



Cambridge IGCSE™

CHEMISTRY

0620/11

Paper 1 Multiple Choice (Core)

October/November 2025

45 minutes

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.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.



- 1 Which process describes the movement of a substance **very slowly** from an area of high concentration to an area of low concentration?
- A** a liquid being frozen
- B** a solid melting
- C** a substance diffusing through a liquid
- D** a substance diffusing through the air
- 2 The atomic number and nucleon number of a potassium atom are shown.

atomic number	19
nucleon number	39

How many protons, neutrons and electrons are in the potassium ion, K^+ , which is formed from this potassium atom?

	protons	neutrons	electrons
A	19	20	18
B	19	20	20
C	20	19	18
D	20	19	19

- 3 Magnesium is in Group II and Period 3 of the Periodic Table.

Which row shows the charge on a magnesium ion and the electronic configuration of a magnesium ion?

	charge	electronic configuration
A	+2	2,8
B	+2	2,8,2
C	-2	2,8
D	-2	2,8,2

- 4 Sodium is in Group I of the Periodic Table.

Chlorine is in Group VII of the Periodic Table.

Sodium and chlorine combine to form a compound.

Which statement about the combination of sodium and chlorine atoms is correct?

- A Both sodium and chlorine lose electrons.
- B Both sodium and chlorine gain electrons.
- C Sodium loses electrons and chlorine gains electrons.
- D Sodium gains electrons and chlorine loses electrons.

- 5 Strontium nitrate is an ionic compound.

Cyclohexane is a covalent compound.

Which row describes a property of each compound?

	strontium nitrate	cyclohexane
A	conducts electricity in aqueous solution	low boiling point
B	low melting point	insoluble in water
C	soluble in water	conducts electricity when solid
D	conducts electricity when solid	high melting point

- 6 Which element forms covalent bonds with hydrogen?

- A magnesium
- B neon
- C nitrogen
- D sodium

- 7 Which statement about graphite and diamond is correct?

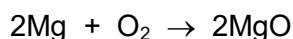
- A Diamond has a high melting point but graphite does **not**.
- B Graphite and diamond both conduct electricity.
- C Graphite and diamond both have giant structures.
- D Graphite is ionic and diamond is covalent.

- 8 Carbon dioxide gas reacts with aqueous calcium hydroxide to form calcium carbonate.

Which equation represents this reaction?

- A** $\text{CO}_2(\text{g}) + \text{Ca}(\text{OH})_2(\text{aq}) \rightarrow \text{CaCO}_3(\text{s}) + \text{H}_2\text{O}(\text{l})$
B $\text{CO}_2(\text{g}) + \text{Ca}(\text{OH})_2(\text{aq}) \rightarrow \text{CaCO}_3(\text{aq}) + \text{H}_2\text{O}(\text{l})$
C $2\text{CO}_2(\text{g}) + 2\text{CaOH}(\text{aq}) \rightarrow 2\text{CaCO}_3(\text{s}) + \text{H}_2(\text{g})$
D $2\text{CO}_2(\text{g}) + 2\text{CaOH}(\text{aq}) \rightarrow 2\text{CaCO}_3(\text{aq}) + \text{H}_2(\text{g})$

- 9 The equation for the combustion of magnesium is shown.



Which mass of magnesium oxide will be formed from the complete reaction of 9.6 g of magnesium?

- A** 8.0 g **B** 16.0 g **C** 24.0 g **D** 40.0 g

- 10 Which row identifies the product at each electrode when molten zinc chloride is electrolysed using inert electrodes?

	positive electrode	negative electrode
A	O_2	Zn
B	Cl_2	Zn
C	Zn	Cl_2
D	Zn	O_2

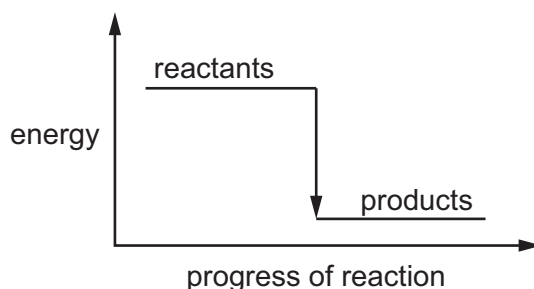
- 11 Which equation represents the reaction in a hydrogen–oxygen fuel cell?

- A** $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
B $2\text{H}_2 + 2\text{O} \rightarrow 2\text{H}_2\text{O}$
C $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + \text{O}_2$
D $2\text{H}_2\text{O} \rightarrow 2\text{H}_2 + 2\text{O}$

- 12 What is always produced when a fuel is burned?

- A** carbon dioxide
B carbon monoxide
C oxides of nitrogen
D thermal energy

- 13 The reaction pathway diagram shows the energy of the reactants and products in a chemical reaction.



Which row describes the enthalpy change and the type of reaction shown?

	description of energy change	type of reaction
A	thermal energy is given out to the surroundings	endothermic
B	thermal energy is given out to the surroundings	exothermic
C	thermal energy is taken in from the surroundings	endothermic
D	thermal energy is taken in from the surroundings	exothermic

- 14 Magnesium is reacted with dilute hydrochloric acid of the same concentration in four experiments using different conditions.

Which reaction finished in the shortest time?

- A** 2 g of magnesium powder in 50 cm³ of dilute HCl at 45 °C
B 2 g of magnesium powder in 50 cm³ of dilute HCl at 50 °C
C 2 g of magnesium ribbon in 50 cm³ of dilute HCl at 45 °C
D 2 g of magnesium ribbon in 50 cm³ of dilute HCl at 50 °C
- 15 Blue hydrated copper(II) sulfate produces a white solid when it is heated.

The white solid turns blue when water is added.

Which word describes the reaction of hydrated copper(II) sulfate?

