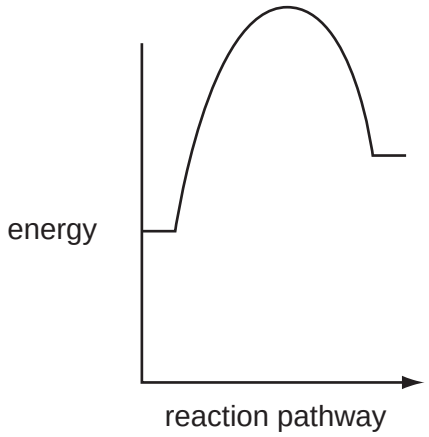
B more bonds are formed than are broken.

C the energy needed to break the bonds is greater than that released on forming new bonds.

D the energy needed to break the bonds is less than that released on forming new bonds.

13 Which reaction profile shows the fastest exothermic reaction?

A



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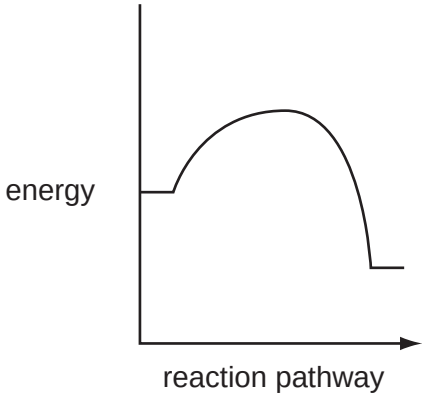

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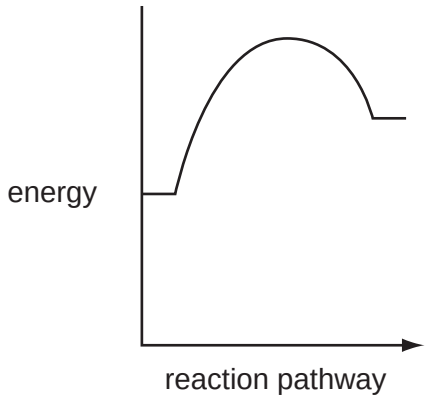

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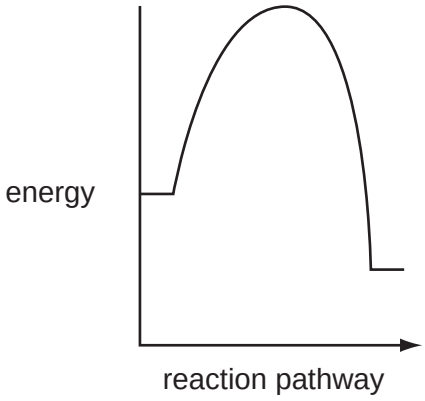
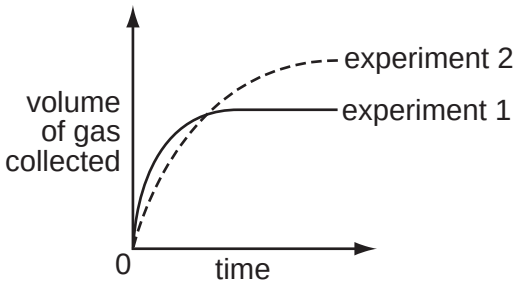
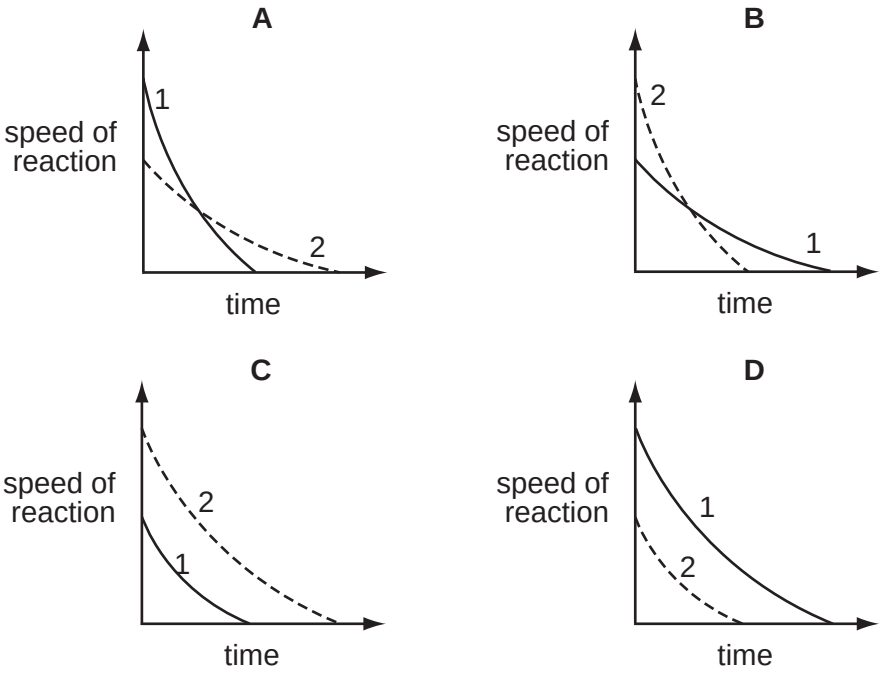


