Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CHEMISTRY **5070/12**

Paper 1 Multiple Choice **October/November 2017**

1 hour

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

8408139347

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.

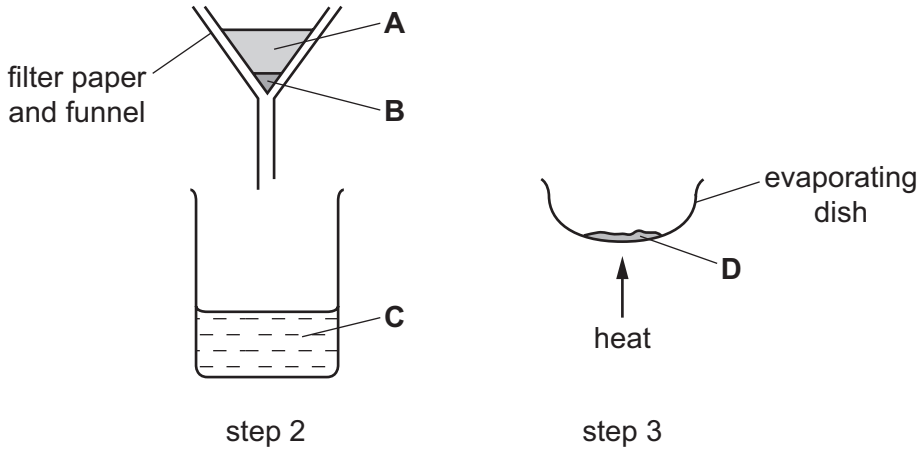
This document consists of **15** printed pages and **1** blank page.

1 A mixture of sand and sodium chloride can be separated in three steps.

Step 1 is to add water to the mixture.

The diagram shows step 2 and step 3.

Where is pure sodium chloride collected?



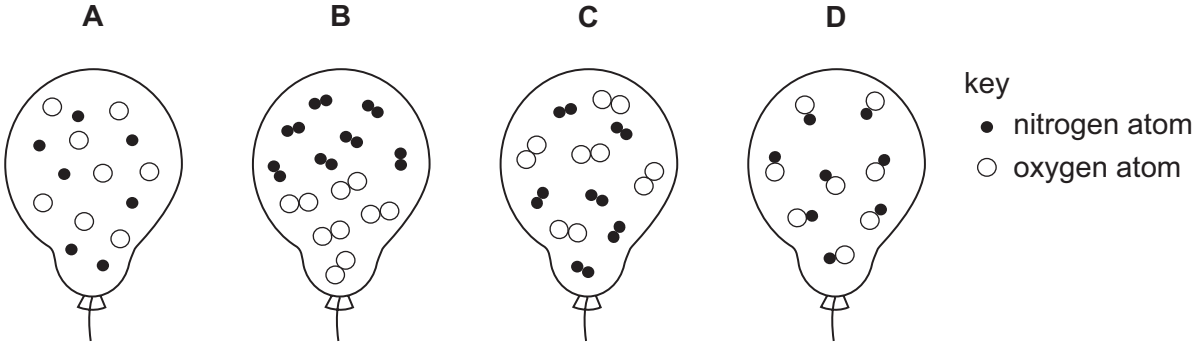
2 The results of two tests on solution **X** are shown.

reagent added	observation on adding a few drops of reagent	observation on adding an excess of reagent
aqueous sodium hydroxide	white precipitate	precipitate dissolves
aqueous ammonia	white precipitate	precipitate remains

Which ion is present in solution **X**?

A Al^{3+} **B** Ca^{2+} **C** Cu^{2+} **D** Zn^{2+}

3 Which diagram shows the arrangement of particles inside a balloon containing a mixture of the gases nitrogen and oxygen?

