AQA

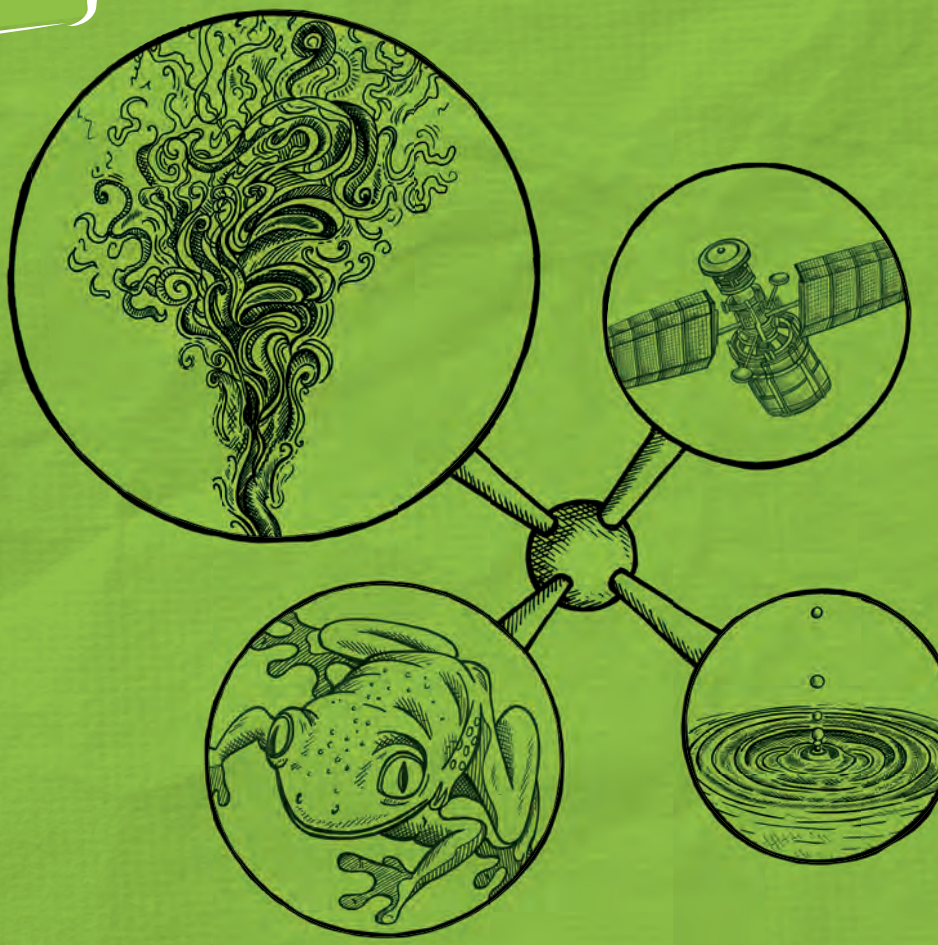
REVISE AQA GCSE (9–1)

Chemistry

REVISION WORKBOOK

Foundation

For the 9–1 exams



Pearson

AQA

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REVISION WORKBOOK

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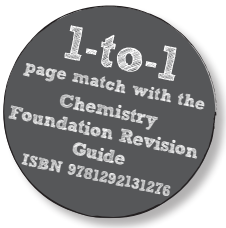


Contents

A small bit of small print:
AQA publishes Sample Assessment Material and the Specification on its website. This is the official content and this book should be used in conjunction with it. The questions in this book have been written to help you practise every topic in the book. Remember: the real exam questions may not look like this.

Elements, mixtures and compounds

Question 1 is an example of a multiple-choice question, in which you only need to tick the correct answer. There will be many multiple-choice questions on both of your papers.

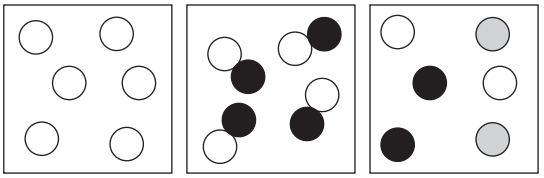
1 Which substance is an element?

Tick **one** box.

☐ air ☐ iron sulfide

☐ copper ☐ water **(1 mark)**

2 The diagram shows particles present in three different substances. Circles represent atoms and different colours represent different elements.



A B C

(a) Which box, A, B or C, represents a mixture of different elements? ..... **(1 mark)**

(b) Which box, A, B or C, represents an element? ..... **(1 mark)**

3 What is a compound?

Tick **one** box.

☐ a substance made up of only one element

☐ a substance made up of two or more elements chemically joined together

☐ a substance made up of only metallic elements chemically joined together

☐ a substance made up of two or more elements physically mixed in a fixed ratio **(1 mark)**

4 Some symbols and formulae are given in the box below.

NaOH	Al_2O_3	H_2O	Na	S	NH_3	CO

Write a formula or symbol from the box for:

(a) a metallic element ..... **(1 mark)**

(b) a compound containing four atoms ..... **(1 mark)**

(c) a compound containing three different elements ..... **(1 mark)**

5 When a mixture of the elements iron and sulfur is heated, a compound is formed.

(a) Name the compound formed. ..... **(1 mark)**

Guided

(b) Describe the difference between an element and a compound in terms of the atoms they contain.

