Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CHEMISTRY **5070/11**

Paper 1 Multiple Choice **May/June 2018**

1 hour

Additional Materials: Multiple Choice Answer Sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

9851277883

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.
Do not use staples, paper clips, 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.
DO **NOT** WRITE IN ANY BARCODES.

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.

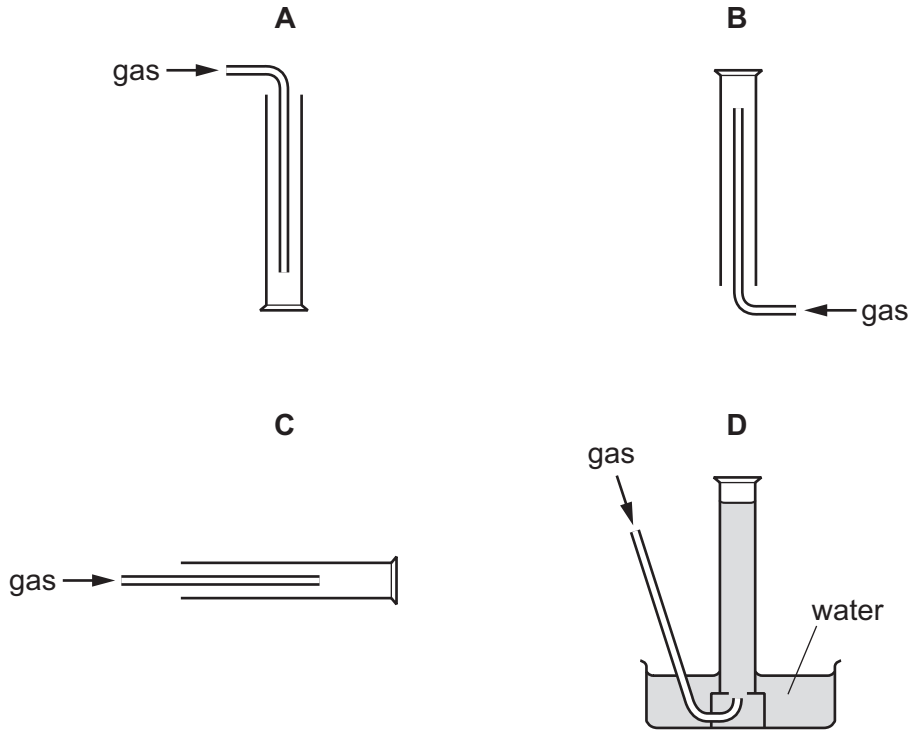
Read the instructions on the Answer Sheet very carefully.

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.
Electronic calculators may be used.

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1 A gas is less dense than air and dissolves in water.

Which diagram shows the correct method of collecting this gas?



2 Which mixture can be separated into its components by adding water, stirring and filtering?

A calcium carbonate and sodium chloride

B magnesium and iron

C sodium chloride and copper(II) sulfate

D sulfuric acid and hydrochloric acid

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3 Tests were carried out on an aqueous solution of an unknown compound, **P**. The observations are recorded in the table.

test	observation
aqueous sodium hydroxide added	green precipitate, soluble in excess giving a green solution
dilute nitric acid added then aqueous barium nitrate	white precipitate
dilute nitric acid added then aqueous silver nitrate	no precipitate

Which ions are present in **P**?

A Cr^{3+} and Cl^{-}

B Cr^{3+} and SO_4^{2-}

C Fe^{2+} and Cl^{-}

D Fe^{2+} and SO_4^{2-}

4 Which substance would diffuse most quickly?

A carbon dioxide at 0 °C

B carbon dioxide at 25 °C

C neon at 0 °C

D neon at 25 °C

5 The ion Q^{2+} has three complete shells of electrons.

What is Q?

A calcium

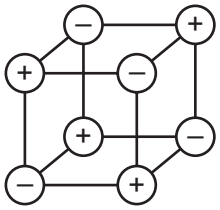
B magnesium

C oxygen

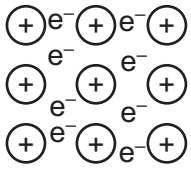
D sulfur

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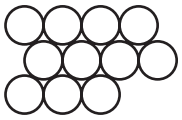
6 The diagrams show the arrangement of particles in three **solids**: X, Y and Z. The three solids are krypton, potassium and sodium chloride.