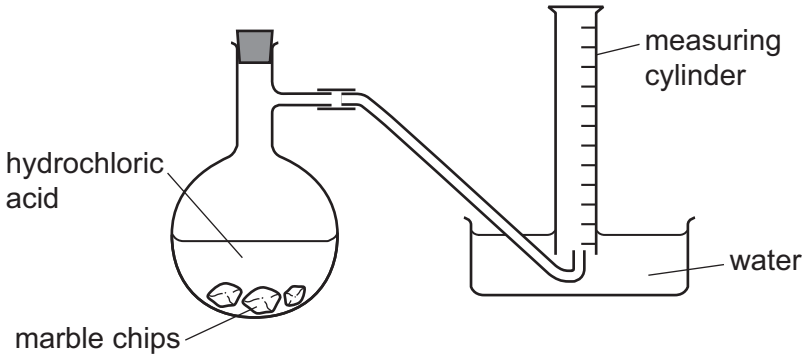


4 A student follows the rate of the reaction between marble chips, $CaCO_3$, and dilute hydrochloric acid.

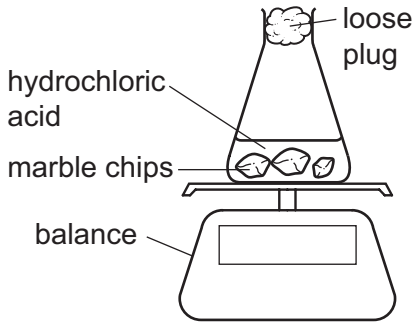
$$CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$$

Which diagrams show apparatus that is suitable for this experiment?

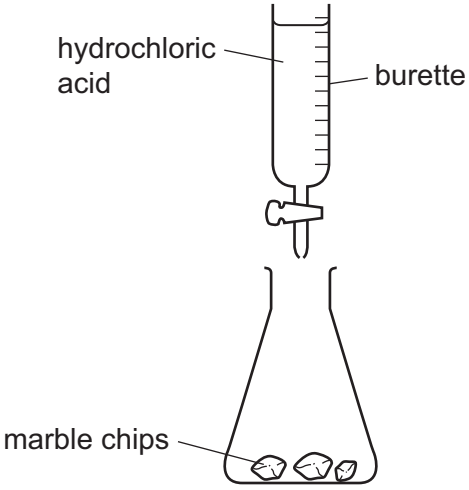
1



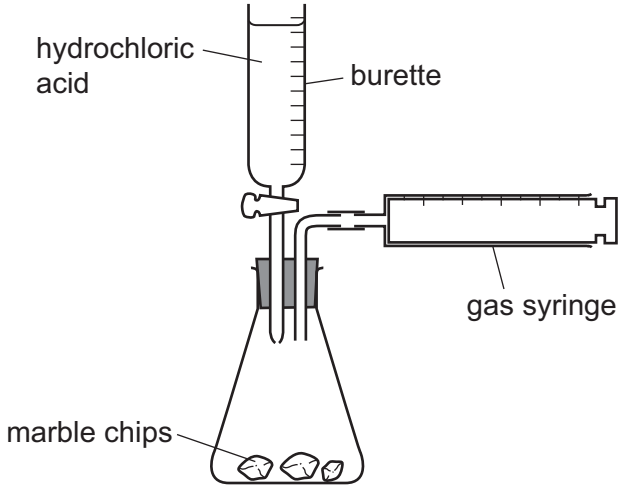
2



3

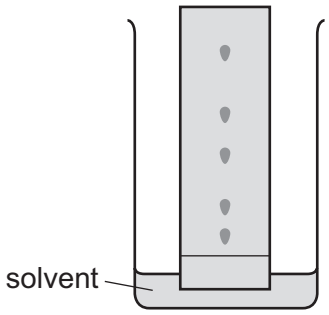


4



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

5 A chemist wishes to separate and identify a mixture of substances using paper chromatography. The diagram shows the apparatus used. The solvent is water.



The solvent front is allowed to reach the top of the paper before the chemist removes the paper from the solvent.

Which problem does this cause?

A This causes the spot nearest the bottom of the paper to catch up with the spot above it.

B This makes it impossible to calculate R_f values.

C This makes it impossible to use a locating agent.

D This results in a safety hazard caused by solvent fumes.

6 Which particle contains the same number of both neutrons and electrons?

A $^{40}_{20}Ca^{2+}$ **B** $^{24}_{12}Mg^{2+}$ **C** $^{19}_{9}F^{-}$ **D** $^{32}_{16}S^{2-}$

7 Which statement is correct for all metals?

A They are hard and brittle.

B They are made up of a lattice of positive and negative ions.

C They conduct electricity by movement of electrons.

D They conduct electricity by movement of ions.

