Cambridge Assessment International Education

Cambridge O Level

CHEMISTRY **5070/12**

Paper 1 Multiple Choice **May/June 2020**

1 hour

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- 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 multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

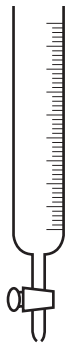
This document has **20** pages. Blank pages are indicated.

[Turn over

1 The diagram shows four pieces of apparatus that are used to measure the volume of a gas or liquid.

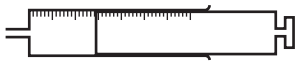
Which piece of apparatus should always be filled to the same level?

A



burette

B



gas syringe

C

measuring cylinder

D

pipette

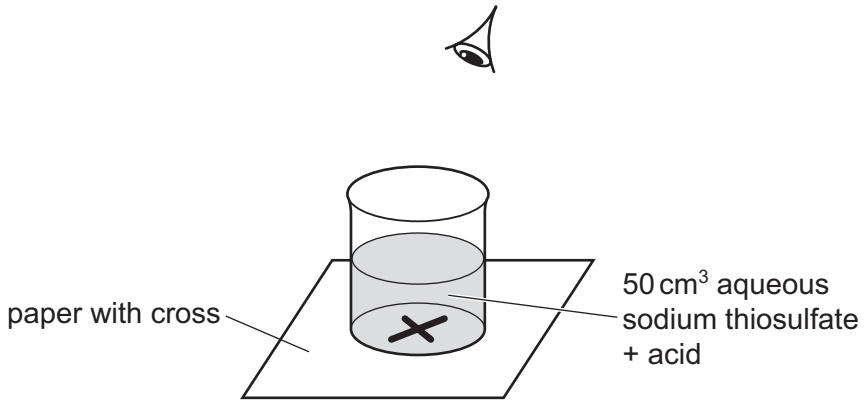
2 Aqueous sodium thiosulfate reacts with acid to make a precipitate of sulfur.

$$Na_2S_2O_3(aq) + 2HCl(aq) \rightarrow 2NaCl(aq) + H_2O(l) + SO_2(g) + S(s)$$

A student investigates the effect of temperature on the rate of this reaction.

The student:

- places a piece of paper with a cross on it below the reaction mixture as shown in the diagram
- measures the time taken for the cross to no longer be seen
- repeats the reaction at different temperatures.



Which apparatus is needed for this investigation?