An element contains one type of atom only. A compound .....

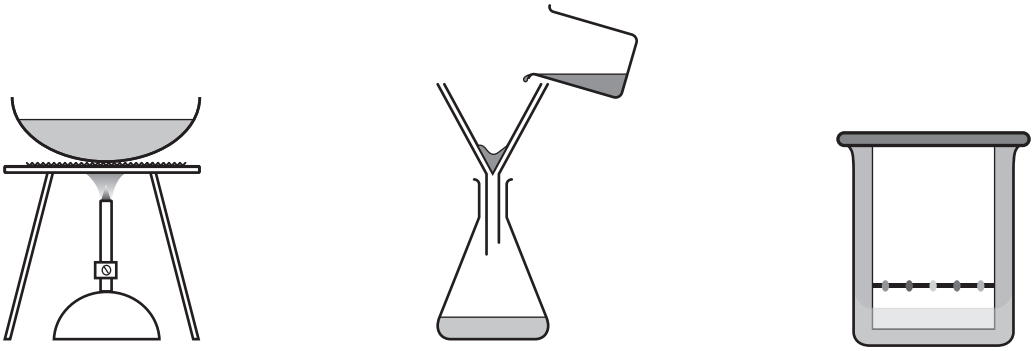
.....

..... **(2 marks)**

Practical skills

Filtration, crystallisation and chromatography

1 The diagram shows some different apparatus used to separate mixtures.



A B C

(a) Name the methods of separation that could be carried out using the apparatus in A, B and C.

A .....

B .....

C ..... **(3 marks)**

Remember: 15% of the marks for your GCSE are for questions on practical work.

(b) Choose the most suitable apparatus (A, B or C shown in the diagram) for separating:

(i) sand from a mixture of sand and water ..... **(1 mark)**

(ii) copper sulfate crystals from a copper sulfate solution ..... **(1 mark)**

(iii) copper carbonate from a suspension of insoluble copper carbonate and water ..... **(1 mark)**

(iv) the different dyes in black ink ..... **(1 mark)**

Guided

2 Rock salt is a mixture of insoluble sand and a soluble salt, sodium chloride.

Insoluble means the solid does not dissolve.

The steps needed to separate sodium chloride from rock salt are shown in the box. They are not in order.

filtration	crystallisation/evaporation	addition of water	heating and stirring

Place the steps in the order in which they must be carried out in the experiment.
Give a reason for each step.

step 1 addition of water.....

reason to dissolve the sodium chloride .....

step 2 .....

reason .....

step 3 .....

reason .....

step 4 .....

reason ..... **(5 marks)**

Practical skills

Distillation

Guided

1 What is the best method to get water from a salt solution?

Tick **one** box.

☐ crystallisation ☐ evaporation

☐ distillation ☐ filtration **(1 mark)**

More than one of the methods can be used to obtain salt from a salt solution, but one method is much quicker than the others.

2 Ethanol and water mix together completely. Ethanol and water have different boiling points.

(a) What is the boiling point of water?

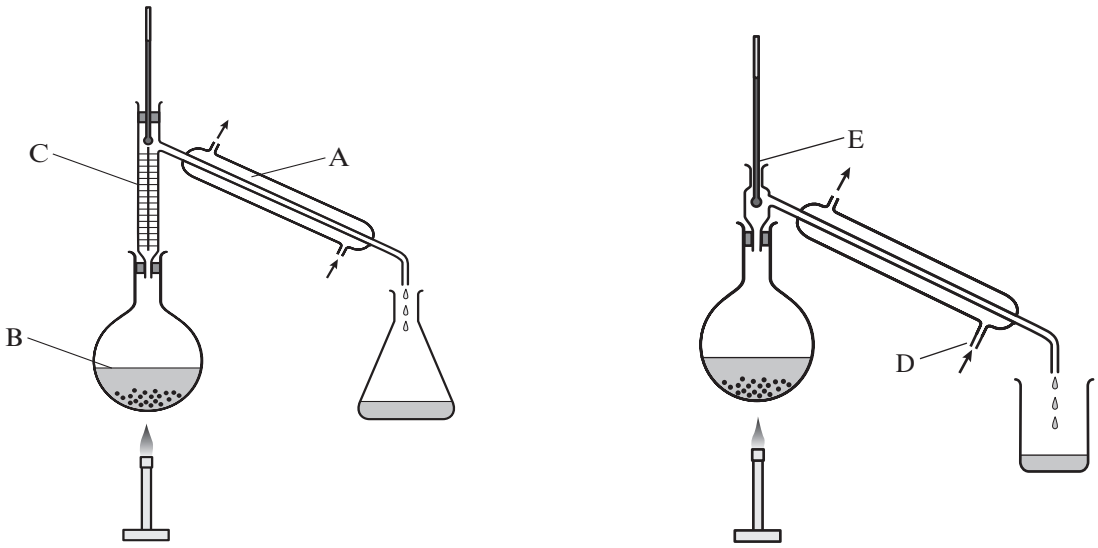
..... **(1 mark)**

(b) Name a method of separation used to separate a mixture of ethanol and water.

