

Name:

Date:

C1 - Test 2
ATOMIC STRUCTURE
Beginner

GCSE

CHEMISTRY

AQA - Triple Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

1.

This question is about the periodic table.

Use the Chemistry Data Sheet to help you answer these questions.

(a) Complete the sentences.

Elements in the periodic table are arranged in order of atomic

_____.

The elements in Group _____ are called the noble gases.

(2)

(b) Calcium (Ca) is in Group 2.

Name **one** other element in Group 2.

(1)

(c) Draw a ring around the correct answer to complete each sentence.

(i) Sodium (Na) is

an alkali metal.
a non-metal.
a transition metal.

(1)

(ii) Nickel (Ni) is

an alkali metal.
a non-metal.
a transition metal.

(1)

(d) In 1869 Mendeleev produced his periodic table.

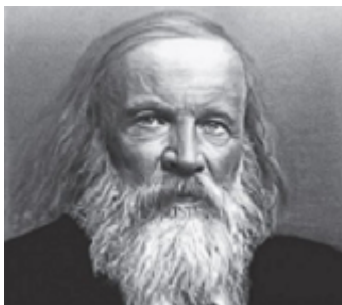
Why did Mendeleev leave gaps in his periodic table?

(1)

(Total 6 marks)

2.

By 1869, about 60 elements had been discovered. Mendeleev arranged these elements in a table, in order of their atomic weight. He put elements with similar chemical properties in the same column. Mendeleev and part of his table are shown below.



Column						
1	2	3	4	5	6	7
H						
Li	Be	B	C	N	O	F
Na	Mg	Al	Si	P	S	Cl

By unknown / неизвестен (here / здесь) [Public domain], via Wikimedia Commons

Use the periodic table on the Data Sheet to help you to answer these questions.

(a) Draw a ring around the correct answer to complete the sentence.

In the periodic table the columns are known as

groups.
periods.
rows.

(1)

(b) Suggest **one** reason why hydrogen should **not** have been put in column 1.

(1)

(c) In 1895, the first of a new family of elements was discovered. One of the new elements was called helium.

Where has this new family of elements been placed in the modern periodic table?

(1)

(d) Complete the sentence.

In the periodic table on your Data Sheet, the elements are arranged in order of their atomic _____ .

(1)

(Total 4 marks)

3.

The periodic table on the Data Sheet may help you to answer these questions.

(a) Part of the periodic table is shown below.

	A																		
F																			

The letters are **not** the symbols of the elements.

Choose your answers **only** from the letters shown in the periodic table above.

Which letter, **A**, **B**, **C**, **D**, **E** or **F**, represents

(i) aluminium

(1)

(ii) a Group 5 element

(1)

(iii) an alkali metal

(1)

(iv) the element with atomic (proton) number of 47

(1)

(v) an element with seven electrons in its outer shell?

(1)

(b) The table shows the boiling points of the Group 7 elements.

The elements are arranged in **alphabetical order**.

Group 7 element		
Name	Symbol	Boiling point in °C
Astatine	At	337
Bromine		58
Chlorine	Cl	-34
Fluorine	F	-188
Iodine	I	184

(i) The symbol for bromine is missing from the table.

What is the symbol for bromine? Symbol = _____

(1)

(ii) Arrange these elements in order of **decreasing** boiling point. The first one and the last one have been done for you.

At _____ _____ _____ F

Highest boiling point $\xrightarrow{\hspace{10em}}$ Lowest boiling point

(1)

(c) The table shows some statements about Group 7 elements.

Tick (✓) the **two** correct statements.

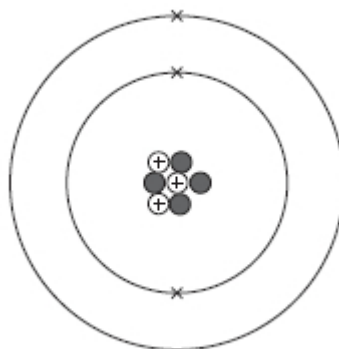
	Tick (✓)
They are halogens.	
They are metals.	
They become less reactive down Group 7.	
They are compounds.	

(2)
(Total 9 marks)

4.

This question is about atomic structure.

The figure below represents the structure of a lithium atom.



(a) Name the particle in the atom that has a positive charge.