8 X represents the element of atomic number 8 and Y represents the element of atomic number 19.

The two elements react together to form a compound.

Which row is correct for the compound formed?

	formula	type of bonding
A	Y_2X	covalent
B	Y_2X	ionic
C	X_2Y	covalent
D	X_2Y	ionic

9 The empirical formula of a liquid compound is C_2H_4O.

To find the empirical formula, it is necessary to know

A the density of the compound.

B the percentage composition by mass of the compound.

C the relative molecular mass of the compound.

D the volume occupied by 1 mole of the compound.

10 25.0 g of hydrated copper(II) sulfate crystals are heated to produce anhydrous copper(II) sulfate and water vapour.

$$CuSO_4.5H_2O(s) \rightarrow CuSO_4(s) + 5H_2O(g)$$

What is the mass of anhydrous copper(II) sulfate formed?
[M_r: $CuSO_4$, 160; H_2O, 18]

A 9.0 g **B** 16.0 g **C** 22.5 g **D** 25.0 g

11 Which sample contains the most atoms?

A 0.5 moles of water

B 1.0 moles of carbon dioxide

C 1.0 moles of methane

D 2.0 moles of hydrogen chloride

12 The relative atomic mass of chlorine is 35.5.

What is the mass of 2 moles of chlorine gas?

A 17.75 g **B** 35.5 g **C** 71 g **D** 142 g

13 One mole of an organic compound, **Q**, is completely burnt in oxygen and produces exactly three moles of water.

Which compound is **Q**?

A butane, C_4H_{10}

B ethanol, C_2H_5OH

C propane, C_3H_8

D propanol, C_3H_7OH

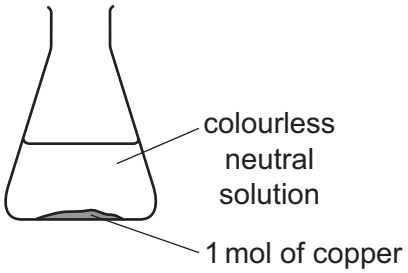
14 In an experiment, 1 mol of powdered copper and 1 mol of powdered zinc are placed in a flask.

Dilute acid, containing 1 mol of acid, is added to the flask.

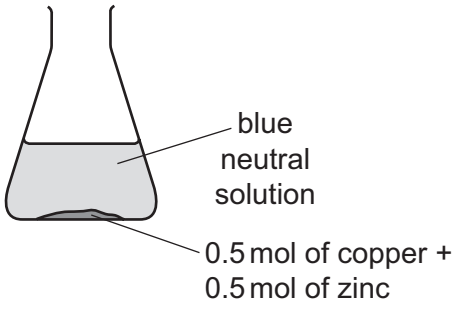
The flask is left until all the reactions, if any, are complete.

Which diagram shows the result of the experiment?

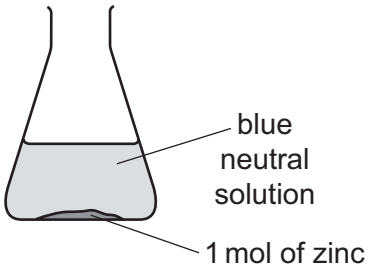
A



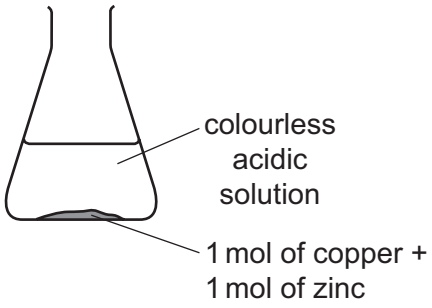
B



C



D



15 A simple cell can be made using two different metals as the electrodes and an aqueous solution as the electrolyte.

Which statements about simple cells are correct?