14 In two separate experiments, a substance is decomposed and the gas evolved is col

The graph shows the total volume of gas collected against time for each experiment.



Which graph shows how the speed of reaction varies with time in each experiment?



15 A colourless gas is passed into each of three different solutions. The results are shown in the table.

solution of	potassium iodide	acidified potassium dichromate(VI)	acidified potassium manganate(VII)
result	stays colourless	orange to green	purple to colourless

What is the colourless gas?

A an acid

B an alkali

C an oxidising agent

D a reducing agent

16 Chlorine can be manufactured by using the reversible reaction between hydrogen chloride and oxygen.

$$4HCl(g) + O_2(g) \rightleftharpoons 2H_2O(g) + 2Cl_2(g) \qquad \Delta H \text{ is negative}$$

A mixture in dynamic equilibrium is present at 450 °C.

Which change to the mixture will increase the amount of chlorine at equilibrium?

A adding a catalyst

B adding more $HCl(g)$

C decreasing the pressure

D increasing the temperature

17 Which pair of substances produce a precipitate when their aqueous solutions are mixed?

A sodium chloride and barium nitrate

B sodium nitrate and barium chloride

C sodium nitrate and silver nitrate

D sodium sulphate and barium chloride

18 Which statement about catalysts is correct?

A Catalysts are used in industry to reduce energy costs.

B Catalysts are used up during a reaction.

C Iron is used as a catalyst in the Contact Process.

D Transition metals do not make good catalysts.

19 Element **X** is a solid at room temperature.

It needs one electron per atom to gain the electronic structure of a noble gas.

It is the least reactive element in its group.

What is the element **X**?

A At **B** Cs **C** F **D** Li

20 Elements **X** and **Y** are in Group VII of the Periodic Table.

X is a liquid at room temperature. **Y** is a solid at room temperature.

1 Atoms of **Y** have more protons than atoms of **X**.

2 Molecules of **Y** have more atoms than molecules of **X**.

3 **Y** displaces **X** from aqueous solutions of $\mathbf{X}^-$ ions.

Which statements are correct?

A 1 only

B 2 only

C 3 only

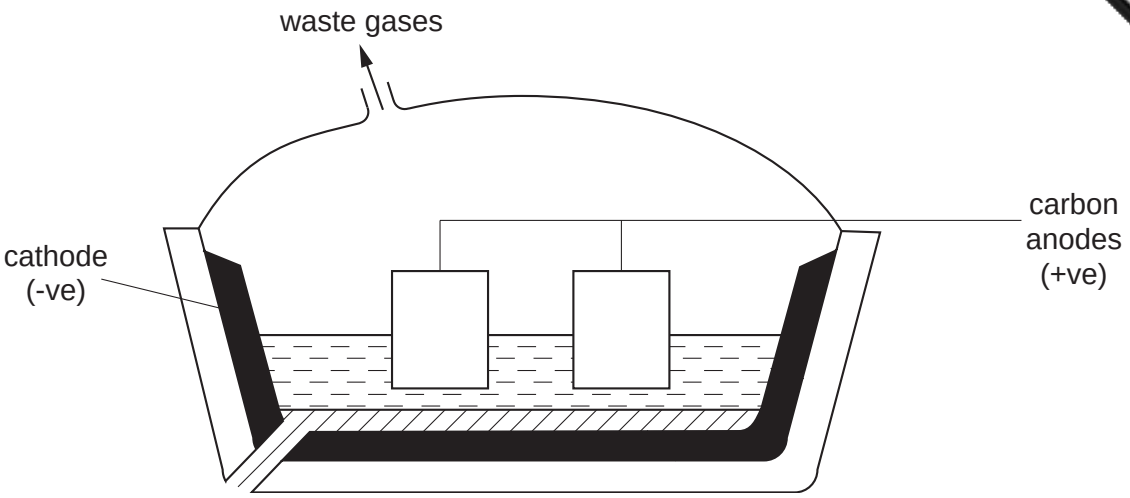
D 1, 2 and 3

21 Metal **M** will displace copper from aqueous copper(II) sulphate solution, but will not displace iron from aqueous iron(II) sulphate solution. **M** is extracted from its oxide by heating the oxide with carbon.

