

The Periodic Table of the Elements

	1	2	3	4	5	6	7	0
1	7 Li lithium 3	9 Be beryllium 4	11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
2	23 Na sodium 11	24 Mg magnesium 12	27 Al aluminum 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
3	39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26
4	85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44
5	133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhodium 75	190 Os osmium 76
6	[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[264] Sg seaborgium 106	[268] Bh bohrium 107	[277] Hs hassium 108
7							[271] Mt meitnerium 109	[272] Rg roentgenium 110
0								

Key

relative atomic mass
atomic symbol
 name
 atomic (proton) number

1 **H**
hydrogen
1

Elements with atomic numbers 112-116 have been reported but not fully authenticated

* The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.

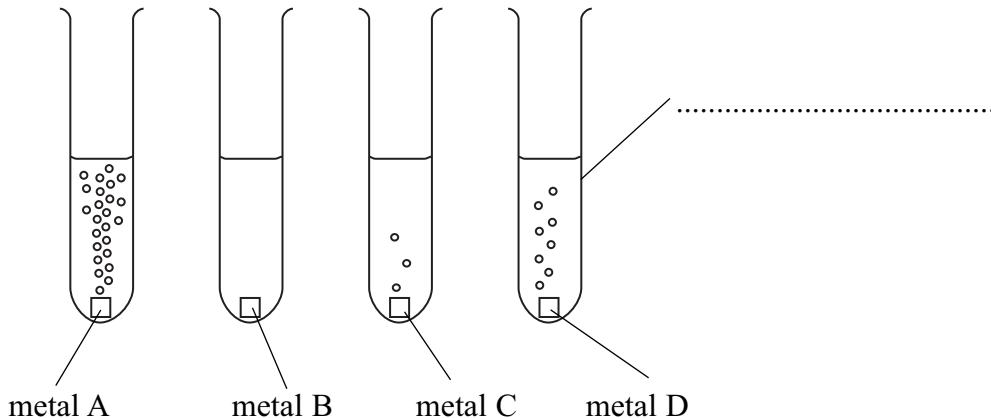


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H 3 4 9 6 9 A 0 3 1 2

1. Luke is investigating the reactions of an acid with four metals, A, B, C and D. He drops the same-sized piece of each metal into separate 10 cm^3 portions of the same acid.
- The diagram shows the four reactions soon after the metal pieces have been added.



- (a) Label the apparatus on the diagram. (1)

- (b) Metals A, C and D react with the acid to produce a gas.

Use the results of the experiment to write down the metals in order of decreasing reactivity.

most reactive

least reactive

(2)



- (c) Luke carries out three further experiments on the reaction of metal C with the acid.
Each time he uses the same mass of metal C and the same volume of acid.
In the first experiment, he heats the acid up.
In the second experiment, he uses powdered metal.
In the third experiment, he uses a less concentrated acid.

Put one tick (\checkmark) in each row of the table to show whether each change speeds up or slows down the reaction, or makes no difference.

change	speeds up reaction	slows down reaction	makes no difference
heats the acid up			
uses powdered metal			
uses a less concentrated acid			

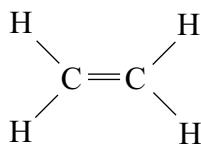
(3)

Q1

(Total 6 marks)



2. The structure of a molecule of ethene is shown.



- (a) What is the formula of a molecule of ethene?

Put a cross (\times) in the correct box.

C_2H_4

C_2H_6

$\text{C}_2\text{H}_5\text{OH}$

(1)

- (b) Put a cross (\times) in the correct box to complete the sentence.

In a molecule of ethene, between the two carbon atoms there is

a cross link

a double covalent bond

an ionic bond

(1)

- (c) What type of substance is ethene?

Put a cross (\times) in the correct box.

alcohol

alkane

alkene

(1)

- (d) Many molecules of ethene can be joined together to make the polymer, poly(ethene).

Put a cross (\times) in the correct box to complete the sentence.

a monomer

In this reaction, ethene is a polymer

an unsaturated oil

(1)



- (e) What colour change do you see in the liquid when ethene is shaken with bromine water?