- A** neutralisation
B oxidation
C reduction
D reversible

16 Iron(III) chloride, FeCl_3 , is a brown solid.

What is the meaning of (III) in the name?

- A** It is the amount of energy released when the compound was formed.
- B** It is the rate of the reaction that formed this compound.
- C** It is how many atoms of iron are bonded together in the compound.
- D** It is the oxidation number of iron in the compound.

17 What are the units of concentration?

- A** mol/dm^3 **B** g/dm **C** dm^3/mol **D** cm/g

18 Which pair of reactants are both soluble in water and mix to form a precipitate?

- A** NaCl and $\text{Mg}(\text{NO}_3)_2$
- B** BaSO_4 and K_2CO_3
- C** CaCl_2 and NaNO_3
- D** $\text{Pb}(\text{NO}_3)_2$ and KCl

19 Four oxides are listed.

- 1 lithium oxide
- 2 phosphorus oxide
- 3 sodium oxide
- 4 sulfur dioxide

Which oxides are basic?

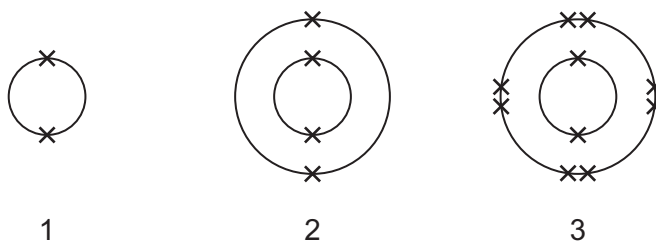
- A** 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

20 Cobalt is a typical transition element.

Which statement about cobalt is correct?

- A** Cobalt has a low density.
- B** Cobalt has a low melting point.
- C** Cobalt can form only colourless compounds.
- D** Cobalt can act as a catalyst.

21 Which diagrams show the electronic configuration for an atom of a noble gas?



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

22 Which statement describes the alloy brass?

- A** It is a mixture of iron and nickel.
B It is a mixture of iron compounds.
C It is a compound of copper, zinc and non-metals.
D It is a mixture of the metals copper and zinc.

23 The results of the reaction of metals W, X, Y and Z with cold water and dilute acid are shown.

metal	reaction with cold water	reaction with dilute acid
W	fizzes, gas evolved	rapid fizzing, gas evolved
X	no observable reaction	no observable reaction
Y	no observable reaction	slow fizzing, gas evolved
Z	a few bubbles of gas	fizzes, gas evolved

What is the order of reactivity of the metals?

	least reactive	→			most reactive
A	W	Z	Y	X	
B	W	Y	Z	X	
C	X	Y	Z	W	
D	X	Z	Y	W	

24 Some methods of preventing iron from rusting are listed.

- 1 alloying with chromium
- 2 greasing
- 3 painting

Which methods are barrier methods?

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

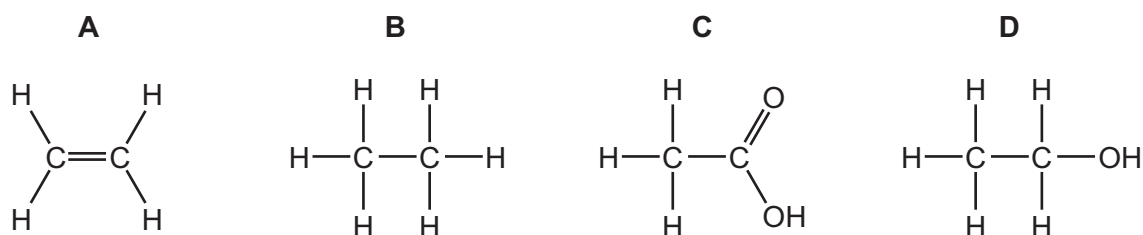
25 Which metal is extracted from bauxite by electrolysis?

- A** aluminium
B copper
C iron
D zinc

26 Which statement about water is correct?

- A** When water is added to solid anhydrous cobalt(II) chloride, the solid turns blue.
B Water containing dissolved sodium chloride boils at a temperature greater than 100 °C.
C All dissolved metal ions found in natural sources of water are beneficial to life.
D Soluble impurities are removed during the sedimentation stage in the treatment of drinking water.

27 What is the structure of ethanol?



28 Which statement about alkanes is correct?

- A** They contain carbon, hydrogen and oxygen only.
B They are saturated compounds with only single ionic bonds.
C The alkanes with longer chain lengths are more volatile.
D They react with chlorine in a substitution reaction.

29 Which row identifies an adverse effect of the named pollutant?

	air pollutant	adverse effect
A	methane	global warming
B	sulfur dioxide	cancer
C	particulates	acid rain
D	carbon monoxide	photochemical smog

30 Which group of compounds have the same general formula?

- A** CH_4 , C_2H_6 , C_3H_6
B CH_4 , C_3H_6 , C_4H_8
C C_2H_4 , C_3H_6 , C_4H_8
D C_2H_4 , C_3H_8 , C_4H_8

31 Some fractions obtained from petroleum are listed.

	fraction	use	position collected in the fractionating column
1	gasoline	waxes and polishes	below refinery gas
2	bitumen	making roads	above kerosene
3	kerosene	jet fuel	below gasoline
4	refinery gas	heating and cooking	above gasoline

Which rows are correct?

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

32 Four different substances or types of substance are listed.

- 1 hydrogen
 2 alcohols
 3 alkenes
 4 carboxylic acids

Which substances are produced by cracking larger alkane molecules?

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

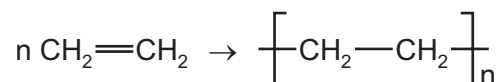
33 Which row shows the conditions used to manufacture ethanol from ethene and steam?

	temperature / °C	pressure / kPa
A	35	60
B	35	6000
C	300	60
D	300	6000

34 Which statement about aqueous ethanoic acid is correct?

- A** It reacts with metal carbonates to form salts, hydrogen and water.
- B** It reacts with metal oxides to form salts and oxygen.
- C** It reacts with reactive metals to form salts and hydrogen.
- D** It turns damp red litmus paper blue.