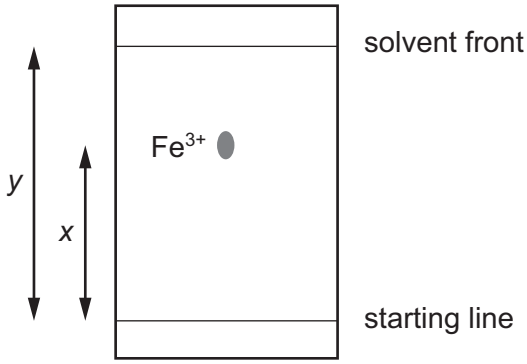
A balance, pipette, stop-clock

B balance, stop-clock, thermometer

C burette, gas syringe, thermometer

D measuring cylinder, stop-clock, thermometer

3 A paper chromatography experiment is carried out to find an R_f value for $Fe^{3+}(aq)$. The result is shown.



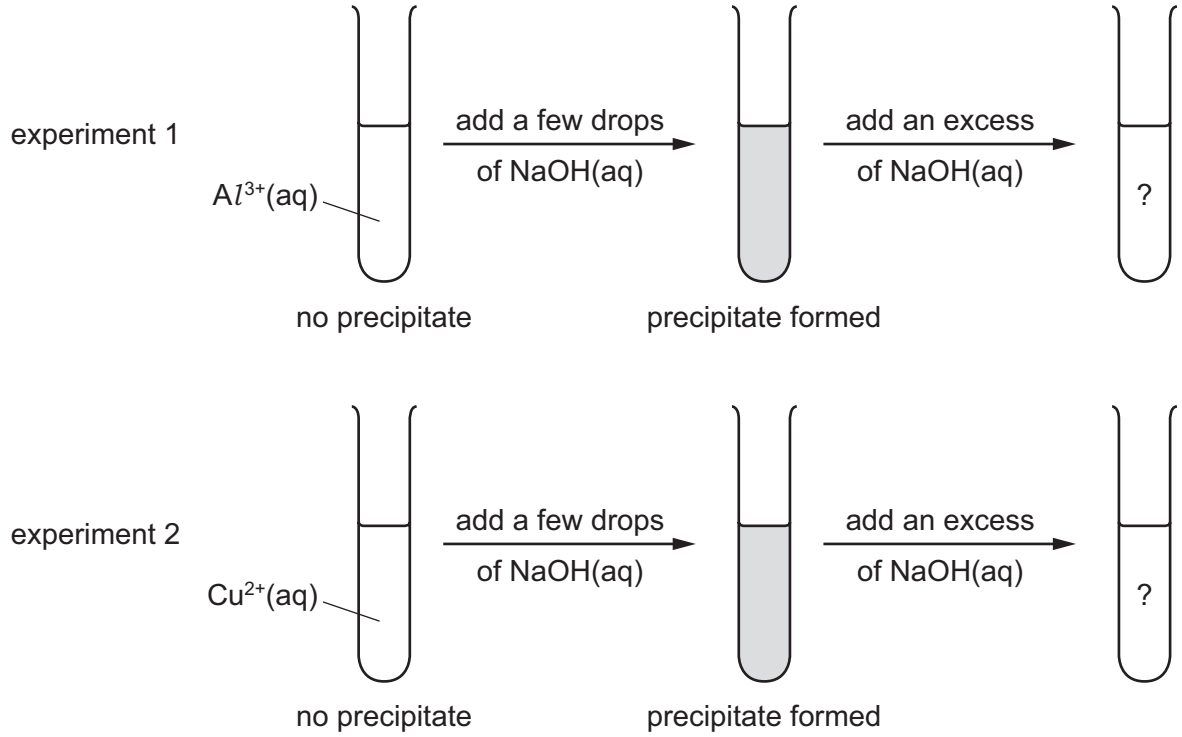
To make the spot containing $Fe^{3+}(aq)$ more visible, the paper is sprayed with aqueous sodium hydroxide so that a precipitate of iron(III) hydroxide forms.

Under the conditions of the experiment, the R_f of $Fe^{3+}(aq)$ is given by .....1..... and the colour of the precipitate is .....2..... .

Which row correctly completes gaps 1 and 2?

	gap 1	gap 2
A	$\frac{x}{y}$	red-brown
B	$\frac{x}{y}$	green
C	$\frac{y}{x}$	red-brown
D	$\frac{y}{x}$	green

4 The diagram shows two experiments.



What are the results of adding an excess of NaOH(aq) in each experiment?

	experiment 1	experiment 2
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = precipitate remains

✗ = precipitate dissolves

5 Which methods of separation require a change of state from liquid to gas?

1 paper chromatography

2 crystallisation

3 distillation

4 filtration

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

6 Hydrogen sulfide, H_2S, and hydrogen chloride, HCl, are both gases at temperatures above –50 °C.

Which gas will diffuse most rapidly at the temperature given?

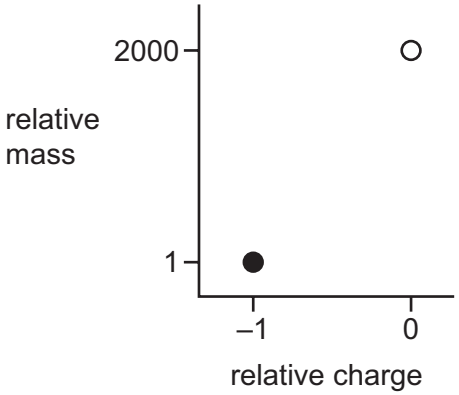
A hydrogen chloride at –40 °C

B hydrogen chloride at –20 °C

C hydrogen sulfide at –40 °C

D hydrogen sulfide at –20 °C

7 The diagram shows the relative mass and the relative charge of two particles, ○ and ●, present in atoms and ions.



Which of these particles are present in a hydrogen atom and in a hydrogen ion?