X



Y



Z

Which row correctly identifies X, Y and Z?

	X	Y	Z
A	krypton	potassium	sodium chloride
B	krypton	sodium chloride	potassium
C	sodium chloride	krypton	potassium
D	sodium chloride	potassium	krypton

7 In the electrolysis of $CuSO_4(aq)$, what is the ionic equation for the reaction at the cathode?

A $Cu + 2e^- \rightarrow Cu^{2+}$

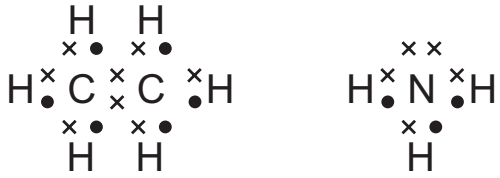
B $Cu^{2+} + 2e^- \rightarrow Cu$

C $2H_2O + Cu^{2+} + 2e^- \rightarrow Cu(OH)_2 + O_2$

D $SO_4^{2-} + 4H^+ + 2e^- \rightarrow H_2SO_4 + H_2$

8 Ethane, C_2H_6, and ammonia, NH_3, are covalent compounds.

The dot-and-cross diagrams of these compounds are shown.



Which statements are correct?

1 A molecule of ethane contains twice as many hydrogen atoms as a molecule of ammonia.

2 An unreacted nitrogen atom has five outer electrons.

3 In a molecule of ethane, the bond between the carbon atoms is formed by sharing two electrons, one from each carbon atom.

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

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9 Which statement is correct?

A All compounds are ionic.

B All compounds conduct electricity when molten.

C Each element only contains one type of atom.

D In a mixture of substances, the proportions of the substances are always the same.

10 When 1 volume of gas **R** reacts with exactly 5 volumes of oxygen, it forms carbon dioxide and water only.

What is **R**?

A butane, C_4H_{10}

B ethane, C_2H_6

C methane, CH_4

D propane, C_3H_8

11 Two characteristics of a gas, **G**, are given.

- **G** reduces copper(II) oxide to a pink-brown solid.
- 1.4 g of **G** has a volume of 1.2 dm^3 at room temperature and pressure.

What is **G**?

A carbon monoxide, CO

B hydrogen, H_2

C nitrogen, N_2

D nitrogen monoxide, NO

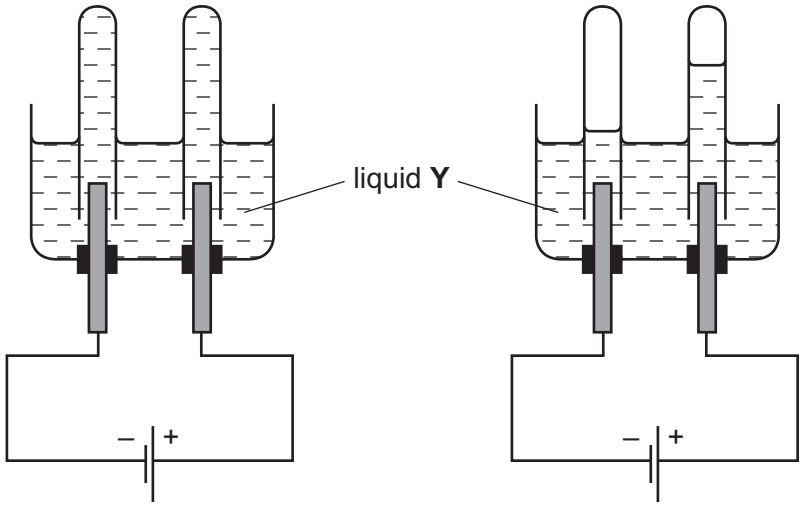
12 The relative formula masses of four compounds are given.

A student has a 1.0 g sample of each compound.

Which sample contains the highest number of moles of oxygen atoms?

	compound	relative formula mass
A	Al_2O_3	102
B	CuO	80
C	H_2SO_4	98
D	HNO_3	63

13 The diagrams show an electrolysis experiment using inert electrodes.



before electrolysis after electrolysis

What could liquid **Y** be?