35 The equation represents a polymerisation reaction.



Which statements are correct?

- 1 The monomer is ethane.
- 2 The reaction is addition polymerisation.
- 3 The polymer does **not** easily decompose.

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

36 A sample of wax is heated. It begins to melt at 45 °C and finishes melting at 49 °C.

A sample of liquid is heated. It begins to boil at 141 °C and remains at 141 °C while it boils.

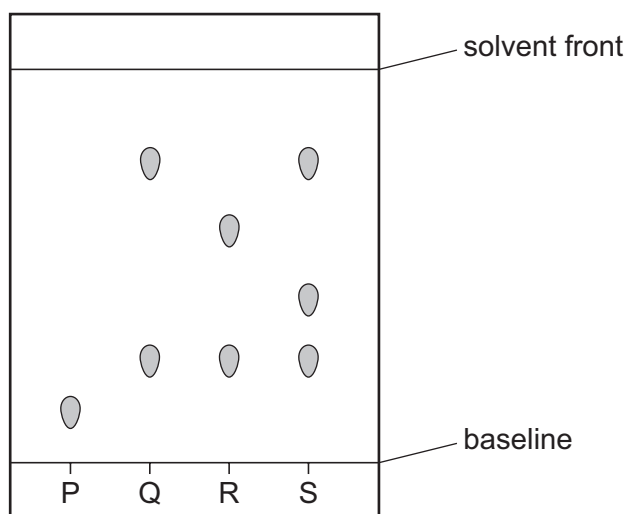
Which conclusion can be made from these results?

- A** Both substances are impure.
- B** Both substances are pure.
- C** The wax is **not** a pure substance and the liquid is a pure substance.
- D** The wax is a pure substance and the liquid is **not** a pure substance.

37 Four dyes, P, Q, R and S, are analysed using chromatography.

Water is the solvent.

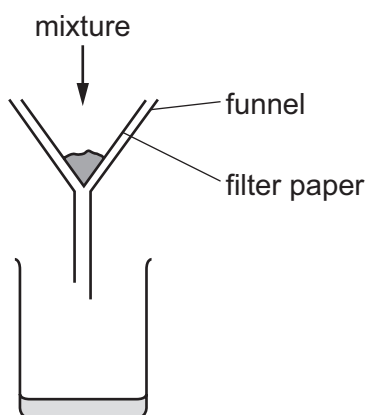
The chromatogram produced is shown.



Which statement about the dyes is correct?

- A** All four dyes are impure.
- B** The four dyes contain a total of eight different substances.
- C** Dye R is a mixture of dye P and dye Q.
- D** Dye S is a mixture of dye Q and one other substance.

38 The apparatus used to separate a mixture is shown.



What is the mixture?

- A** aqueous calcium chloride and aqueous calcium nitrate
- B** copper(II) hydroxide and aqueous calcium chloride
- C** ethanol and water
- D** sand and calcium carbonate

- 39** Two different white solids are heated and the gases formed are tested.

The gas from solid 1 turns damp red litmus paper blue.

The gas from solid 2 relights a glowing splint.

Which row identifies the gases formed from each solid?

	solid 1	solid 2
A	ammonia	hydrogen
B	ammonia	oxygen
C	chlorine	hydrogen
D	chlorine	oxygen

- 40** Which aqueous ion gives a blue precipitate when aqueous sodium hydroxide is added?

A Ca^{2+} **B** Cr^{3+} **C** Cu^{2+} **D** Fe^{2+}

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The Periodic Table of Elements

Group																		
I	II											III	IV	V	VI	VII	VIII	
3 Li lithium 7	4 Be beryllium 9	Key atomic number atomic symbol name relative atomic mass										1 H hydrogen 1	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 —	113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesson —	

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 dm³ at room temperature and pressure (r.t.p.).



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- 1 Water exists as solid ice, liquid water and steam.

In which states can water easily be compressed to half its original volume?

- A ice, liquid water and steam
- B liquid water and steam only
- C liquid water only
- D steam only

- 2 The melting point of sulfur is 113°C .

Which row describes the arrangement and movement of sulfur particles at 25°C ?

	arrangement of particles	movement of particles
A	regular	vibrate about fixed positions
B	regular	random
C	random	vibrate about fixed positions
D	random	random

- 3 Solid Y is added to an excess of hot water.

A blue solution forms and a brown solid remains.

The brown solid is filtered off and dried.

The brown solid conducts electricity.

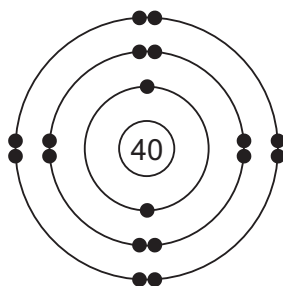
What is Y?

- A a compound that contains a metal
- B a mixture that contains a metal
- C a pure substance that is a metal
- D a pure substance that is a non-metal

- 4 Which statement about the structure of an atom is correct?

- A Electrons and protons each have a relative mass of 1, and neutrons have no charge.
- B Electrons have a relative mass of 1 and a negative charge.
- C Protons have a relative mass of 1 and a negative charge.
- D Neutrons have a relative mass of 1 and no charge.

- 5 The diagram shows the electronic configuration of a particle with a nucleon number of 40.

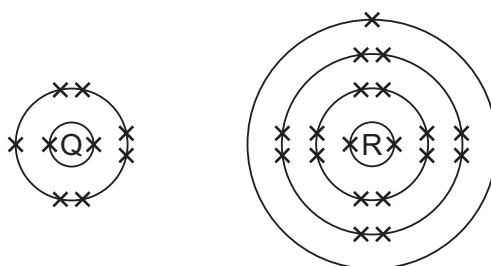


The table shows the suggestions that three students, 1, 2 and 3, made to identify the particle.

	student		
	1	2	3
particle	Ar	Cl	Ca ²⁺

Which students are correct?