1 A greater voltage is produced using magnesium and silver than using magnesium and copper.

2 The electrolyte is an aqueous solution containing both positive and negative ions.

3 The more reactive metal will release electrons.

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

16 Magnesium can be produced by electrolysis of molten magnesium chloride, $MgCl_2$.

What are the equations for the reactions that occur at the positive electrode and at the negative electrode?

	positive electrode	negative electrode
A	$2Cl^- \rightarrow Cl_2 + 2e^-$	$2H^+ + 2e^- \rightarrow H_2$
B	$Cl_2 + 2e^- \rightarrow 2Cl^-$	$Mg^{2+} + 2e^- \rightarrow Mg$
C	$2Cl^- \rightarrow Cl_2 + 2e^-$	$Mg^{2+} + 2e^- \rightarrow Mg$
D	$2Cl^- \rightarrow Cl_2 + 2e^-$	$Mg^{2+} + 2e^- \rightarrow 2Mg$

17 Three different solutions were electrolysed using inert electrodes.

solution 1 aqueous sodium chloride

solution 2 concentrated hydrochloric acid

solution 3 dilute sulfuric acid

Which solutions produce hydrogen at the negative electrode?

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

18 Compound **Y** reacts with oxygen. This reaction has a positive enthalpy change of reaction, ΔH.

What information can be deduced about **Y** and its reaction with oxygen?

A Compound **Y** can be used as a fuel.

B Compound **Y** could be a hydrocarbon.

C In the reaction the energy needed to break bonds is greater than the energy released when bonds are made.

D In the reaction the products are at a lower energy level than the reactants.

19 The formation of liquid water from hydrogen and oxygen may occur in three stages.

1 $2H_2(g) + O_2(g) \rightarrow 4H(g) + 2O(g)$

2 $4H(g) + 2O(g) \rightarrow 2H_2O(g)$

3 $2H_2O(g) \rightarrow 2H_2O(l)$

Which stages are endothermic?

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

20 Sulfur trioxide is produced by the following reaction.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \qquad \Delta H = -195\,kJ$$

Which change in conditions would produce a greater amount of SO_3 at equilibrium?

A adding a catalyst

B increasing the pressure

C increasing the temperature

D removing some SO_2 and O_2

21 Magnesium reacts with dilute sulfuric acid.

$$Mg(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2(g)$$

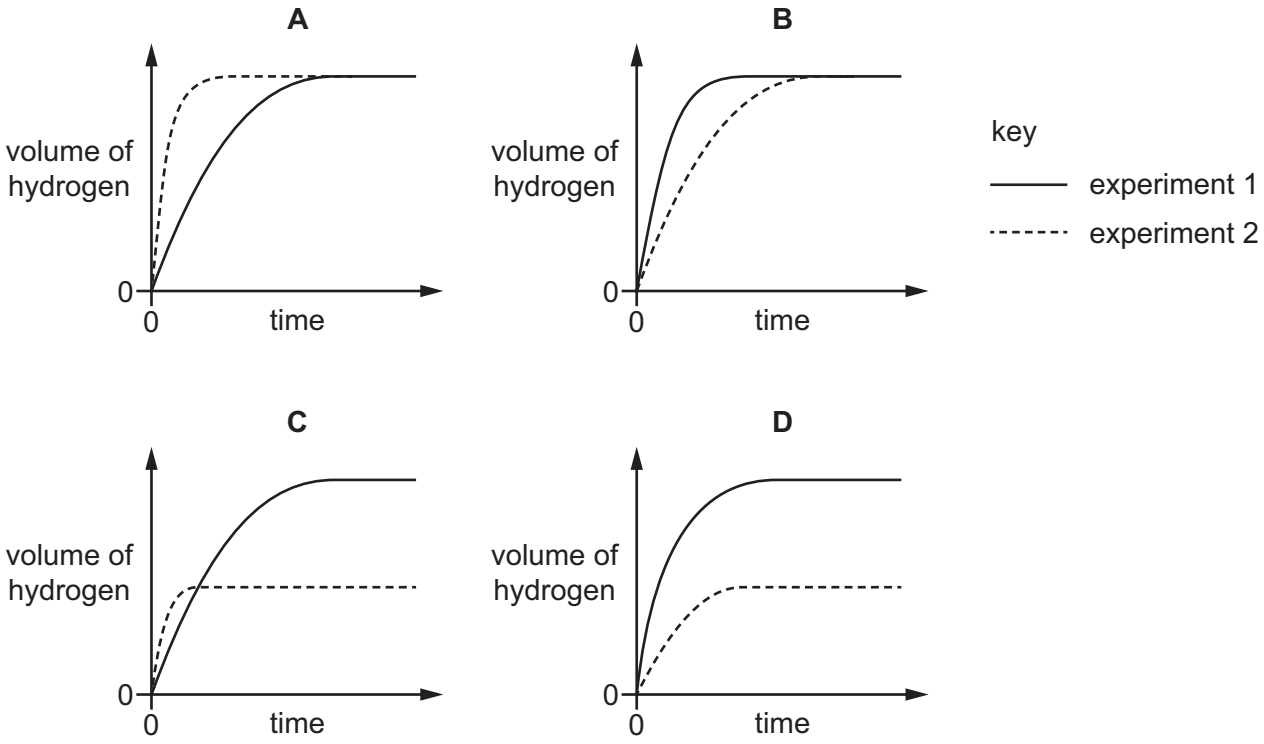
Two experiments were carried out.