	H	H^+
A	both ○ and ●	both ○ and ●
B	both ○ and ●	○ but not ●
C	● but not ○	neither ○ nor ●
D	○ but not ●	● but not ○

8 Which ion has the most shells that contain electrons?

A Al^{3+} **B** Be^{2+} **C** N^{3-} **D** S^{2-}

9 Which substance conducts electricity both when solid and when molten?

A an alloy

B a hydrocarbon

C a metal oxide

D a salt

10 When they react together, which pair of elements form an ionic compound?

A carbon and hydrogen

B hydrogen and chlorine

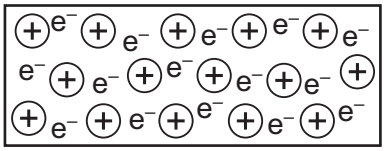
C lithium and oxygen

D sulfur and oxygen

11 How many shared electrons are in one carbon dioxide molecule?

A 2 **B** 4 **C** 8 **D** 12

12 Element X has a lattice of positive ions and a 'sea of electrons'.



Which property will X have?

A It conducts electricity by the movement of ions and electrons.

B It has a high melting point.

C It is decomposed by an electric current.

D It is not malleable.

13 Which row shows the correct state symbols for the reaction between calcium carbonate and dilute hydrochloric acid? (The conditions are room temperature and pressure.)

	$CaCO_3$ +	$2HCl \rightarrow CaCl_2$ +		H_2O +	CO_2
A	s	aq	aq	aq	g
B	s	l	aq	l	g
C	s	l	l	aq	g
D	s	aq	aq	l	g

14 The expression shown for the value of A_r for fluorine is incomplete.

$$A_r \text{ (fluorine)} = \frac{\text{average mass of one .....1..... of fluorine}}{\text{.....2..... of the mass of one atom of } {}^{12}_{6}\text{C}}$$

How should the gaps in the expression be correctly completed?

	gap 1	gap 2
A	atom	$\frac{1}{6}$
B	atom	$\frac{1}{12}$
C	molecule	$\frac{1}{6}$
D	molecule	$\frac{1}{12}$

15 A mixture of 5 cm^3 of CH_4 and 100 cm^3 of air is exploded. Assume air is 80% N_2 by volume and 20% O_2 by volume. The resulting mixture is cooled. All volumes are measured at room temperature and pressure.

$$CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$$

What is the composition of the resulting gas?

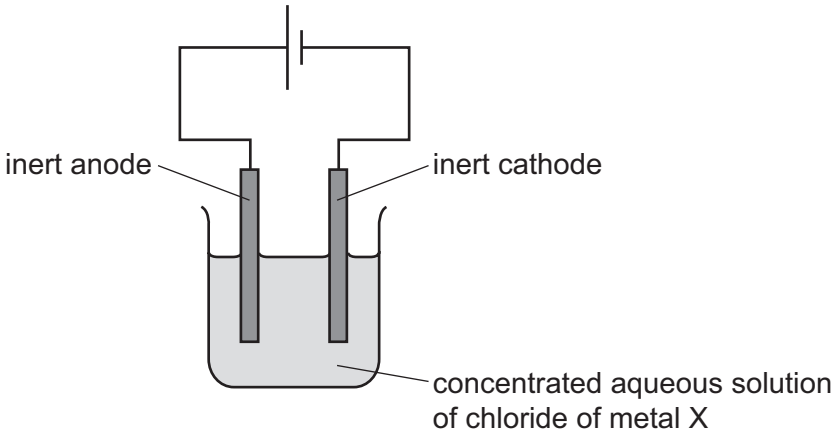
	5 cm^3 of CO_2	10 cm^3 of O_2	80 cm^3 of N_2	10 cm^3 of steam
A	✓	✓	✓	✓
B	✓	✓	✓	✗
C	✓	✗	✓	✓
D	✓	✗	✓	✗

16 Which arrangement is used to electroplate copper onto a steel key?

	electrolyte	anode (positive electrode)	cathode (negative electrode)
A	aqueous copper(II) sulfate	piece of pure copper	steel key
B	aqueous copper(II) sulfate	steel key	piece of pure copper
C	dilute sulfuric acid	piece of pure copper	steel key
D	dilute sulfuric acid	steel key	piece of pure copper

17 The chloride of metal X is dissolved in water.

A concentrated solution of this chloride is electrolysed using inert electrodes.