- A** 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only
- 6 What is defined as different atoms of the same element with the same number of protons but different numbers of neutrons?
- A** homologous series
B isotopes
C mass number
D the group number
- 7 The electronic configurations of atoms Q and R are shown.



Q and R form an ionic compound.

What is the formula of the compound?

- A** R₇Q **B** R₄Q₂ **C** RQ **D** RQ₇

8 Which properties are typical of simple molecules?

- 1 high melting point
- 2 good electrical conductivity
- 3 low boiling point
- 4 high malleability

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

9 Diamond is extremely hard and does **not** conduct electricity.

Which statement explains these properties?

- A** It has positive carbon ions surrounded by delocalised electrons.
- B** It has strong ionic bonds between each carbon atom.
- C** It has delocalised electrons, and each carbon atom forms three covalent bonds with other carbon atoms.
- D** It has **no** delocalised electrons, and each carbon atom forms four covalent bonds with other carbon atoms.

10 Which equation represents the complete combustion of butane, C_4H_{10} ?

- A** $2C_4H_{10} + 5O_2 \rightarrow 8C + 10H_2O$
- B** $2C_4H_{10} + 9O_2 \rightarrow 8CO + 10H_2O$
- C** $2C_4H_{10} + 13O_2 \rightarrow 8CO_2 + 10H_2O$
- D** $C_4H_{10} + 4O_2 \rightarrow 4CO_2 + 5H_2$

11 What is the relative formula mass of calcium sulfate, $CaSO_4$?

A 88 **B** 92 **C** 136 **D** 232

12 What is the product at each electrode when molten silver iodide is electrolysed using inert electrodes?

	cathode	anode
A	hydrogen	iodine
B	iodine	silver
C	silver	iodine
D	silver	oxygen

- 13 Which row describes a product at each electrode when dilute sulfuric acid is electrolysed using inert electrodes?

	product at anode	product at cathode
A	10 cm ³ of a colourless gas	10 cm ³ of a brown gas
B	10 cm ³ of a colourless gas	20 cm ³ of a colourless gas
C	20 cm ³ of a colourless gas	10 cm ³ of a colourless gas
D	20 cm ³ of a brown gas	10 cm ³ of a colourless gas

- 14 Which experiment is the most exothermic?

	initial temperature / °C	final temperature / °C
A	20	5
B	20	32
C	25	12
D	25	34

- 15 In which test-tube is a physical change taking place?

A

water

sodium chloride

B

water

iron nail

C

dilute hydrochloric acid

zinc

D

dilute hydrochloric acid

calcium carbonate

- 16 Which items of apparatus are essential when measuring the effect of temperature on the rate of any reaction?

- 1 balance
- 2 gas syringe
- 3 stop-watch
- 4 thermometer

A 1 and 2

B 1 and 3

C 2 and 4

D 3 and 4

17 When pink cobalt(II) chloride is heated, it forms a blue solid and water.

When water is added to the blue solid, it releases heat and a pink solid is formed.

Which row describes the type of reaction that occurs and the pink cobalt(II) chloride?

	type of reaction	pink cobalt(II) chloride
A	non-reversible	anhydrous
B	non-reversible	hydrated
C	reversible	anhydrous
D	reversible	hydrated

18 What is the oxidation number of iron in iron(III) oxide, Fe_2O_3 ?

A +2

B +3

C -2

D -3

19 Which substances react with dilute hydrochloric acid to form aqueous copper(II) chloride?

1 copper

2 copper(II) oxide

3 copper(II) carbonate

4 copper(II) hydroxide

A 1, 2, 3 and 4

B 1, 2 and 3 only

C 2, 3 and 4 only

D 2 and 3 only

- 20** A few drops of thymolphthalein and methyl orange are added separately to two test-tubes containing solution X.

Solution Y is then added to both test-tubes until present in excess.

The colours of the indicators before and after addition of solution Y are shown.

	colour of thymolphthalein	colour of methyl orange
solution X only	colourless	red
mixture of solution X and excess solution Y	blue	yellow

What is solution Y?

- A** HCl(aq) **B** NaOH(aq) **C** $\text{H}_2\text{O(l)}$ **D** NaCl(aq)
- 21** Which mixture of solids is separated by adding water, stirring, and then using filtration?
- A** ammonium chloride and silver chloride
B barium sulfate and calcium sulfate
C copper(II) hydroxide and iron(III) hydroxide
D potassium nitrate and sodium nitrate
- 22** The character of the elements and charges on the ions of the elements change across the Periodic Table.

Which row describes the elements on the left and the elements on the right of the Periodic Table?

	elements on the left		elements on the right	
	character	charge on ion	character	charge on ion
A	metallic	positive	non-metallic	negative
B	metallic	negative	non-metallic	positive
C	non-metallic	positive	metallic	negative
D	non-metallic	negative	metallic	positive

- 23** Which statement describes a general trend down Group I?
- A** The melting point increases.
B The reactivity decreases.
C The density increases.
D The total number of electrons decreases.

24 Which statement describes the appearance of the named halogen at room temperature and pressure?

- A** Chlorine is a colourless gas.
- B** Chlorine is a red-brown liquid.
- C** Iodine is a purple gas.
- D** Iodine is a grey-black solid.

25 Osmium is a transition element.

Which row gives the expected properties of osmium?

	melting point	density at r.t.p.	compounds formed
A	high	high	coloured
B	high	high	white
C	high	low	white
D	low	high	coloured

26 Which statement about the element neon, Ne, is correct?

- A** It is in Group VII of the Periodic Table.
- B** It reacts rapidly with oxygen.
- C** It exists as diatomic molecules.
- D** Its atoms have a full outer shell of electrons.