..... **(1 mark)**

Think about which method is used to separate a mixture of liquids.

3 Two separation techniques are shown below. The diagrams are not labelled.



(a) What is the name of the technique carried out using the apparatus on the left?

..... **(1 mark)**

(b) What is the purpose of the piece of apparatus labelled **A**?

..... **(1 mark)**

(c) What change of state happens at **B**?

..... **(1 mark)**

(d) No labels have been included in the diagrams. Name the labels that should be placed at:

C ..... **E** .....

D .....

(3 marks)

Practical skills It is important that you know how to label diagrams for all methods of separation.

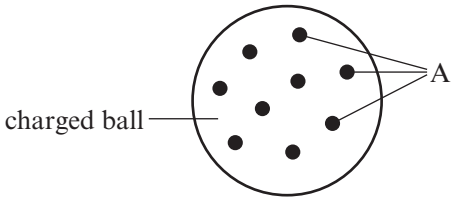
(e) Name a different way of heating the apparatus shown in the diagrams.

..... **(1 mark)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Historical models of the atom

1 The 'plum pudding' model of an atom, as shown below, suggested that the atom was a charged ball.



(a) What type of charge was thought to be on the ball in the plum pudding model?

..... **(1 mark)**

(b) Name particle A in the diagram.

..... **(1 mark)**

Guided

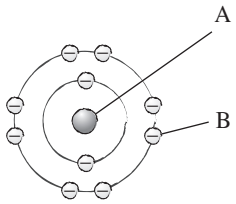
(c) New evidence about atoms meant that the nuclear model has now replaced the plum pudding model. Describe the nuclear model of an atom.

The atom has a nucleus which contains .....

.....

..... **(2 marks)**

2 The diagram shows Bohr's model of an atom.



(a) What is the name for the part of the atom labelled A?

..... **(1 mark)**

(b) What is the charge of the part of the atom labelled A?

..... **(1 mark)**

Remember one particle had not been discovered at the time of Bohr's model.

(c) Name the type of particle found in A.

..... **(1 mark)**

(d) What is the name for the particle labelled B?

..... **(1 mark)**

3 Which scientist discovered the neutron?

Tick **one** box.

☐ Bohr ☐ Einstein

☐ Chadwick ☐ Rutherford **(1 mark)**

Particles in an atom

1 (a) What is the symbol for the element calcium? Use the periodic table on page 116 to help you answer this question.

.....

(1 mark)

(b) What is the atomic number of calcium?

.....

(1 mark)

2 An atom of sodium has an atomic number of 11 and a mass number of 23.

(a) Define mass number.

..... **(1 mark)**

(b) In terms of sub-atomic particles, why has a sodium atom no overall charge?

.....

..... **(1 mark)**

(c) Give the number of protons, neutrons and electrons in this atom of sodium.

number of protons .....

number of neutrons .....

number of electrons ..... **(3 marks)**

Remember for an atom the number of protons equals the number of electrons.
To find the number of neutrons subtract the atomic number from the mass number.

(d) Name the two sub-atomic particles found in the nucleus of a sodium atom.

..... **(1 mark)**

3 (a) Complete the table below to give the number of protons, neutrons and electrons in each of four different atoms, A, B, C and D.

Atom	Atomic number	Mass number	Number of electrons	Number of neutrons	Number of protons
A	27	59	27	59 − 27 = 32	27
B	28	59			
C	13	27			
D	19	39			

(4 marks)

Guided

(b) Use the periodic table on page 116 to give the name of each atom.

A cobalt .....

B .....

C .....

D ..... **(4 marks)**

The atomic number identifies an atom. For A the atomic number is 27, which is cobalt.

Had a go ☐ Nearly there ☐ Nailed it! ☐

Atomic structure and isotopes

1 An atom of potassium has the symbol $^{39}_{19}K$.

(a) Complete the table to show the relative mass and charge of each particle present in a potassium atom.

Particle	Relative mass	Relative charge
electron		
neutron		
proton		

(3 marks)

Remember that number of protons = number of electrons. Remember also that number of neutrons =mass number minus atomic number.

(b) Give the number of protons, neutrons and electrons in this atom of potassium.

number of protons .....

number of neutrons .....

number of electrons ..... **(3 marks)**

(c) State the approximate radius of a potassium atom.

Give your answer in metres.