experiment 1 24.0 g of magnesium was reacted with 100 cm^3 of 1.0 mol / dm^3 sulfuric acid.

experiment 2 24.0 g of magnesium was reacted with 50 cm^3 of 2.0 mol / dm^3 sulfuric acid.

In each experiment the volume of hydrogen was measured at various times. The results were plotted on a graph.

Which graph is correct?



22 Which statement is correct for both aluminium and iron?

A Both form 2+ ions.

B Both have amphoteric oxides.

C The manufacture of both metals involves the reduction of the metal ions.

D They are both normally manufactured by electrolysis.

23 A household cleaning compound is used to remove calcium carbonate from bathroom surfaces.

The compound reacts with the calcium carbonate to form a soluble salt, carbon dioxide and water.

What is the pH of this cleaning compound?

A pH 2 **B** pH 7 **C** pH 10 **D** pH 14

24 Dilute hydrochloric acid is added separately to samples of copper, copper(II) oxide and copper(II) carbonate.

Which row correctly shows whether copper(II) chloride is produced?

	Cu	CuO	$CuCO_3$
A	✓	✓	✓
B	✗	✓	✗
C	✓	✗	✓
D	✗	✓	✓

key

✓ = copper(II) chloride produced

✗ = copper(II) chloride not produced

25 Which ions are present when hydrochloric acid has exactly neutralised aqueous sodium hydroxide?

A Na^+, Cl^-, H^+ and OH^-

B Na^+, Cl^- and H^+ only

C Na^+ and Cl^- only

D H^+ and OH^- only

26 Which experiment will result in the formation of a white precipitate?

A aqueous barium nitrate added to aqueous sodium chloride

B aqueous sodium carbonate added to aqueous calcium chloride

C carbon dioxide passed through aqueous potassium chloride

D dilute hydrochloric acid added to aqueous ammonia

27 Which statement about both the Group I and Group VII elements is correct?

A They conduct electricity when molten.

B They form covalent compounds when bonded to non-metals.

C They exist as diatomic molecules.

D When Group I elements combine with Group VII elements, ionic compounds form.

28 The elements helium, argon and neon are noble gases.

Which statement is correct?

A All these elements have eight electrons in their outer shell.

B Argon is used to react with impurities in the manufacture of steel.

C Helium is used in balloons as it is more dense than air.

D Neon is used in light bulbs to give an inert atmosphere.

29 Which row shows the correct catalyst for each industrial process?

	manufacture of sulfuric acid	manufacture of ammonia	manufacture of margarine
A	nickel	iron	vanadium(V) oxide
B	nickel	vanadium(V) oxide	iron
C	vanadium(V) oxide	iron	nickel
D	vanadium(V) oxide	nickel	iron

30 In the solid state, germanium has the same structure as diamond.

What is the likely melting point of germanium?

A above 800 °C

B between 100 °C and 800 °C

C 100 °C

D below 100 °C

31 Aluminium is a metal that is often used to make caps for bottles. When thrown away and buried in the soil, the caps do not corrode.

Why is this?

A Aluminium does not react with acids.

B Aluminium does not react with alkalis.

C Aluminium is alloyed with other metals.

D Aluminium is protected by a layer of oxide.

32 Which statement about Group I metals is correct?

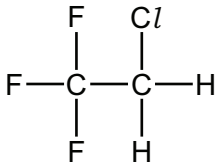
A They are hard compared with most other metals.

B They form coloured compounds.

C They have high densities compared with most other metals.

D They only form ions with a charge of +1.