27 Substance G reacts with:

- dilute acids to produce hydrogen
- steam to produce a basic oxide
- oxygen to produce a basic oxide.

What is substance G?

- A** magnesium
- B** phosphorus
- C** silicon
- D** silver

28 Which row describes two properties and a use of the named metal?

	metal	property 1	property 2	use
A	aluminium	high density	resistant to corrosion	food containers
B	aluminium	low density	good electrical conductivity	overhead power cables
C	copper	good electrical conductivity	low ductility	electrical wiring
D	copper	high melting point	low density	aircraft manufacture

29 Four methods to prevent the rusting of iron are listed.

- 1 alloying
- 2 coating with plastic
- 3 greasing
- 4 painting

Which methods are barrier methods?

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

30 Iron is extracted from hematite in a blast furnace.

Which reaction involves thermal decomposition?

- A** Calcium carbonate reacts to form calcium oxide and carbon dioxide.
B Carbon (coke) reacts with oxygen to form carbon dioxide.
C Carbon dioxide reacts with carbon to form carbon monoxide.
D Iron(III) oxide reacts with carbon monoxide to form iron and carbon dioxide.

- 31** Clean, dry air contains nitrogen, oxygen and small amounts of other gases.

The noble gases have been left out of the table.

Which row shows the composition of clean, dry air?

	nitrogen / %	oxygen / %	other gases
A	21	78	small amount of carbon dioxide
B	21	78	small amount of carbon monoxide
C	78	21	small amount of carbon dioxide
D	78	21	small amount of carbon monoxide

- 32** Some substances found in water from natural sources are potentially harmful.

Which substance contains microbes that cause disease?

- A** metal compounds
- B** nitrates
- C** phosphates
- D** sewage

- 33** Gas X is a waste gas from digestion in animals.

Gas Y is formed when gas X is burned with an insufficient amount of oxygen.

Gas Z is formed when gas X is burned with an excess of oxygen.

What are X, Y and Z?

	X	Y	Z
A	carbon dioxide	methane	carbon monoxide
B	carbon monoxide	methane	carbon dioxide
C	methane	carbon dioxide	carbon monoxide
D	methane	carbon monoxide	carbon dioxide

- 34** Which statement about photosynthesis is correct?

- A** It decreases the amount of oxygen in the atmosphere.
- B** It is a reaction between carbon dioxide and water.
- C** It produces a gas that contributes to increased global warming.
- D** It requires a temperature greater than 50 °C.

35 L and M are different homologous series.

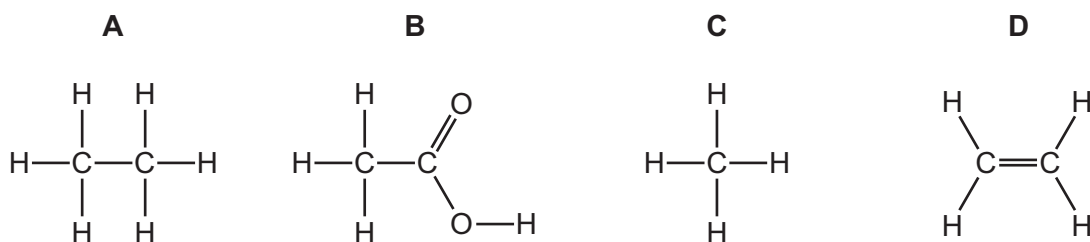
The first three members of homologous series L all decolourise aqueous bromine.

The first three members of homologous series M all dissolve in water to give solutions with a pH below 7.

What are the general formulae for homologous series L and M?

	homologous series L	homologous series M
A	C_nH_{2n}	$C_nH_{2n+1}COOH$
B	C_nH_{2n}	$C_nH_{2n+1}OH$
C	C_nH_{2n+2}	$C_nH_{2n+1}OH$
D	C_nH_{2n+2}	$C_nH_{2n+1}COOH$

36 Which structure represents an unsaturated hydrocarbon?



37 Petroleum is a mixture of compounds.

Which elements are present in all of these compounds?

- 1 carbon
- 2 hydrogen
- 3 oxygen

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

38 Which statement about ethanol explains why it is used as a fuel?

- A** It is a colourless liquid.
- B** It has a low density.
- C** It forms carbon dioxide when burned.
- D** It releases energy when burned.

- 39 The table shows the observations of two tests on an aqueous solution of a solid.

test	observations
add acidified silver nitrate	white precipitate
add aqueous sodium hydroxide	green precipitate that dissolves in excess sodium hydroxide

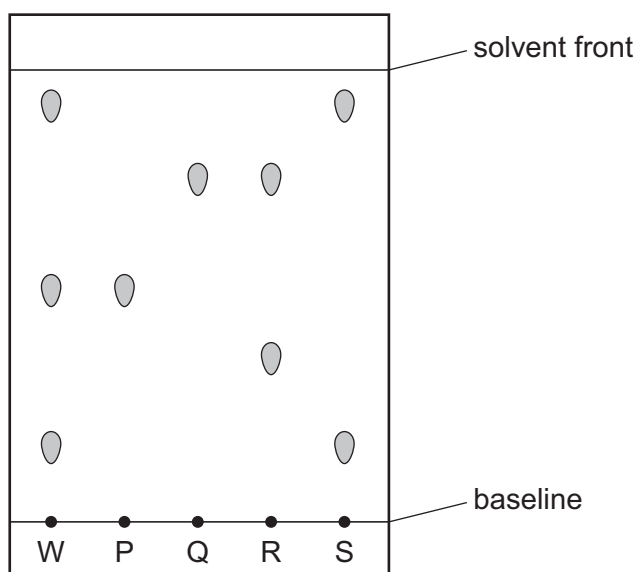
What is the solid?