X is above sodium in the reactivity series.

In addition to chlorine, which gas is liberated and at which electrode?

	gas	liberated at electrode
A	hydrogen	anode
B	hydrogen	cathode
C	oxygen	anode
D	oxygen	cathode

18 Which change in conditions, for the reaction between zinc and dilute sulfuric acid, increases the rate of reaction by lowering the activation energy?

A adding a catalyst

B increasing the concentration of the acid

C increasing the surface area of the zinc

D increasing the temperature

19 Many reactions can be classified as redox reactions.

Which equations show redox reactions?

1 $Mg + 2HCl \rightarrow MgCl_2 + H_2$

2 $2FeCl_2 + Cl_2 \rightarrow 2FeCl_3$

3 $2Na + Br_2 \rightarrow 2NaBr$

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

20 Which row correctly shows whether the hydrogen ion concentration and the pH of ethanoic acid are higher or lower than those of hydrochloric acid of the same concentration?

	hydrogen ion concentration	pH
A	higher	higher
B	higher	lower
C	lower	higher
D	lower	lower

21 Which aqueous reagent liberates ammonia from ammonium nitrate on warming?

A calcium nitrate

B potassium hydroxide

C sodium chloride

D sulfuric acid

22 Two fertilisers are made by mixing chemical compounds.

Fertiliser X contains 500 g of NH_4NO_3 and 500 g of $(NH_4)_2SO_4$ per kilogram.

Fertiliser Y contains 700 g of NH_4NO_3 and 300 g of $CaSO_4$ per kilogram.

Which fertiliser contains the higher percentage of nitrogen by mass and which contains the higher percentage of sulfur by mass?

[M_r: NH_4NO_3, 80; $(NH_4)_2SO_4$, 132; $CaSO_4$, 136]

	fertiliser with higher percentage N	fertiliser with higher percentage S
A	X	X
B	X	Y
C	Y	X
D	Y	Y

23 Which processes occur in the manufacture of sulfuric acid?

1 burning sulfur in air

2 dissolving sulfur dioxide in sulfuric acid

3 dissolving sulfur dioxide in water

4 reacting sulfur dioxide with air

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

24 A lump of element X can be cut by a knife.

During its reaction with water, X floats and melts.

What is X?

A calcium

B copper

C magnesium

D potassium

25 Chlorine is passed into separate samples of aqueous potassium iodide and aqueous potassium bromide.

In which solutions is there a colour change?