A aqueous copper(II) sulfate

B concentrated aqueous sodium chloride

C dilute sulfuric acid

D ethanol

14 Which statement about ionic compounds is correct?

A Ionic compounds conduct electricity when solid because they contain charged particles that can move.

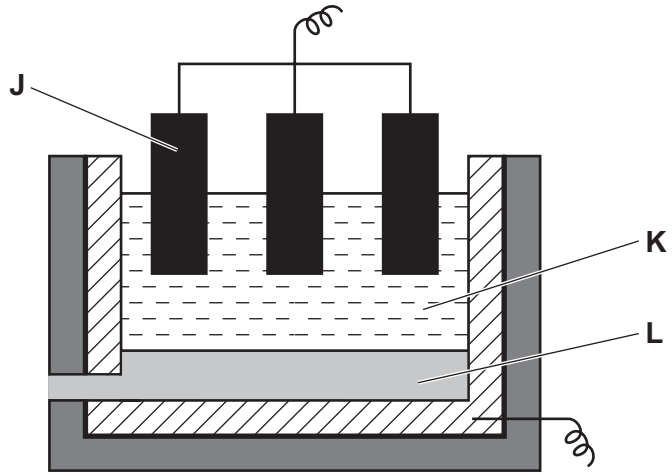
B Ionic compounds consist of a lattice of positive ions and negative ions.

C Most ionic compounds are solids at room temperature because of the strong attraction between electrons and positive ions.

D When molten or in aqueous solution, ionic compounds conduct electricity because they contain electrons that can move.

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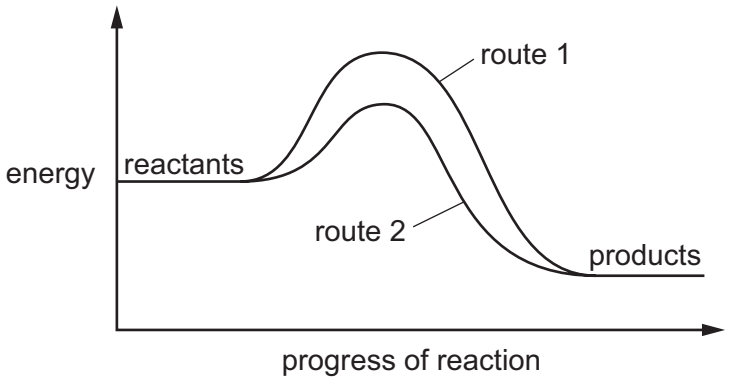
15 The diagram shows apparatus that can be used to extract aluminium from its ore.



What are **J**, **K** and **L**?

	J	K	L
A	negative electrode	aluminium oxide + cryolite	aluminium
B	negative electrode	cryolite	aluminium oxide
C	positive electrode	aluminium oxide	cryolite
D	positive electrode	aluminium oxide + cryolite	aluminium

16 The diagram shows the energy profile for a reaction.



Which statements about this reaction are correct?

1 More energy is needed to break the bonds than is released when new bonds are formed.

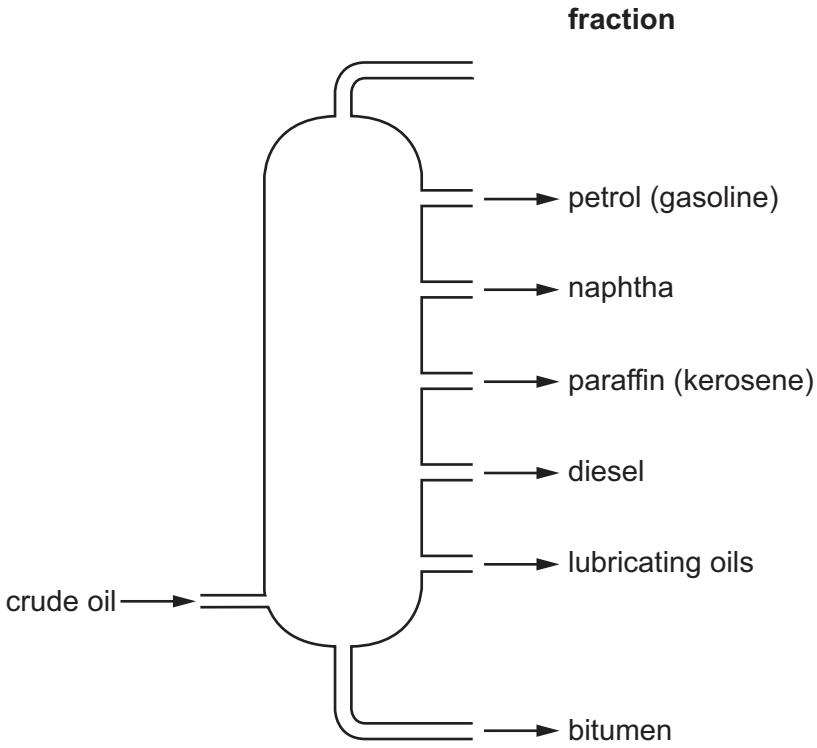
2 Route 1 and route 2 give the same overall equation for the reaction.