What is the order of reactivity of these four metals?

	least reactive ⟶ most reactive			
A	sodium	metal **M**	iron	copper
B	sodium	iron	metal **M**	copper
C	copper	iron	metal **M**	sodium
D	copper	metal **M**	iron	sodium

22 The diagram shows the electrolytic production of aluminium.



What is the physical state of the aluminium oxide and aluminium during this process?

	aluminium oxide	aluminium
A	liquid	liquid
B	liquid	solid
C	solid	liquid
D	solid	solid

23 Aluminium is used to make saucepans because of its apparent lack of reactivity.

Which property of aluminium explains its unreactivity?

A It has a high electrical conductivity.

B It has a low density.

C It has a surface layer of oxide.

D It is in Group III of the Periodic Table.

24 Alloys are usually harder than the metals from which they are made.

Which difference between the metals explains the greater hardness of alloys?

A atomic radii

B densities

C electrical conductivities

D relative atomic masses

25 Which gas **cannot** be removed from the exhaust gases of a petrol powered car by its converter?

A carbon dioxide

B carbon monoxide

C hydrocarbons

D nitrogen dioxide

26 Which gas, present in pond water, decreases in concentration during eutrophication?

A carbon dioxide

B methane

C nitrogen

D oxygen

27 The results of tests carried out on compound **X** are shown.

test	result
dilute hydrochloric acid added	gas given off which turned limewater cloudy
warm with aqueous sodium hydroxide	gas evolved which turned red litmus blue

What is compound **X**?

A ammonium carbonate

B ammonium nitrate

C calcium carbonate

D calcium nitrate

28 Aluminium sulphate can be obtained as shown in the equation.

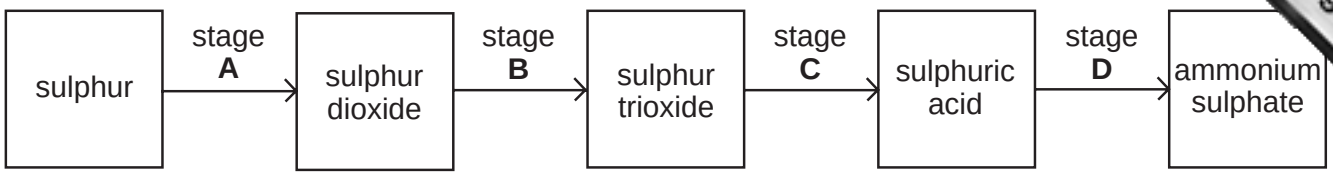
$$2Al(OH)_3 + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 6H_2O$$

How many moles of sulphuric acid are needed to produce 0.5 mol of aluminium sulphate?

A 0.5 **B** 1.0 **C** 1.5 **D** 3.0

29 Ammonium sulphate is an important fertiliser.

During which stage in the manufacture of ammonium sulphate does a reaction with water o



30 The diagram shows the colours of the indicators, methyl orange and methyl red, at different pH values.

pH	2	3	4	5	6
colour of methyl orange	red		yellow		
colour of methyl red	red				yellow

The table shows the pH of four solutions.

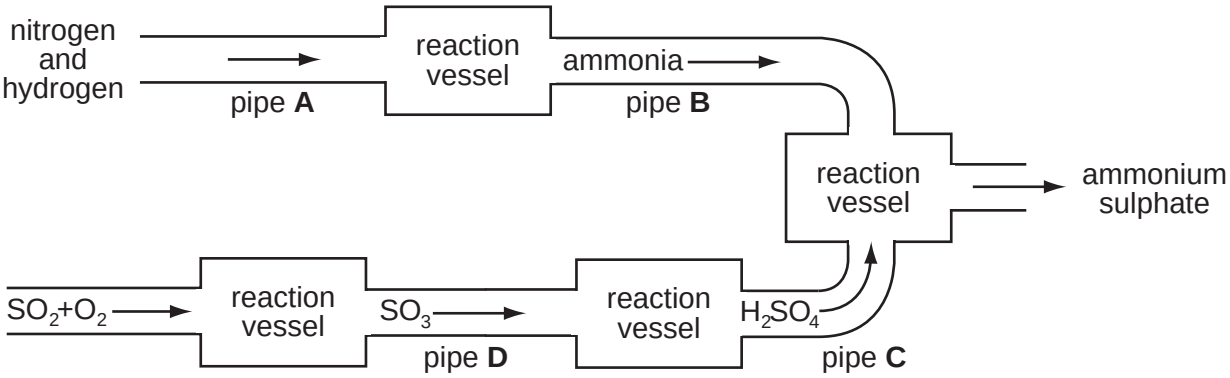
solution	W	X	Y	Z
pH	2	3	5	6

In which solutions will both indicators be yellow?