..... **(1 mark)**

(d) Another atom of potassium has the symbol $^{41}_{19}K$. Explain why atoms of $^{41}_{19}K$ and $^{39}_{19}K$ are isotopes.

.....

..... **(2 marks)**

2 Carbon has two naturally occurring isotopes, ^{12}C and ^{13}C.

(a) Why are ^{12}C and ^{13}C isotopes?

Tick **one** box.

☐ They are atoms of the same element with a different number of electrons.

☐ They are atoms with the same atomic number and a different number of neutrons.

☐ They are atoms with a different atomic number and a different number of neutrons.

☐ They are atoms of the same element with a different number of protons. **(1 mark)**

Guided

(b) Use the information about the two isotopes of carbon in the table below to calculate the relative atomic mass of carbon to one decimal place.

Mass number	12	13
Abundance	99	1

Maths skills Remember, when rounding to one decimal place, if the second decimal place number is five or more, round up.

$$\text{relative atomic mass} = \frac{(\text{mass number isotope 1} \times \text{abundance}) + (\text{mass number isotope 2} \times \text{abundance})}{\text{total abundance}}$$

$$= \frac{(12 \times 99) + \ldots\ldots}{(99 + 1)} = \ldots\ldots$$ **(2 marks)**

Electronic structure

1 Which element has an electronic structure of 2,5?

Tick **one** box.

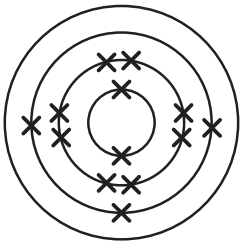
☐ oxygen ☐ nitrogen ☐ silicon ☐ sulfur

(1 mark)

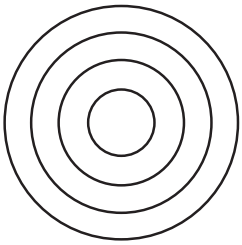
2 Complete the energy level (shell) diagrams for the elements with the following number of electrons.

Guided

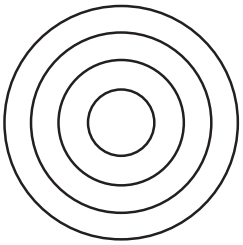
13 electrons



17 electrons



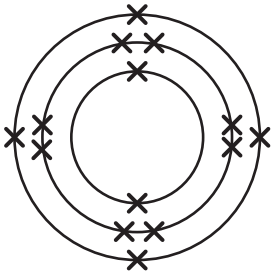
20 electrons



(3 marks)

3 Use the periodic table on page 116 to help you answer this question.

The diagram shows the electron structure of the atoms of an element.



To find the number of neutrons, you need to get the mass number from the periodic table and subtract the atomic number from it.

(a) What is the name and atomic number of this element?

..... **(2 marks)**

(b) State the number of protons and electrons in the atoms of this element.

..... **(1 mark)**

(c) What other information is needed to allow us to work out the number of neutrons in the nucleus of the atoms?

..... **(1 mark)**

4 The electronic structure of magnesium can be written as 2,8,2. Write the electronic structures for the following elements in the same way.

(a) potassium ..... **(1 mark)**

(b) phosphorus ..... **(1 mark)**

(c) calcium ..... **(1 mark)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Development of the periodic table

1 Below is part of Mendeleev's periodic table. Mendeleev left gaps in the table, marked by an asterisk (*).

H						
Li	Be	B	C	N	O	F
Na	Mg	Al	Si	P	S	Cl
K Cu	Ca Zn	* *	Ti *	V As	Cr Se	Mn Br
Rb Ag	Sr Cd	Y In	Zr Sn	Nb Sb	Mo Te	* I

(a) How many groups are in Mendeleev's periodic table?

..... **(1 mark)**

(b) Name a group in the modern periodic table which is not present in Mendeleev's periodic table.

..... **(1 mark)**

(c) State a difference between group 1 in Mendeleev's periodic table and group 1 in the modern periodic table.

..... **(1 mark)**

(d) State two differences between Mendeleev's periodic table and the modern periodic table.

.....

..... **(2 marks)**

(e) The element in the fourth column marked by an asterisk (*) has the atomic number 32. Name this element.

Each element in the periodic table has two numbers; the atomic number is the smaller one of the two. On the periodic table on page 116 find the element which has the atomic number 32.

..... **(1 mark)**

(f) Complete the sentence below by choosing the two most appropriate words from the list.

allotropes	**isotopes**	**number**	**protons**	**mass**	**weight**

The order of elements in Mendeleev's table is similar but not the same as in the modern periodic table.

The modern periodic table is organised in order of atomic number.

Knowledge of ..... made it possible to explain why the order based on atomic ..... was not always correct. **(2 marks)**

2 Mendeleev listed the elements in his periodic table in an order. Which property did he use to list the elements?

Tick **one** box.

☐ atomic number ☐ mass number

☐ atomic weight ☐ number of neutrons **(1 mark)**

The modern periodic table

1 The periodic table contains metals and non-metals.

(a) Classify the elements below as metals or non-metals.

barium .....

potassium .....

phosphorus ..... **(3 marks)**

(b) Name a metal which is a liquid at room temperature.