3 Route 2 involves the use of a catalyst.

4 The reaction is exothermic.

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

17 The diagram shows the fractionation of petroleum (crude oil).



Which row shows the correct use for the fraction?

	fraction	use
A	bitumen	as a lubricant
B	diesel	for aircraft engines
C	naphtha	making road surfaces
D	paraffin (kerosene)	fuel for heating and cooking

18 Which compound is a constituent of petroleum (crude oil)?

A C_2H_5OH **B** CH_3CO_2H **C** C_8H_{18} **D** $C_6H_{12}O_6$

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19 A student wrote two conclusions about calcium carbonate.

conclusion 1 The reaction with dilute hydrochloric acid is faster with powdered calcium carbonate than with large pieces of calcium carbonate.

conclusion 2 Grinding large pieces of calcium carbonate to form powder increases the surface area.

Which statement is correct?

A Both conclusions are correct and conclusion 2 explains conclusion 1.

B Both conclusions are correct but conclusion 2 does not explain conclusion 1.

C Conclusion 1 is correct but conclusion 2 is not correct.

D Conclusion 2 is correct but conclusion 1 is not correct.

20 A compound decolourises acidified potassium manganate(VII).

What could this compound be?

1 magnesium chloride, $MgCl_2$

2 iron(II) chloride, $FeCl_2$

3 ethanol, C_2H_5OH

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

21 Nitrogen reacts with oxygen in an equilibrium reaction.

$$N_2(g) + O_2(g) \rightleftharpoons 2NO(g) \qquad \Delta H = +170\,kJ/mol$$

When the reaction is at equilibrium, which statement is correct?

A The concentration of nitrogen present will change with time.

B The forward and backward reactions are taking place at the same rate.

C The forward reaction releases heat energy.

D There are more molecules on the left hand side of the equation than on the right.

22 A solution of **W** has the following properties.

- When added in excess to solid ammonium chloride, a gas is given off that turns damp red litmus paper blue.
- When added in excess to a solution of pH 3, the resulting solution has a pH of 13.

What is **W**?

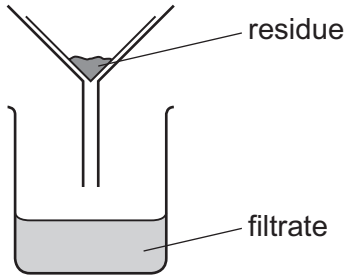
A a strong acid

B a strong base

C a weak acid

D a weak base

23 Pure lead(II) sulfate is prepared by mixing two substances, X and Y. When the reaction is complete the mixture is filtered. Pure lead(II) sulfate is obtained.



Which row shows the best way to prepare pure lead(II) sulfate?