33 CFC compounds were used as aerosol propellants. The structure of one CFC compound is shown.



Which element in this compound causes a depletion of ozone in the atmosphere?

A carbon

B chlorine

C fluorine

D hydrogen

34 Dry air is a mixture of gases of which 99% is nitrogen and oxygen.

What is the main constituent of the remaining 1%?

A argon

B helium

C hydrogen

D water vapour

35 Why is chlorine added to the water supply?

A Chlorine is used to desalinate the water.

B Chlorine kills bacteria that may be present in the water.

C Chlorine precipitates solids that may be present in the water.

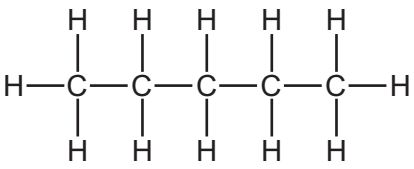
D Chlorine removes tastes and odours from the water.

36 When the alcohol of molecular formula $C_4H_{10}O$ is oxidised, what is the molecular formula of the acid formed?

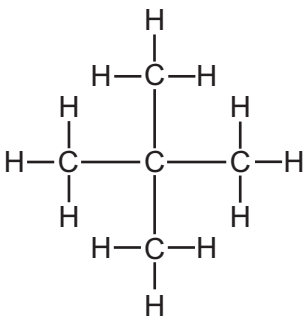
A $C_4H_{12}O_2$ **B** $C_4H_{10}O_2$ **C** $C_4H_8O_2$ **D** $C_4H_6O_2$

37 The diagrams show the structures of five hydrocarbons.

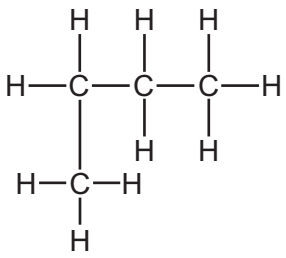
1



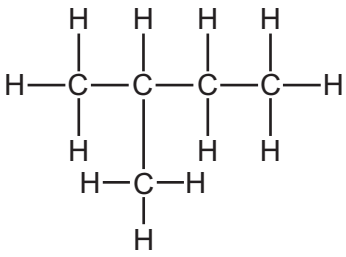
2



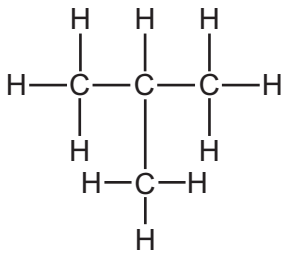
3



4



5



Which three hydrocarbons are isomers of each other?

A 1, 2 and 4 **B** 2, 3 and 5 **C** 2, 3 and 4 **D** 3, 4 and 5

38 Which alcohol and acid will react together to make the ester $CH_3COOC_2H_5$?

A CH_3OH and CH_3COOH

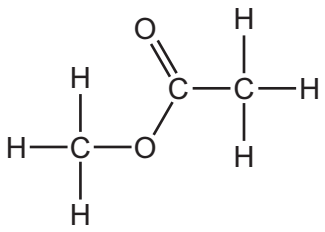
B CH_3OH and C_2H_5COOH

C C_2H_5OH and CH_3COOH

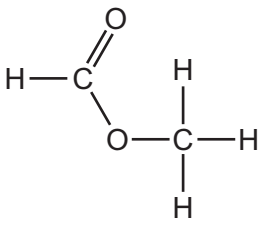
D C_2H_5OH and C_2H_5COOH

39 Which compound has a pH of less than 7 in aqueous solution?

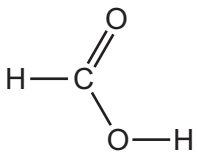
A



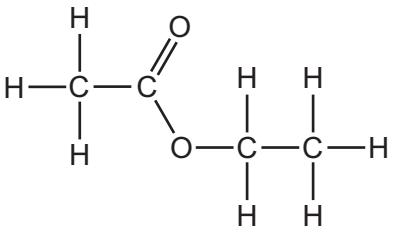
B



C



D



40 Which statement about polymers is correct?

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

B Nylon and *Terylene* both contain the amide linkage.

C Simple sugars can be produced by hydrolysing proteins.

D Starch contains the elements carbon, hydrogen and oxygen.

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.).