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

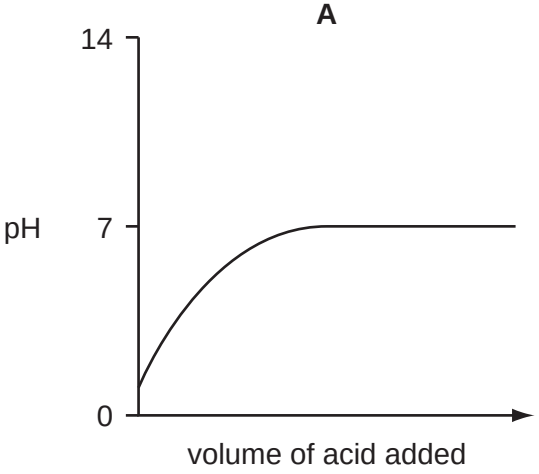
31 The diagram shows some of the stages in the manufacture of ammonium sulphate.

From which connecting pipe would a major leak most **increase** the pH value of rain?



32 Which graph shows the changes in pH as an excess of hydrochloric acid is added to sodium hydroxide?

A



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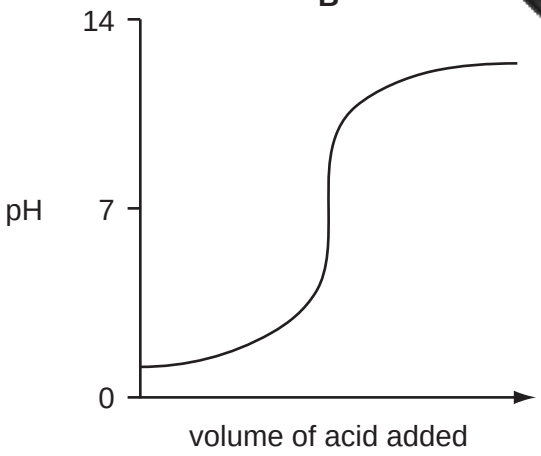

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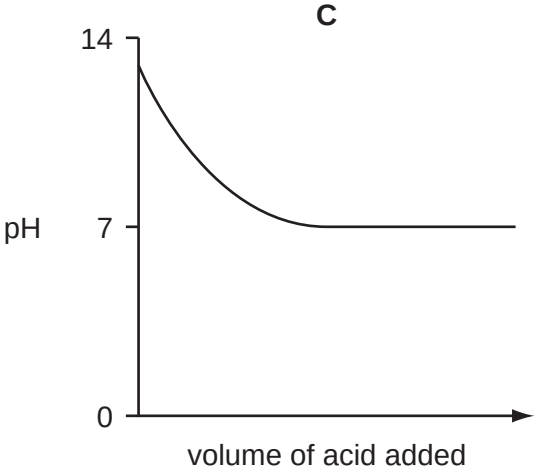

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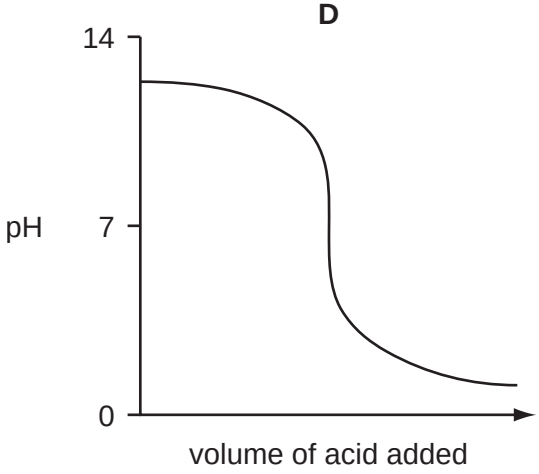


33 Two tests are carried out on a solution of compound **X**.

test	result
add nitric acid followed by aqueous silver nitrate	white precipitate formed
excess aqueous sodium hydroxide added	white precipitate formed that does not re-dissolve

What is compound **X**?