(1)

(b) Name the particle in the atom that has the smallest mass.

(1)

(c) Complete the sentences.

Choose the answers from the box.

3	4	7	10
---	---	---	----

The mass number of the lithium atom is _____.

The number of neutrons in the lithium atom is _____.

(2)

(d) What are lithium atoms with different numbers of neutrons called?

Tick (✓) **one** box.

Compounds

Ions

Isotopes

Molecules

(1)

(e) Name the particle in the atom discovered by James Chadwick.

_____ .

(1)

(f) An element has two isotopes.

The table shows information about the isotopes.

	Mass number	Percentage (%) abundance
Isotope 1	10	20
Isotope 2	11	80

Calculate the relative atomic mass (A_r) of the element.

Use the equation:

$$A_r = \frac{(\text{mass number} \times \text{percentage}) \text{ of isotope 1} + (\text{mass number} \times \text{percentage}) \text{ of isotope 2}}{100}$$

Give your answer to 1 decimal place.

Relative atomic mass (A_r) = _____

(2)

(g) The radius of an atom is 0.2 nm

The radius of the nucleus is $\frac{1}{10000}$ the radius of the atom.

Calculate the radius of the nucleus.

Give your answer in standard form.

Radius = _____ nm

(2)

(Total 10 marks)

(ii) They arranged the elements in order of their

atomic weight
melting point
reactivity

(1)

(iii) They put elements in the same Group if they had similar

boiling points
chemical reactions
electrical conductivities

(1)

(iv) We now know that elements in the same Group have the same number of

electrons
neutrons
protons

in their outer shell (energy level).

(1)

(Total 8 marks)

6.

Group 7 is an important family of elements in the periodic table.

(a) (i) What name is given to the Group 7 elements?

Draw a ring around your answer.

Halogens

Noble gases

Transition elements

(1)

(ii) The grid shows some statements about Group 7 elements.

Tick (✓) the **two** correct statements.

Statement	(✓)
They are metals	
They consist of molecules	
They have coloured vapours	
They have high melting points	

(2)

(b) The table gives information about some of the Group 7 elements.

Name of element	Melting point in °C	Boiling point in °C	Electronic structure
Fluorine	-220	-188	2, 7
Chlorine	-101	-35	2, 8, 7
Bromine	-7	58	2, 8, 18, 7
Iodine	114	183	2, 8, 18, 18, 7

Use information from the table to help you to answer these questions.

Write the correct number in the box to complete the sentence.

(i) All these elements are in Group 7 because they have electrons in their outer shell.

(1)

(ii) Draw a ring around the correct word in the box to complete the sentence.

At 20 °C bromine is a

gas.
liquid.
solid.

(1)

(iii) Use the periodic table on the **Data Sheet** to name the Group 7 element that is **not** shown in the table.

(1)

(c) A student investigated the reactivity of three Group 7 elements.

The student added:

- aqueous chlorine to potassium bromide and potassium iodide solutions
- aqueous bromine to potassium chloride and potassium iodide solutions
- aqueous iodine to potassium chloride and potassium bromide solutions.

The student's results are shown in the table.

Solutions of	Potassium chloride	Potassium bromide	Potassium iodide
Chlorine		Solution turned orange-brown	Solution turned brown
Bromine	No change		Solution turned brown
Iodine	No change	No change	

Explain how these results show that chlorine is more reactive than bromine and iodine.

(2)
(Total 8 marks)

7.

(a) Use the periodic table on the Data Sheet to help you answer these questions.

Part of the periodic table is shown below.

The letters are **not** the symbols of the elements.

							A									
B												C				
							D								E	
													F			

Choose your answers **only** from the letters shown in the periodic table above.

Which letter, **A, B, C, D, E** or **F**, represents

(i) hydrogen

Letter

(1)

(ii) a Group 3 element

Letter

(1)

(iii) a halogen

Letter

(1)

(iv) the element with atomic (proton) number of 7

Letter

(1)

(v) an element with one electron in its outer shell?

Letter


(1)

(b) The table shows the melting points of the Group 1 metals arranged in alphabetical order.

Group 1 metal		
Name	Symbol	Melting point in °C
Caesium	Cs	29
Francium	Fr	27
Lithium	Li	180
Potassium	K	64
Rubidium	Rb	39
Sodium	Na	98

(i) Arrange these metals in order of increasing melting point. Three have been done for you.