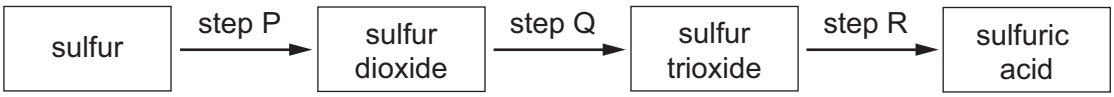
	substance X	substance Y	method after filtration
A	aqueous lead(II) nitrate	aqueous sodium sulfate	crystallise the filtrate
B	aqueous lead(II) nitrate	aqueous sodium sulfate	wash and dry the residue
C	solid lead(II) carbonate	dilute sulfuric acid	crystallise the filtrate
D	solid lead(II) carbonate	dilute sulfuric acid	wash and dry the residue

24 What are the percentages by mass of nitrogen in ammonium nitrate, NH_4NO_3, and in calcium nitrate, $Ca(NO_3)_2$?

	% nitrogen in NH_4NO_3	% nitrogen in $Ca(NO_3)_2$
A	18	14
B	18	17
C	35	9
D	35	17

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25 The diagram shows three steps in the manufacture of sulfuric acid.



In which steps is a catalyst used?

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

26 Which statement about the elements in the Periodic Table is correct?

A An atom of potassium, K, has more protons than an atom of argon, Ar.

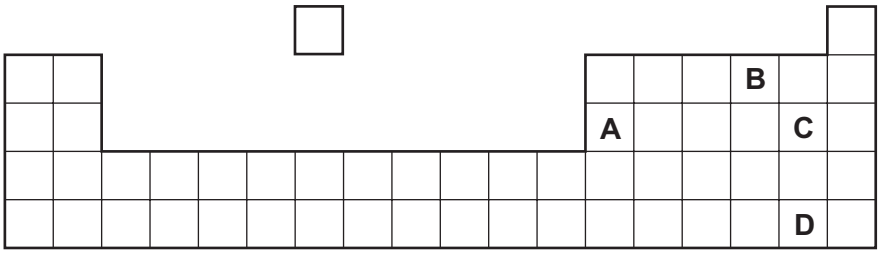
B Elements in the same period have similar chemical properties.

C Elements that are non-metals form only covalent bonds with other elements.

D On descending Group I from lithium, Li, to caesium, Cs, the metals become less reactive.

27 The positions of four elements are shown on the outline of part of the Periodic Table.

Which element is a solid non-metal at r.t.p.?



28 What is **not** a typical property of transition elements?

A They form coloured compounds.

B They have high melting points.

C They have low densities.

D They have variable oxidation states.

29 Brass is an alloy.

Which statement about brass is correct?

A It contains a sea of electrons.

B It contains positive and negative ions which are free to move.

C It is a compound of a metal and a non-metal.

D It is a compound of two or more metals.

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30 Which statement about the reactions of some metals and metal compounds is correct?

A Copper reacts with dilute hydrochloric acid to form hydrogen.

B Sodium oxide is reduced to sodium metal by heating with carbon.

C Zinc carbonate is more thermally stable than sodium carbonate.

D Zinc displaces copper from aqueous copper(II) sulfate.

31 Which metal is used in the galvanising of iron?

A calcium

B copper

C lead

D zinc

32 Iron is obtained in the blast furnace from the ore haematite.

Which process takes place in the blast furnace?

A Calcium carbonate is used to remove acidic impurities.

B Coke is reduced to carbon dioxide.

C Haematite is oxidised by carbon monoxide.

D Haematite undergoes thermal decomposition.

33 Aluminium is a Group III element. It is extracted from its ore by electrolysis.

The position of aluminium in the Periodic Table indicates that its aqueous ion is likely to be .....1..... .

Its method of extraction indicates that aluminium is .....2..... in the reactivity series.

Which words complete gaps 1 and 2?

	1	2
A	coloured	high
B	coloured	low
C	colourless	high
D	colourless	low

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34 Which pair of gases are both non-acidic?

A ammonia and methane

B carbon dioxide and ammonia

C methane and nitrogen dioxide

D nitrogen dioxide and carbon dioxide

35 Which term correctly describes the conversion of seawater into drinkable water?

A chlorination

B desalination

C filtration

D neutralisation

36 Which formula represents an alkane?

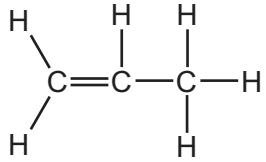
A $C_{31}H_{33}$ **B** $C_{31}H_{60}$ **C** $C_{31}H_{62}$ **D** $C_{31}H_{64}$

37 **Z** is a compound that:

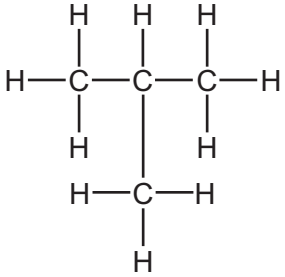
- can be formed, as the only other product, when the alkane C_8H_{18} is cracked to produce butane
- decolourises bromine water
- has a branched chain structure.