..... **(1 mark)**

(c) Use the periodic table to help you complete the table.

Element	Group number	Number of electrons in outer shell
calcium		
fluorine		

(4 marks)

2 How are elements arranged in the modern periodic table?

Tick **one** box.

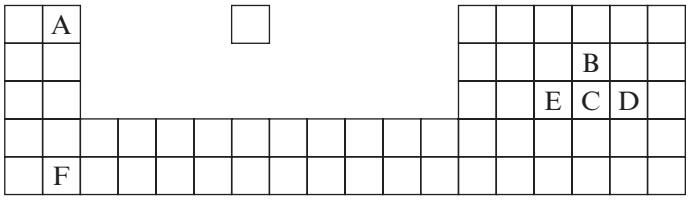
☐ by increasing atomic number

☐ by increasing mass number

☐ by increasing number of neutrons

☐ by increasing reactivity **(1 mark)**

3 The diagram shows the position of six different elements in the periodic table. The letters do not represent the symbols for the elements.



Use the letters in the diagram to answer the questions below.

(a) Identify **two** metals with the same number of electrons in the outer shell of their atoms.

Remember that metals are found on the left of the periodic table.

..... **(1 mark)**

(b) Identify a halogen.

..... **(1 mark)**

(c) Identify a non-metal that has five electrons in the outer shell of its atoms.

..... **(1 mark)**

4 Group 3 of the periodic table contains the elements boron, aluminium and gallium.

(a) Why do these three elements have similar chemical properties?

..... **(1 mark)**

Guided

(b) Which of boron, aluminium and gallium has the lowest number of protons in the nucleus?

The element with the smallest atomic number is .....

The atomic number gives the number of protons, so the element with the lowest number of protons is ..... **(1 mark)**

Group 0

1 Neon is a noble gas. The atomic number of neon is 10.

(a) Write the electronic structure of neon.

..... **(1 mark)**

(b) Use your answer to (a) to explain why neon is unreactive.

..... **(1 mark)**

2 Which of the electronic structures below is the structure of an atom of a noble gas?

Tick **one** box.

☐ 2 ☐ 2,2 ☐ 2,8,2 ☐ 2,8,7 **(1 mark)**

3 The table below shows some properties of the noble gases.

Element	Boiling point in °C	Density in g/dm^3	Relative atomic mass
helium	−269	0.2	4
neon	−246	0.9	20
argon	−190		40
krypton		3.8	84
xenon	−111	5.9	131

(a) What is the group number of the noble gases?

..... **(1 mark)**

(b) Predict the boiling point of krypton.

..... **(1 mark)**

(c) What is the relationship between boiling point and relative atomic mass?

.....

..... **(1 mark)**

(d) Estimate the density of argon.

Look at the general trend in density. You are asked for an estimate, so a value halfway between 0.9 and 3.8 is a good idea.

..... **(1 mark)**

(e) Write the electronic structures of helium and neon.

..... **(2 marks)**

4 Why do the atoms of noble gases not easily form molecules?

Guided

Tick **one** box.

☐ ~~They all have 8 electrons in their outer shell.~~

☐ They have a full outer shell and are stable.

☐ They only form covalent bonds.

☐ Their reactivity decreases down the group. **(1 mark)**

The first answer in this guided question has been crossed out. This is because it is untrue – helium is a noble gas and it has only 2 electrons in its outer shell.

Group 1

1 Some of the elements of group 1 are listed below.

lithium	sodium	potassium	rubidium

(a) Which metal is the most reactive?

..... **(1 mark)**

(b) Which metal reacts with oxygen to give K_2O?

..... **(1 mark)**

(c) Which metal has the electronic structure 2,8,1?

..... **(1 mark)**

2 Two elements in group 1 of the periodic table are lithium and potassium.

(a) Explain why lithium and potassium are both in group 1 of the periodic table. Your answer should be in terms of their electronic structures.

.....

..... **(1 mark)**

(b) Very small pieces of lithium and potassium are separately allowed to react with water.

(i) Describe the similarities and differences in what is observed.

.....

.....

.....

.....

.....

..... **(4 marks)**

(ii) Name the products for the reaction of potassium with water.

..... **(2 marks)**

3 Sodium is a group 1 metal that reacts with non-metals.

(a) Complete the word equations for some reactions of sodium.

sodium + chlorine → .....

sodium + oxygen → ..... **(2 marks)**

Guided

(b) Sodium reacts with water to produce sodium hydroxide and hydrogen.

(i) Balance the equation for this reaction.

.....Na + ...H_2O → ..2NaOH + H_2 **(1 mark)**

(ii) Name the ion which makes the final solution alkaline.

..... **(1 mark)**

First a 2 is placed in front of the NaOH. Now there are two oxygens on the right of the equation. Balance the oxygen on the left – you must put a number in front of the H_2O. Then balance the Na.