A aluminium chloride

B aluminium sulphate

C calcium chloride

D calcium sulphate

34 Which property of the alkanes does **not** increase as relative molecular mass increases?

A boiling point

B flammability

C melting point

D viscosity

35 What is the structure of the product of the reaction between butene, $CH_3–CH_2–CH=CH_2$, and bromine, Br_2?

A $CH_2Br–CH_2–CH_2–CH_2Br$

B $CH_2Br–CH_2–CHBr–CH_3$

C $CH_3–CHBr–CH_2–CH_2Br$

D $CH_3–CH_2–CHBr–CH_2Br$

36 Which formula represents a compound that will react with sodium carbonate to give off carbon dioxide?

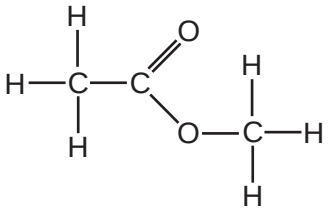
A CH_3OH

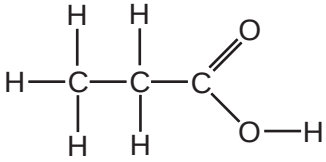
B HCO_2CH_3

C CH_3CO_2H

D $CH_3CO_2C_2H_5$

37 The displayed formulae of two compounds are shown.





What are the similarities and differences between the two compounds?

	similarities	differences
A	molecular formulae	reactions
B	molecular formulae	relative molecular masses
C	structures	molecular formulae
D	structures	relative molecular masses

38 In which of the following are all the compounds members of the same homologous se

A CH_4 C_2H_6 C_3H_6

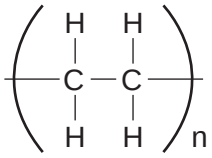
B CH_4 C_2H_6 C_3H_8

C C_2H_4 C_3H_6 C_4H_{10}

D C_3H_4 C_3H_6 C_3H_8

39 Which polymer has the empirical formula CH?

A



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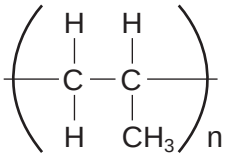

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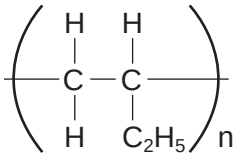

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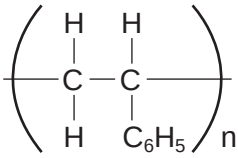
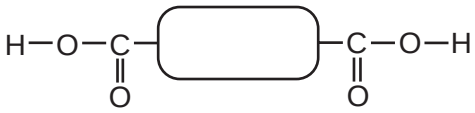


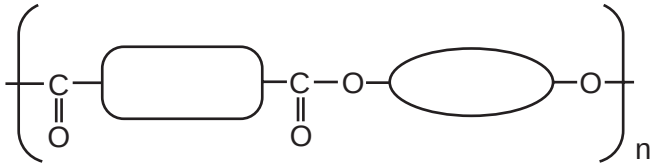
40 *Terylene* (a polyester) is made by condensation polymerisation of the two monomers shown.



and

What is the repeat unit of the polymer?

A



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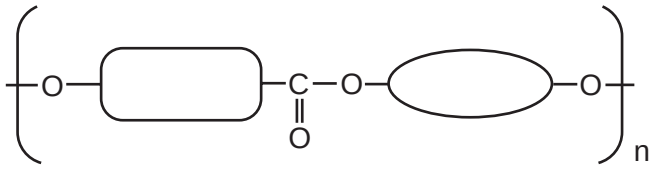

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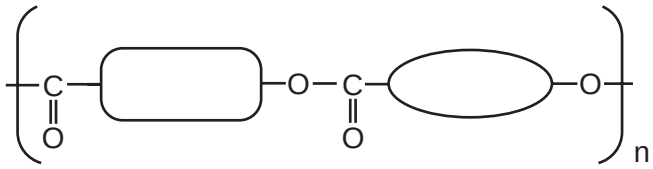

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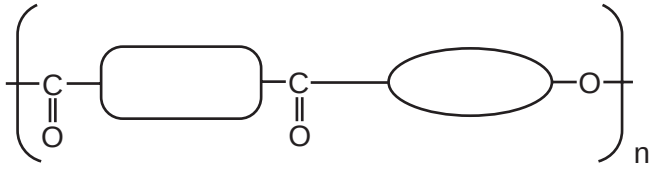

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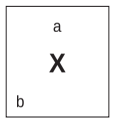
DATA SHEET
The Periodic Table of the Elements

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 Radium 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 = 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.).