What is the formula of **Z**?

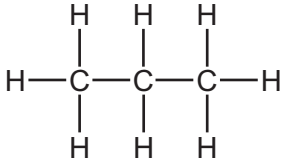
A



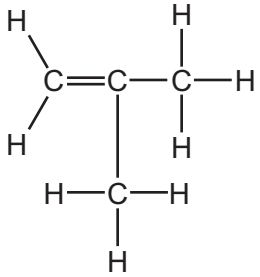
B



C



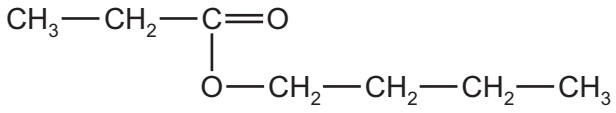
D



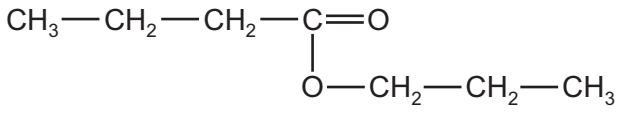
38 A carboxylic acid of molecular formula $C_4H_8O_2$ reacts with an alcohol of molecular formula C_3H_8O to form an ester.

What could be the formula of the ester formed?

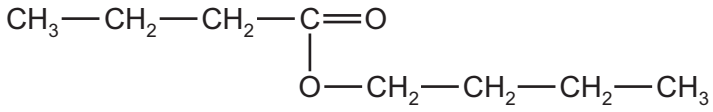
A



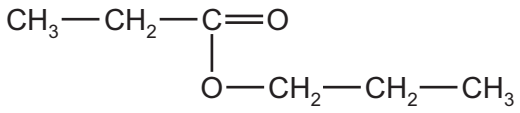
B



C



D



39 Some properties of compound **J** are listed.

- It reacts with potassium carbonate to produce carbon dioxide.
- It reacts with ethanol to produce a sweet-smelling liquid.
- It reacts with sodium hydroxide to produce a salt.

What is a possible identity of **J**?

A ethanoic acid

B ethanol

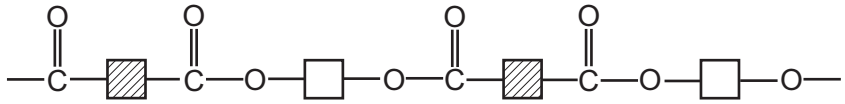
C ethyl ethanoate

D ethyl methanoate

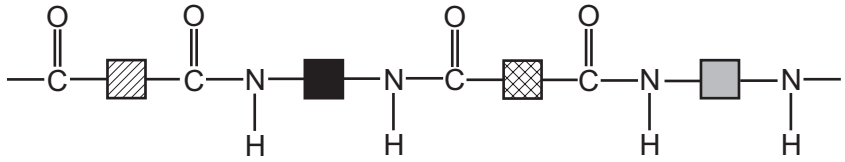
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40 Which partial structure represents nylon?

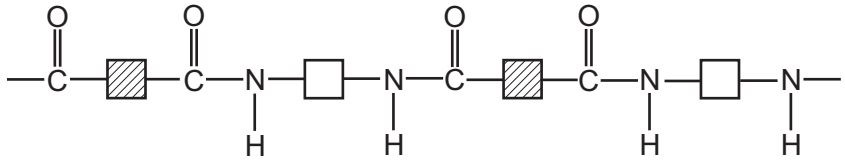
A



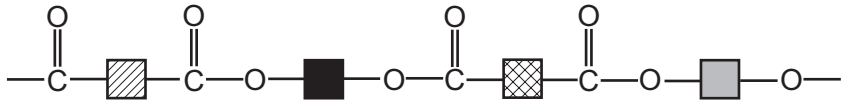
B



C



D



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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

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