Group 7

1 What is the name for group 7 in the periodic table?

Tick **one** box.

☐ alkali metals ☐ noble gases

☐ halogens ☐ transition metals

(1 mark)

2 Group 7 elements react with group 1 metals such as sodium and potassium.

(a) Write a word equation for the reaction of sodium with bromine.

..... **(1 mark)**

(b) How many electrons are in the outer shell of bromine?

> Remember, you do not need to the write electronic structure for this – the group number is all that you need.

..... **(1 mark)**

(c) Balance the equation for the reaction of potassium with chlorine.

..... K + Cl_2 → ..... KCl **(1 mark)**

(d) Name the product KCl.

..... **(1 mark)**

3 The table shows the results of adding halogens to solutions of halide ions.

Halogen	Sodium chloride solution	Sodium bromide solution	Sodium iodide solution
chlorine		orange solution produced	brown solution produced
bromine	no reaction		brown solution produced
iodine	no reaction	no reaction	

Guided

(a) Explain why there is no reaction between sodium chloride and bromine.

Reactivity decreases down the group and so bromine is less reactive than .....

.....

..... **(2 marks)**

(b) Complete the word equation for the reaction between chlorine and sodium iodide.

chlorine + sodium iodide → ..... **(1 mark)**

(c) State the name of the type of reaction in (b).

..... **(1 mark)**

(d) What does the information in the table show about the trend in reactivity of the halogens?

.....

..... **(1 mark)**

Transition metals

1 Which element is a transition metal?

Tick **one** box.

☐ aluminium ☐ chromium

☐ calcium ☐ lead

(1 mark)

2 Iron is used as a catalyst in the production of ammonia. Iron can form iron(II) ions (Fe^{2+}) and iron(III) ions (Fe^{3+}). Both of these ions have different colours in solution.

Guided

(a) State three pieces of information that show that iron is a transition metal.

Like all transition metals iron is a catalyst, ...

.....

..... **(3 marks)**

(b) Work out the formula of iron(II) oxide and iron(III) oxide.

Oxide ions have the formula O^{2-}.

iron(II) oxide .....

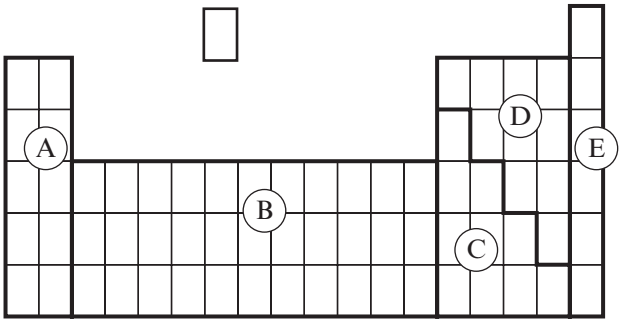
iron(III) oxide ..... **(2 marks)**

3 Tick (✓) true or false for each of the following general statements comparing the properties of transition metals with alkali metals.

Statements	True	False
Alkali metals have higher densities than transition metals.		
Transition metals are stronger than alkali metals.		
Alkali metals are harder than transition metals.		
Transition metals are more reactive than alkali metals.		

(4 marks)

4 This question refers to the elements in the different blocks of the periodic table shown below.



Which of the blocks A to E contain:

(a) mostly non-metals? ..... **(1 mark)**

(b) the group of elements that usually form ions with a 1+ charge? ..... **(1 mark)**

(c) metals that are often used as catalysts? ..... **(1 mark)**

(d) the most unreactive elements? ..... **(1 mark)**

Chemical equations

1 Complete the word equations.

(a) potassium + chlorine → .....

(b) magnesium + oxygen → .....

(c) hydrogen + bromine → .....

(d) copper + oxygen → ..... **(4 marks)**

Guided

2 The chemical equation for the reaction between methane and oxygen is shown below.

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$

(a) Describe this reaction between methane and oxygen in terms of the names of the substances and the number of molecules involved.

One molecule of methane reacts.....

..... **(2 marks)**

(b) When 4 g of methane burns, 11 g of carbon dioxide and 9 g of water are produced.

What mass of oxygen was needed to react with the 4 g of methane?

mass of products = 11 + 9

= 20 g

mass of oxygen = ... g **(1 mark)**

Remember: no atoms are gained or lost during a chemical reaction, so the total mass of reactants used up will always equal the total mass of products formed.

3 Balance the following equations.

(a) ….. Mg + ….. O_2 → ….. MgO **(1 mark)**

(b) ….. HCl + …. Ca → ….. $CaCl_2$ + …. H_2 **(1 mark)**

(c) ….. N_2 + …… H_2 → ….. NH_3 **(1 mark)**

(d) ….. SO_2 + ….. O_2 → ….. SO_3 **(1 mark)**

(e) ….. H_2 + ….. F_2 → ….. HF **(1 mark)**

4 Sodium metal burns in oxygen to form sodium oxide.

..... Na + O_2 → ..... Na_2O

(a) Balance the above symbol equation for the reaction of sodium and oxygen. **(2 marks)**

(b) Potassium burns in oxygen in a similar way to sodium.