Fr Cs _____ _____ _____ Li

Lowest  Highest

(1)

(ii) Use the periodic table on the Data Sheet **and** your answer in part (b)(i) above to complete this sentence about how the melting points change.

Going down Group 1, the melting points _____

(1)

- (c) The transition metals are a block of elements between Groups 2 and 3 of the periodic table. Transition metals have different properties to Group 1 metals.

Put ticks (✓) next to the **three** correct statements about transition metals in the table below.

Statement	(✓)
They are harder than Group 1 metals	
They have lower densities than Group 1 metals	
They have higher melting points than Group 1 metals	
They are more reactive with water than Group 1 metals	
They often form coloured compounds but Group 1 compounds are usually white	

(3)
(Total 10 marks)

8.

This question is about atoms and molecules.

(a) In the diagrams below:

(N) is a nitrogen atom

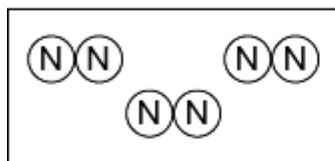
(O) is an oxygen atom

(C) is a carbon atom.

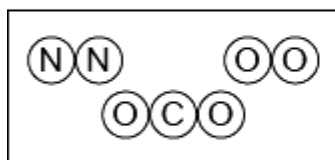
Draw **one** line from each diagram to its correct description.
One line has been done for you.

Diagram

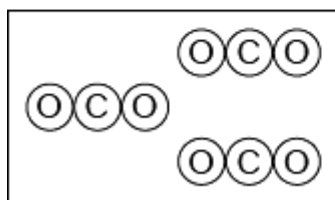
Description



Compound



Element



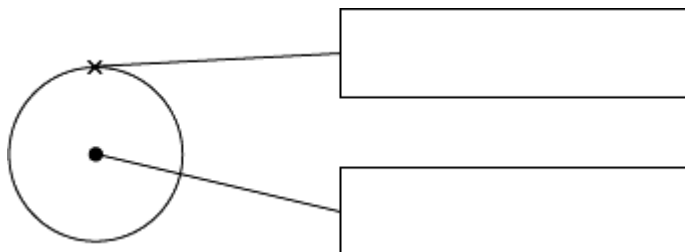
Mixture

Polymer

(2)

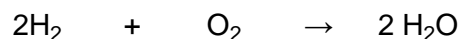
- (b) The diagram below shows a hydrogen atom.
Use words from the box to write the correct labels on the diagram.

alloy	electron	group	nucleus
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(2)

- (c) This chemical equation represents the reaction of hydrogen burning.



Complete the sentence to describe what is happening in this chemical reaction.

Hydrogen reacts with _____

(2)

(Total 6 marks)

9.

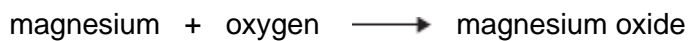
Magnesium burns in oxygen.



By Kingsway School [CC BY 2.0],
via Flickr

(a) Use the Chemistry Data Sheet to help you to answer this question.

The word equation for magnesium burning is:

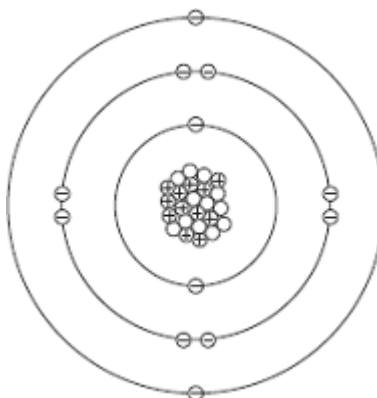


Draw **one** line from each substance to its correct description.

Substance	Description
magnesium	compound
magnesium oxide	metal
oxygen	mixture
	non-metal

(3)

(b) The diagram represents a magnesium atom.



Complete the table to show the name of each particle and the charge of each particle in the magnesium atom.

Name of particle	Charge
proton	+1
neutron	_____
_____	-1

(2)

(c) Use the Chemistry Data Sheet to help you to answer these questions.

Draw a ring around the correct answer to complete each sentence.

(i) In a magnesium atom, the protons and neutrons are in the

core.
nucleus.
shell.