Put a cross () in the correct box.

from colourless to orange

no change in colour

from orange to colourless

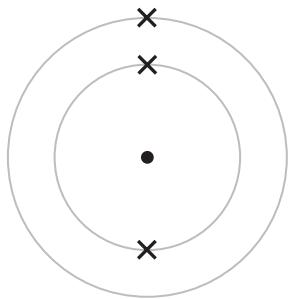
(1)

Q2

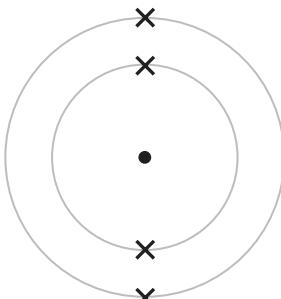
(Total 5 marks)



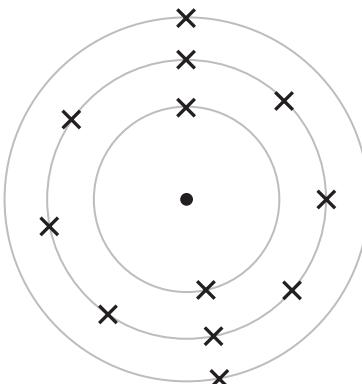
3. (a) The diagrams show the electronic configurations of three atoms.



lithium



beryllium



magnesium

Use the diagrams to answer the following questions.

- (i) In which group of the periodic table is lithium?

.....
(1)

- (ii) Write down the electronic configuration of beryllium

(1)

- (iii) How do the electronic configurations of beryllium and magnesium show that these elements are in the same group in the periodic table?

.....
.....
(1)

- (b) Name the **two** types of particles that can be found in the nucleus of an atom.

..... and
(2)

Q3

(Total 5 marks)



4. Diamond and graphite are two forms of the element carbon.

- (a) Name one other solid form of the element carbon.

.....
(1)

- (b) The table gives some properties of graphite.

- (i) Complete the table to show the properties of diamond.

property	graphite	diamond
melting point	high	
boiling point	high	
conduction of electricity	conducts	

(2)

- (ii) Explain how graphite is able to conduct an electric current.

.....
.....
.....
(1)

- (c) There are shared pairs of electrons between carbon atoms in diamond.
Name the type of bond between these atoms.

.....
(1)

- (d) Graphite has a high melting point.
Explain why.

.....
.....
.....
.....
(2)

Q4

(Total 7 marks)



5. (a) Many scientists contributed to the development of the periodic table. One of these was Dmitri Mendeleev. In his table, he arranged the elements in order of increasing relative atomic mass.

In the modern periodic table, elements are arranged in order of increasing atomic number.

- (i) Explain the term **atomic number**.

.....

.....

(1)

- (ii) When the elements are arranged in order of increasing relative atomic mass, iodine would appear in group 6.

Give one reason why iodine must appear in group 7.

.....

.....

(1)

- (b) Gallium is the element below aluminium in the periodic table.

When Mendeleev produced his periodic table, gallium had not been discovered. He left a gap for gallium below aluminium and predicted the properties of gallium and its compounds.

The table below shows Mendeleev's predictions and the properties we now know gallium to have.

	Mendeleev's prediction	properties of gallium
relative atomic mass	about 68	70
melting point (°C)	low	30
reaction of oxide with acids	forms colourless solution	forms colourless solution

Give one piece of evidence from the table that shows that Mendeleev's predictions were correct.

.....

.....

.....

(1)



(c) Aluminium oxide and gallium oxide are ionic compounds.

- (i) The formula of aluminium oxide is Al_2O_3 .
The symbol for an atom of gallium is Ga.

Suggest the formula of gallium oxide.

.....

(1)

- (ii) Calculate the relative formula mass of aluminium oxide, Al_2O_3 .

(relative atomic masses: O = 16, Al = 27)

Answer

(1)

- (iii) Predict one property of gallium oxide that is not given in the table.

.....

.....

(1)

(d) Mendeleev did not know of the existence of the noble gases.

Helium and neon are noble gases and do not form any compounds.

Why do helium and neon not form any compounds?

.....

.....

(1)

Q5

(Total 7 marks)

TOTAL FOR PAPER: 30 MARKS

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