Write a balanced symbol equation for the reaction of potassium and oxygen.

..... **(2 marks)**

Remember that oxygen is diatomic. Work out the formula of potassium oxide first.

5 $C_2H_5OH + yO_2 \rightarrow 2CO_2 + 3H_2O$

What is the value of *y* in the equation above?

Tick **one** box.

☐ 2 ☐ 3 ☐ 3½ ☐ 6 **(1 mark)**

Extended response – Atomic structure

Compare the chemical and physical properties of the alkali metals with those of the transition metals.

The question asks you to compare, so make sure you do this, by considering properties that are the same and properties that are different. In your answers, use statements like 'The alkali metals …, but the transition metals…'. Try to compare chemical properties such as reactions with water, and the charges on the ions formed, and physical properties such as melting point, hardness and density.

.... **(6 marks)**

Check your answer and make sure you have fully answered the question. It is a good idea to tick the parts of the question you have done, so you do not leave points out.

Had a go ☐ Nearly there ☐ Nailed it! ☐

Forming bonds

1 What holds the ions in sodium chloride together?

Tick **one** box.

☐ covalent bonds ☐ metallic bonds

☐ electrostatic forces ☐ magnetic forces **(1 mark)**

2 (a) Complete the table by inserting each of the elements listed below into the correct column.

Guided

chlorine	oxygen	hydrogen	calcium	magnesium	sulfur	nitrogen

Metal	Non-metal
	chlorine

Find chlorine on the periodic table on page 116 – it is on the right of the periodic table so it is a non-metal. Now find oxygen on the periodic table.

(2 marks)

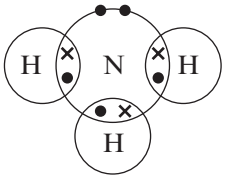
Ionic bonding occurs in compounds formed from metals combined with non-metals. Covalent bonding occurs in most non-metal elements and compounds.

(b) Complete the table by ticking (✓) the correct type of bonding in the compound.

Compound	Ionic bonding	Covalent bonding
calcium oxide	✓	
hydrogen chloride		
hydrogen sulfide		
magnesium chloride		

(4 marks)

3 The diagram shows the bonding in a compound of nitrogen and hydrogen.



(a) Write the formula of the compound shown in the diagram.

.....

(1 mark)

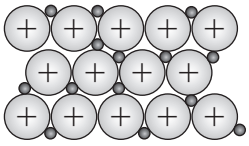
(b) Name and describe the type of bonding shown in the diagram.

.....

.....

(2 marks)

(c) What type of bonding is represented in the diagram to the right?



.....

(1 mark)

4 Which pair of elements forms a covalent compound?

Tick **one** box.

☐ lithium and chlorine ☐ nitrogen and hydrogen

☐ magnesium and oxygen ☐ potassium and bromine **(1 mark)**

Ionic bonding

1 What is the charge on an oxide ion?

Oxygen has atomic number 8 so its electronic structure is 2,6. Now work out how many electrons it needs to lose or gain to obtain a full outer shell.

Tick **one** box.

☐ 1– ☐ 2–

☐ 1+ ☐ 2+ **(1 mark)**

2 (a) Write the electronic structure of a sodium atom.

..... **(1 mark)**

(b) Write the electronic structure of a sodium ion.

..... **(1 mark)**

3 What happens when calcium reacts with chlorine to form calcium chloride?

Tick **one** box.

☐ Each chlorine atom loses one electron.

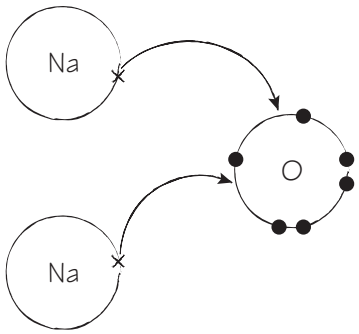
☐ Each chlorine atom gains one electron.

☐ Each calcium atom gains one electron.

☐ Each calcium atom gains two electrons. **(1 mark)**

4 Sodium forms an ionic compound with oxygen. Describe what happens when two atoms of sodium react with one atom of oxygen. Give the formulae of the ions formed.

Guided



You need to work out the number of electrons in the outer shell of each atom, and think about their transfer, as shown in the diagram. Then describe in words where the electrons transfer from and to, and how many electrons are involved.

Two sodium atoms each lose .....

.....

.....

.....

.....

.....

.....

.....

.....