(1)

(ii) The number of protons in a magnesium atom is the

atomic number
mass number.
group number.

(1)

(iii) The sum of the protons and neutrons in a magnesium

atom is the

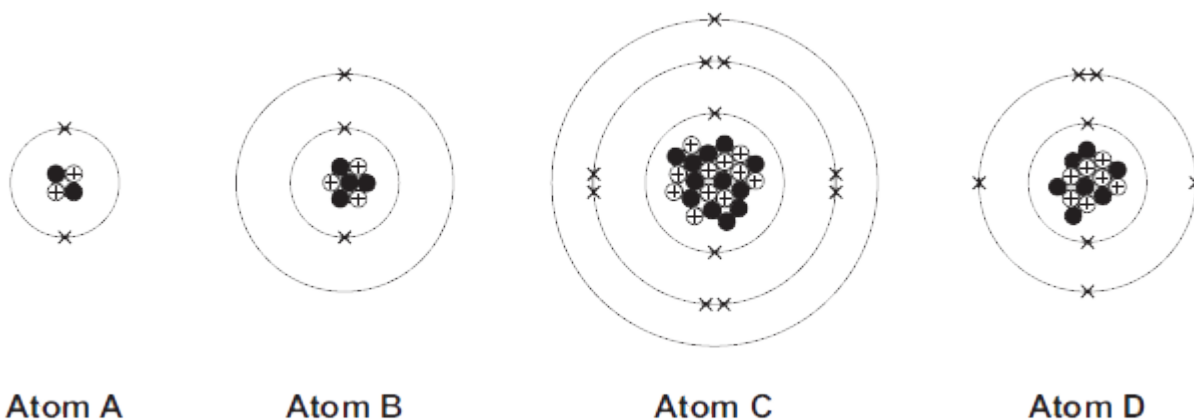
atomic number.
mass number.
group number.

(1)

(Total 8 marks)

10.

The diagrams show the sub-atomic particles in four different atoms.



Use the Chemistry Data Sheet to help you to answer these questions.

(a) Draw a ring around the correct answer to complete each sentence.

(i) The centre of each atom is called the

energy level.
molecule.
nucleus.

(1)

(ii) The centre of each atom contains neutrons and

bonds.
electrons.
protons.

(1)

(b) Complete the sentence.

There is no overall electrical charge on each atom because the
number of _____ is equal to the number of _____

(1)

(c) What is the name of the element represented by atom **D**? _____

(1)

(d) Which **two** of the atoms, **A**, **B**, **C** and **D**, are in the same group of the periodic table?

Give a reason for your answer.

Atom and atom

Reason _____

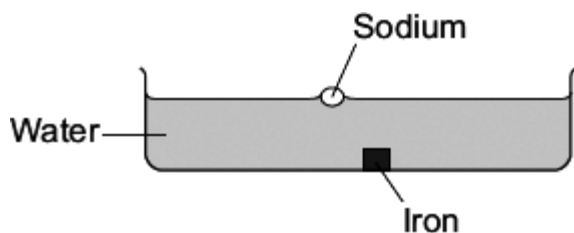
(2)

(Total 6 marks)

11.

How a metal is used depends on its properties.

A teacher demonstrated some of the properties of sodium (an alkali metal) and iron (a transition element) by placing a small cube of each metal into water.



A student observed that:

Sodium	Iron
floated on the surface of the water	sank to the bottom of the water
melted to form a molten ball of sodium	did not melt
reacted to produce a gas	did not react
no sodium was left after 5 minutes	the cube of iron remained after 5 minutes

(a) Tick (✓) **two** properties of sodium compared with iron that are shown by the student's observations.

Sodium compared with iron	Tick(✓)
sodium has a higher boiling point	
sodium has a lower density	
sodium is harder	
sodium is more reactive	
sodium is softer	

(2)

(b) Draw a ring around the correct answer to complete the word equation.

sodium + water → sodium
hydroxide +

carbon dioxide
hydrogen
oxygen

(1)

(c) Draw a ring around the correct answer to complete the sentence.

Sodium hydroxide is an alkali because it produces

H ⁺ (aq)
OH ⁻ (aq)
Na ⁺ (aq)

ions

in aqueous solution.

(1)

(Total 4 marks)