	KI(aq)	KBr(aq)
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

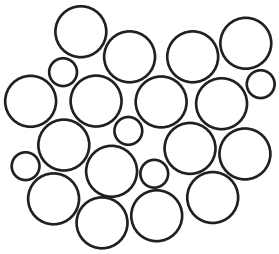
key

✓ = yes

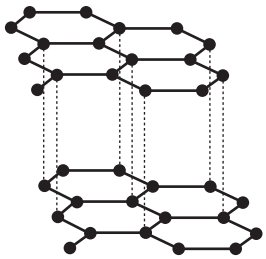
✗ = no

26 Which diagram shows the structure of an alloy?

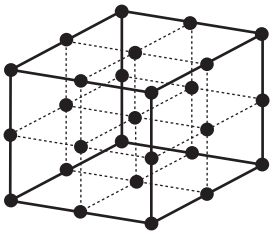
A



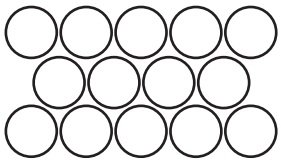
B



C



D



27 Which element can only be extracted from its ore using electrolysis?

A calcium

B copper

C lead

D silver

28 Which equation shows a thermal decomposition that occurs in the blast furnace?

A $C + O_2 \rightarrow CO_2$

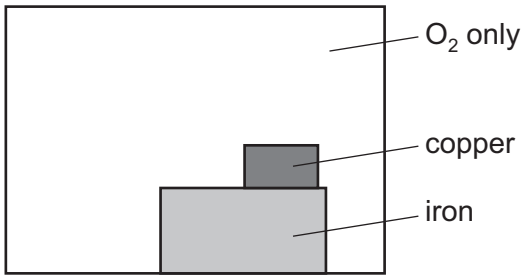
B $CO_2 + C \rightarrow 2CO$

C $CaCO_3 \rightarrow CaO + CO_2$

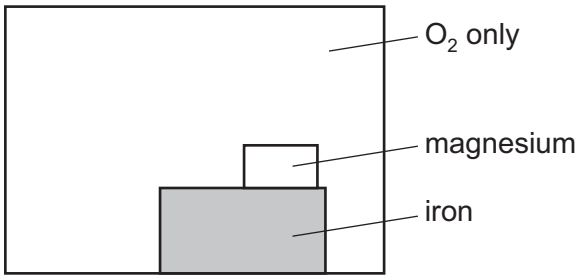
D $CaO + SiO_2 \rightarrow CaSiO_3$

29 Which diagram correctly shows the conditions necessary for the rusting of iron and also the metal that can be used to prevent rusting by sacrificial protection?

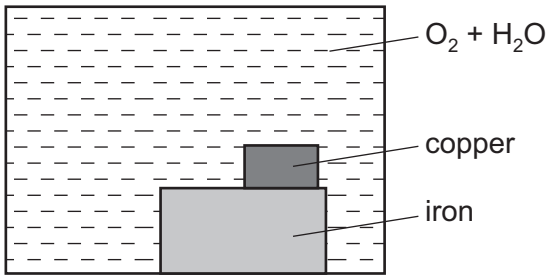
A



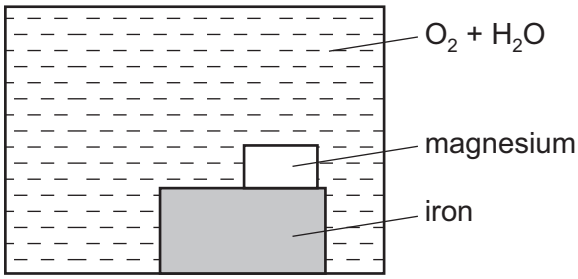
B



C



D



30 Aluminium is produced by the electrolysis of pure aluminium oxide. One of the electrodes in the process has to be replaced often.

Which statement is correct?

A The product at the anode reacts with the anode.

B The product at the anode reacts with the cathode.

C The product at the cathode reacts with the anode.

D The product at the cathode reacts with the cathode.

31 Which row correctly compares carbon dioxide and methane?

	both contain carbon	both are described as a greenhouse gas	both lower the pH of water when they dissolve in it
A	✓	✗	✓
B	✓	✓	✗
C	✗	✓	✓
D	✗	✓	✗

32 Sea water has to be purified in order to obtain drinking water from it.

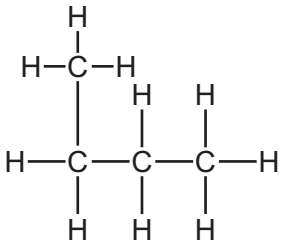
Which processes are used to purify the sea water?

	fractional distillation	desalination
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

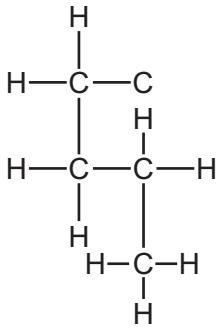
key
✓ = used
✗ = not used

33 Which structure represents an isomer of butane?

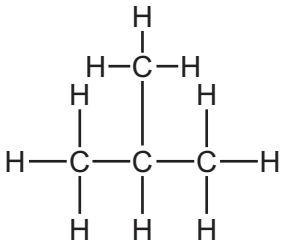
A



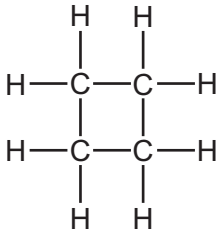
B



C



D



34 Which statement about the organic compounds CH_4, C_2H_4, C_2H_6 and C_3H_8 is correct?

A Only C_2H_4 and C_2H_6 decolourise bromine water.

B They are all saturated compounds.

C They are all unsaturated compounds.

D They are all hydrocarbons.

35 The alkenes are a homologous series.

Which statement about alkenes is correct?