- A chromium(III) bromide
- B chromium(III) chloride
- C iron(II) bromide
- D iron(II) chloride

- 40 W is a mixture of coloured dyes. It is thought to contain dyes P, Q, R or S.

A sample of W is separated by chromatography.

The chromatogram is shown.



What does the chromatogram show?

- A W contains P and S only.
- B W contains P and R only.
- C W contains P, Q and S.
- D W contains P, R and S.

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The Periodic Table of Elements

Group																																																																																											
I	II											III	IV	V	VI	VII	VIII																																																																										
3 Li lithium 7	4 Be beryllium 9	Key atomic number atomic symbol name relative atomic mass										1 H hydrogen 1	5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20	18 Ar argon 40	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 —	113 Nh nihonium —	114 Fl flerovium —	115 Mc moscovium —	116 Lv livermorium —	117 Ts tennessine —	118 Og oganesson —	2 He helium 4

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
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 —

actinoids

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).



Cambridge IGCSE™

CHEMISTRY

0620/13

Paper 1 Multiple Choice (Core)

October/November 2025

45 minutes

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.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Any blank pages are indicated.



- 1** Substances exist as solids, liquids or gases.

In which states of matter are the particles a similar distance apart?

- A** solid, liquid and gas
- B** solid and liquid only
- C** solid and gas only
- D** liquid and gas only

- 2** A container with a fixed shape is filled with gas and then sealed. The container is then heated.

Which changes take place?

- 1 The volume of gas decreases.
- 2 The gas molecules move faster.
- 3 The pressure inside the cylinder increases.

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

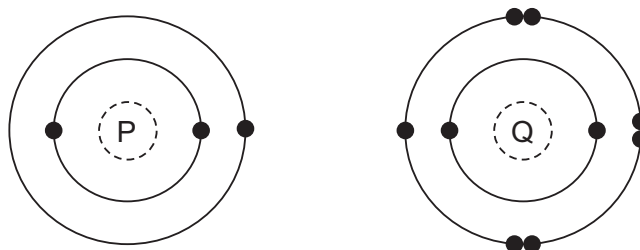
- 3** A crystal of sodium chloride is dropped into a beaker of water.

Over time, the sodium chloride particles become evenly distributed throughout the water.

Which processes occur in this experiment?

- A** both dissolving and diffusion
- B** dissolving only
- C** diffusion only
- D** neither dissolving nor diffusion

- 4 The electronic structures of two atoms, P and Q, are shown.



P and Q combine together to form a compound.

What is the type of bonding in the compound, and what is the formula of the compound?

	type of bonding	formula
A	covalent	PQ_2
B	covalent	PQ
C	ionic	PQ
D	ionic	PQ_2

- 5 The electronic configuration of an ion is 2,8,8.

What could this ion be?

	S^{2-}	Ca^{2+}
A	✓	✓
B	✓	✗
C	✗	✓
D	✗	✗

key

✓ = yes

✗ = no

- 6 The table shows the nucleon number and the number of neutrons in one atom of isotopes W, X, Y and Z.

isotope	nucleon number	number of neutrons
W	35	18
X	37	20
Y	39	20
Z	40	22

Which statement about W, X, Y and Z is correct?

- A** W and X are isotopes of the same element.
- B** X and Y are isotopes of elements in the same group of the Periodic Table.
- C** Y and Z are isotopes of elements in the same period of the Periodic Table.
- D** Z has a higher proton number than Y.
- 7 Which statement about an ionic bond is correct?
- A** It is a strong electrostatic attraction between cations and anions.
- B** It is a strong electrostatic attraction between protons and electrons.
- C** It is a weak electrostatic attraction between cations and anions.
- D** It is a weak electrostatic attraction between protons and electrons.
- 8 Which row describes simple molecular compounds?

	melting point	electrical conductivity when molten
A	high	good
B	high	poor
C	low	good
D	low	poor

- 9 Boron nitride is a compound of the elements boron and nitrogen.

It has a similar structure to diamond.

What is likely to be a property of boron nitride?

- A It conducts electricity.
- B It is soluble in water.
- C It is used as a lubricant.
- D It is very hard.

- 10 Which statement defines the term molecular formula?

- A a formula that shows the total number of atoms in a molecule
- B a formula that shows the total number of elements in a molecule
- C a formula that shows the arrangement of different atoms in a molecule
- D a formula that shows the number and type of different atoms in a molecule

- 11 What is the relative formula mass, M_r , of calcium hydroxide, $\text{Ca}(\text{OH})_2$?

- A 38 B 58 C 74 D 114

- 12 Which statements explain why metal objects are electroplated?

- 1 Electroplating improves the appearance of the object.
- 2 Electroplating insulates the metal object.
- 3 Electroplating makes the metal object more resistant to corrosion.
- 4 Electroplating makes the metal object softer.