..... **(5 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Giant ionic lattices

1 Sodium chloride is an ionic compound. Tick (✓) two properties of ionic compounds.

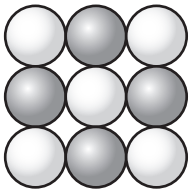
Property	Tick
usually dissolve in water	
high melting point	
low boiling point	
never conduct electricity	

(2 marks)

2 What surrounds each sodium ion in a sodium chloride crystal?

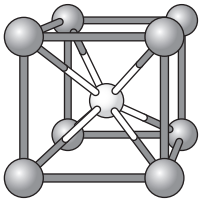
Tick **one** box.

- ☐ one chloride ion
- ☐ two chloride ions
- ☐ four chloride ions
- ☐ six chloride ions



(1 mark)

3 The structure of caesium chloride can be represented using the ball-and-stick model shown in the diagram.



(a) What type of bonding is found in caesium chloride?

..... **(1 mark)**

(b) What is the name for this type of structure?

..... **(1 mark)**

(c) The ball-and-stick model is not a good representation of an ionic compound.

Give one reason why.

Think about how the ions fit together in the crystal.

.....

..... **(1 mark)**

(d) What holds the ions together in caesium chloride?

.....

..... **(2 marks)**

Guided

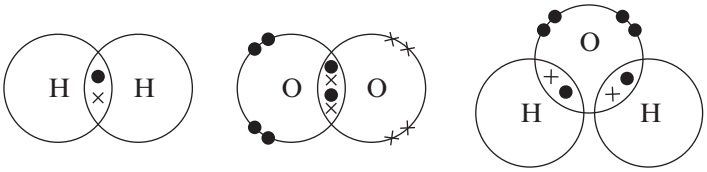
(e) Why does calcium chloride solid not conduct electricity?

The ions are held tightly in the .....

..... **(2 marks)**

Covalent bonding

1 The dot-and-cross diagrams of some molecules are shown below.



A B C

(a) Which substance, A, B or C, contains a double covalent bond?

..... **(1 mark)**

(b) Which substance, A, B or C, contains no lone pairs?

..... **(1 mark)**

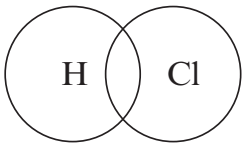
(c) Which substance, A, B or C, contains two lone pairs?

..... **(1 mark)**

(d) What is the name of substance C?

..... **(1 mark)**

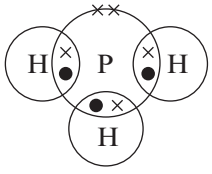
2 Complete the dot-and-cross diagram to show the bonding in a molecule of hydrogen chloride. Show the outer shell electrons only.



(2 marks)

3 A dot-and-cross diagram for the bonding in a molecule of the gas phosphine is shown below.

Remember that a lone pair is an unbonded pair of electrons and a covalent bond is a shared pair of electrons.



(a) Complete the diagram by labelling:

(i) a lone pair **(1 mark)**

(ii) a covalent bond. **(1 mark)**

(b) Give the formula of phosphine.

..... **(1 mark)**

(c) Is phosphine a compound or an element?

..... **(1 mark)**

(d) What is a covalent bond?

..... **(1 mark)**

Small molecules

1 Phosphine (PH_3) is a gas made of small molecules.

(a) Name the type of bonding in phosphine.

..... **(1 mark)**

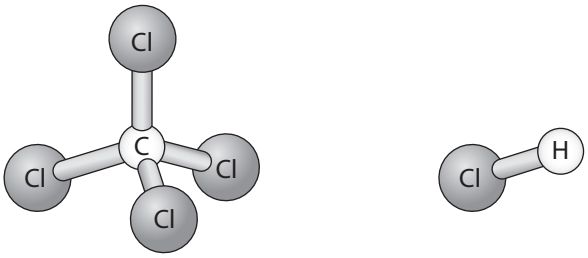
(b) Explain if phosphine conducts electricity.

To conduct electricity, free electrons or ions are needed to carry the charge. Are there any in phosphine?

.....

..... **(2 marks)**

2 The molecules of two chlorine compounds are shown below.



A B

(a) Write the molecular formula of the compound shown in:

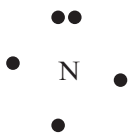
(i) A ..... **(1 mark)**

(ii) B ..... **(1 mark)**

(b) Draw a diagram of the compound in diagram A above. Use letters to represent the atoms and a line to represent each single bond.

(1 mark)

3 Complete the dot and cross diagram to represent the compound ammonia NH_3. Show outer electrons only and the hydrogen electrons as crosses.



Nitrogen has atomic number 7 and electronic structure 2,5. The 5 outer electrons of nitrogen are shown. Hydrogen has atomic number 1 and electronic structure 1. To complete NH_3, use the outer electron on each of the 3 hydrogen atoms so that nitrogen has a full outer shell of 8 electrons.

(1 mark)

4 Why does hydrogen chloride have a low boiling point?

Tick **one** box.

☐ It is covalently bonded.

☐ It is ionically bonded.

☐ The covalent bonds between the atoms are weak.

☐ The forces between the molecules are weak. **(1 mark)**