A An alkene molecule contains four fewer hydrogen atoms than an alkane molecule with the same number of carbon atoms.

B If a food is described as *polyunsaturated* it means that it contains polymers.

C Propene reacts with steam to form propanol.

D The general formula for the alkenes is C_nH_{2n+2}.

36 Which organic compound is used as a solvent, a renewable fuel and in the production of vinegar?

A ethanoic acid

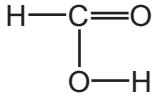
B ethanol

C propanoic acid

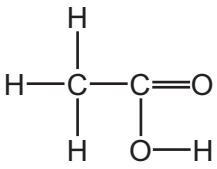
D propanol

37 Which structure shows the carboxylic acid with the lowest relative molecular mass?

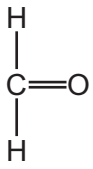
A



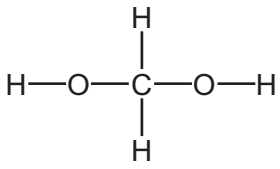
B



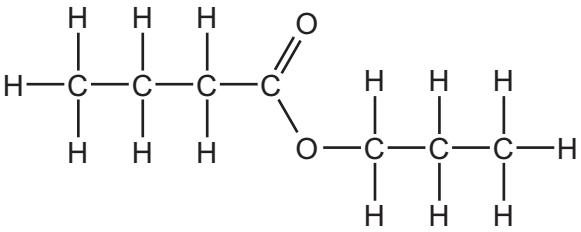
C



D



38 What is the name of the ester shown?



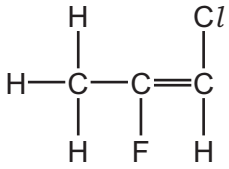
A butyl propanoate

B propyl butanoate

C propyl ethanoate

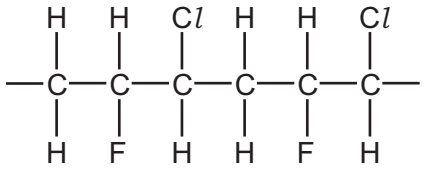
D propyl propanoate

39 The diagram shows the structure of a monomer.

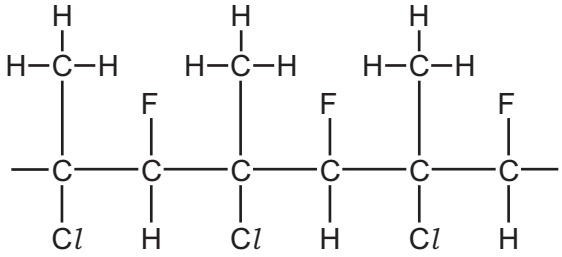


Which diagram shows the partial structure of its polymer?

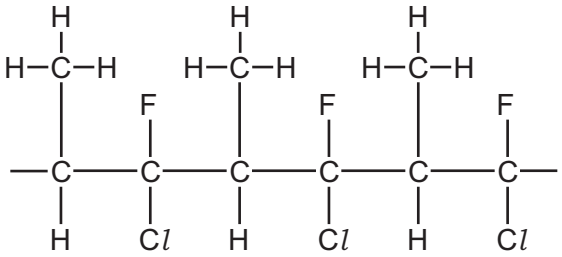
A



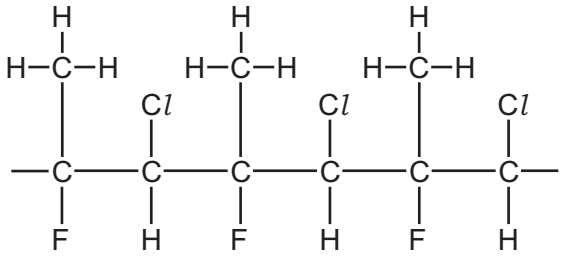
B



C



D



40 Which statement about polymers is correct?

A Nylon and *Terylene* are produced by addition polymerisation.

B Nylon and *Terylene* both contain amide linkages.

C Simple sugars are produced by hydrolysing proteins.

D Starch contains the elements carbon, hydrogen and oxygen.

BLANK PAGE

BLANK PAGE

BLANK PAGE

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.).