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

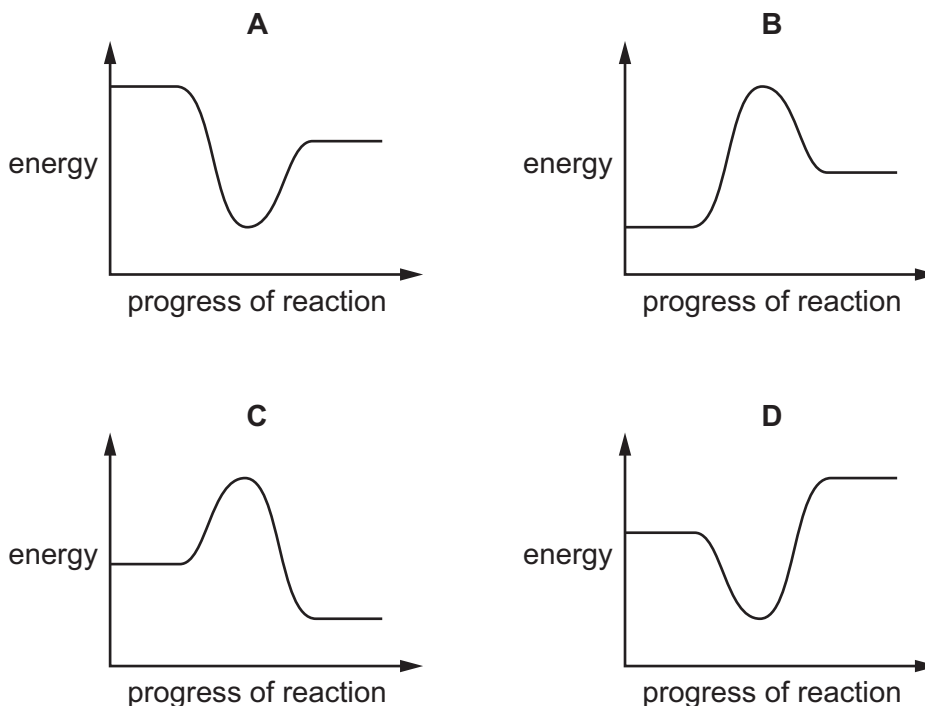
- 13 Three statements about a hydrogen–oxygen fuel cell are listed.

- 1 The overall equation for the reaction is $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$.
- 2 The hydrogen required comes from the air.
- 3 The waste gas causes respiratory problems.

Which statements are correct?

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

14 Which reaction pathway diagram represents an endothermic reaction?



15 Some physical and chemical changes are listed.

- 1 rusting of iron
- 2 condensing of steam
- 3 dissolving of sugar in water
- 4 cracking of alkanes

Which changes are physical changes?

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

16 Blue copper(II) sulfate crystals are heated in air until they turn into a white powder.

The powder is allowed to cool and after a few days it starts to turn blue.

Why does the white powder start to turn blue?

- A** Carbon dioxide in the air reacts with the powder to form copper(II) carbonate.
B The powder reacts with water in the air to form copper(II) hydroxide.
C The white copper compound is slowly oxidised.
D Water is absorbed from the air and causes the reaction to reverse.

- 17 Carbon reacts with silver oxide to form carbon dioxide and silver.

Which substance is reduced?

- A carbon
- B carbon dioxide
- C silver
- D silver oxide

- 18 Base Q dissolves in water to make aqueous Q.

Aqueous Q is tested with thymolphthalein.

Which row gives the colour of thymolphthalein in aqueous Q and the ion responsible for this colour?

	colour of thymolphthalein	ion
A	blue	H^+
B	colourless	H^+
C	blue	OH^-
D	colourless	OH^-

- 19 Solid calcium hydroxide is added to aqueous ammonium chloride and the mixture is warmed.

A gas is produced.

What is the name of the gas?

- A hydrogen
- B chlorine
- C carbon dioxide
- D ammonia

- 20 Elements L and M are in the same group of the Periodic Table.

Why do L and M have similar chemical properties?

- A They have the same number of electrons in the nucleus.
- B They have the same number of electrons in the outer shell.
- C They have the same number of neutrons in the nucleus.
- D They have the same number of neutrons in the outer shell.

21 The diagram shows elements W, X, Y and Z in a section of the Periodic Table.

[illegible]

Which statement about the reactivity of the elements is correct?

- A** X is more reactive than Y, and W is more reactive than Z.
- B** X is more reactive than Y, and Z is more reactive than W.
- C** Y is more reactive than X, and W is more reactive than Z.
- D** Y is more reactive than X, and Z is more reactive than W.

22 Which three compounds are all insoluble in water?

- A** ammonium carbonate, silver chloride and sodium sulfate
- B** barium sulfate, calcium chloride and magnesium hydroxide
- C** calcium nitrate, magnesium carbonate and lead(II) hydroxide
- D** calcium sulfate, magnesium hydroxide and silver chloride

23 18 carat gold contains 75% gold and 25% copper by mass.

Which statements about 18 carat gold are correct?

- 1 It is a mixture.
- 2 It is a compound.
- 3 It is an alloy.
- 4 It conducts electricity.

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

24 The properties of four metals, E, F, G and H, are shown.

E does **not** react with cold water, but reacts with steam.

F does **not** react with water or dilute acid, but the oxide of F is reduced by carbon.

The oxide of G is **not** reduced by carbon, but G reacts vigorously with cold water.

H does **not** react with water or steam, but reacts with dilute acid.

What is the order of reactivity of the metals starting with the most reactive?

	most reactive				least reactive
A	F	E	H		G
B	F	H	E		G
C	G	E	H		F
D	G	H	E		F

25 Four substances, or groups of substances, found in water from a natural source are listed.

- 1 some metal compounds
- 2 plastics
- 3 dissolved oxygen
- 4 nitrates and phosphates from fertilisers and detergents

Which substances found in water from a natural source can be beneficial to aquatic life?

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

26 Which element is used to remove tastes and odours in the treatment of the domestic water supply?

- A** chlorine
B carbon
C calcium
D copper

27 NPK fertilisers are mixtures of salts used to improve plant growth.

Which salt could be used as a component of an NPK fertiliser?

- A** sodium nitrate
- B** aluminium sulfate
- C** magnesium chloride
- D** calcium ethanoate

28 Plants produce glucose by photosynthesis.

What is essential for this process?

- 1 carbon dioxide
- 2 oxygen
- 3 light
- 4 water

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

29 Two reactions, M and N, both form carbon dioxide.



Which types of reaction are M and N?

	M	N
A	thermal decomposition	thermal decomposition
B	thermal decomposition	combustion
C	combustion	thermal decomposition
D	combustion	combustion

30 The molecular formulae of four compounds are shown.



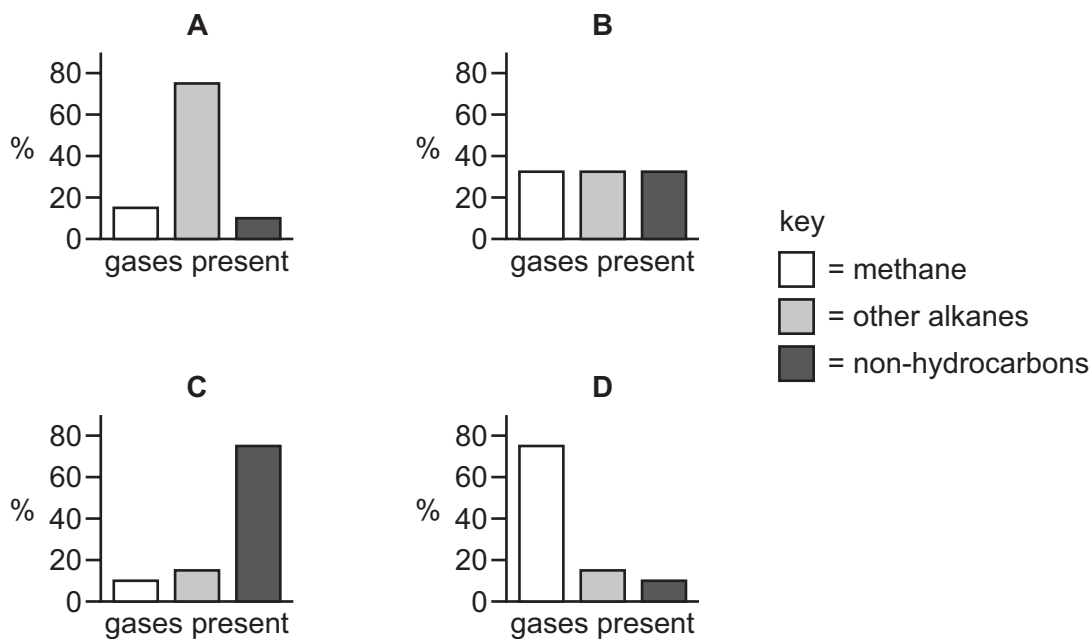
How many of these compounds are in the alkane homologous series?

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

31 Which type of reaction takes place when pentane reacts with chlorine?

- A polymerisation
- B addition
- C substitution
- D cracking

32 Which bar chart shows the percentage composition of natural gas?



33 Which statement about alcohols is correct?

- A Alcohols have the same functional group as carboxylic acids.
- B Ethanol is an alcohol that is formed by fermentation at 300 °C.
- C Ethanol is the alcohol produced in the addition reaction between ethene and hydrogen.
- D Water is produced from the combustion of alcohols.

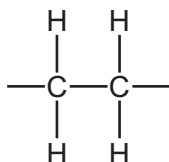
- 34 The equation shows the reaction between ethanoic acid and solid P to produce Q and hydrogen.



Which row identifies P and Q?

	P	Q
A	sodium	ethanol
B	sodium	sodium ethanoate
C	sodium oxide	ethanol
D	sodium oxide	sodium ethanoate

- 35 The diagram shows one repeat unit of a polymer.



Which row gives the name of the polymer and of the monomer used to make it?

	name of polymer	name of monomer
A	poly(ethane)	ethane
B	poly(ethane)	ethene
C	poly(ethene)	ethane
D	poly(ethene)	ethene

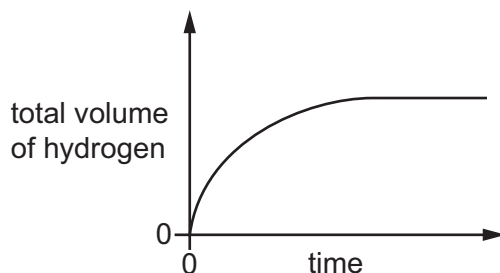
- 36 Some properties of a plastic pollutant are listed.

- 1 It is a poor conductor of electricity.
- 2 It does **not** react with water.
- 3 It is resistant to oxidation.
- 4 It has low density.

Which properties explain why this plastic is difficult to remove from the environment?

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

- 37 The graph shows the volume of hydrogen produced over time in a chemical reaction.



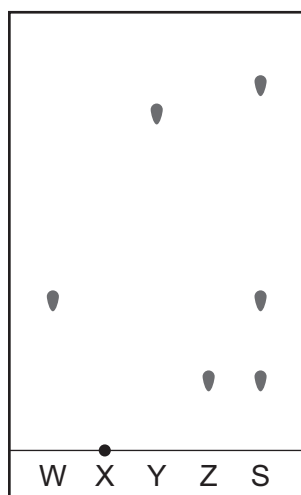
A student uses a stop-watch.

Which other item of apparatus is used to take measurements to produce this graph?

- A beaker
 - B gas syringe
 - C pipette
 - D test-tube
- 38 A student uses paper chromatography to identify the food dyes in a coloured sweet, S.

The student uses four known food dyes, W, X, Y, and Z, and ethanol as the solvent.

The chromatogram obtained is shown.



Which statements are correct?

- 1 S contains only two dyes.
- 2 X is insoluble in ethanol.
- 3 S contains Y and Z.
- 4 S contains W.

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

- 39** An aqueous cation reacts with aqueous sodium hydroxide to form a white precipitate.

The precipitate is insoluble in excess sodium hydroxide.

What is the aqueous cation?

- A** aluminium ion
 - B** calcium ion
 - C** chromium ion
 - D** zinc ion
- 40** A piece of damp red litmus paper is put into a test-tube of gas. The litmus paper turns white.
- Which gas is in the test-tube?
- A** ammonia
 - B** carbon dioxide
 - C** chlorine
 - D** oxygen

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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	
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