

Atomic Structure and the periodic table

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Q1.

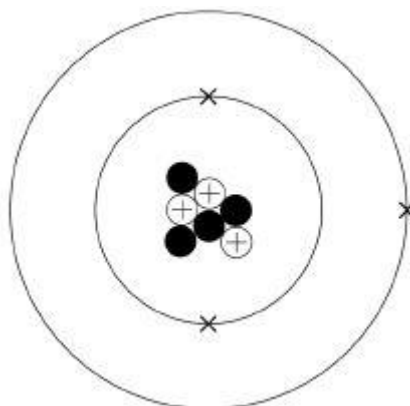
The table below shows the relative mass and charge of the particles in an atom.

Name of particle	Relative mass	Charge
proton	1	+1
neutron		
electron	very small	

(a) Complete the table above.

(3)

(b) The diagram below represents a lithium atom.



Give the number of protons, neutrons and electrons in the lithium atom shown in the diagram above.

Number of protons _____

Number of neutrons _____

Number of electrons _____

(3)

(c) Scientific models of the atom have changed over time.

Draw **one** line from each description of the atomic model to the stage in the development of the atomic model.

Description of atomic model

Stage in the development of the atomic model

A ball of positive charge with electrons embedded in it

Dalton atoms

Neutrons discovered

Spherical atoms

Nucleus of atoms discovered

Plum pudding model

(2)
(Total 8 marks)

Q2.

This question is about atoms and chemical elements.

Mendeleev's periodic table has groups of elements with similar properties.

Figure 1 shows part of Mendeleev's periodic table.

Figure 1

1	1 H							
2	7 Li	9.4 Be	11 B	12 C	14 N	16 O	19 F	
3	23 Na	24 Mg	27.3 Al	28 Si	31 P	32 S	35.5 Cl	
4	39 K	40 Ca	44	48 Ti	51 V	52 Cr	55 Mn	56 59 59 63 Fe, Co, Ni, Cu

(a) Compare Mendeleev's periodic table with the modern periodic table.

Which group is missing from Mendeleev's periodic table?

Tick **one** box.

Group 1

Group 2

Group 7

Group 0

(1)

(b) In the early periodic tables some elements were placed in the wrong groups.

Mendeleev overcame some of these problems in his periodic table.

Give **two** ways Mendeleev did this.

1. _____

2. _____

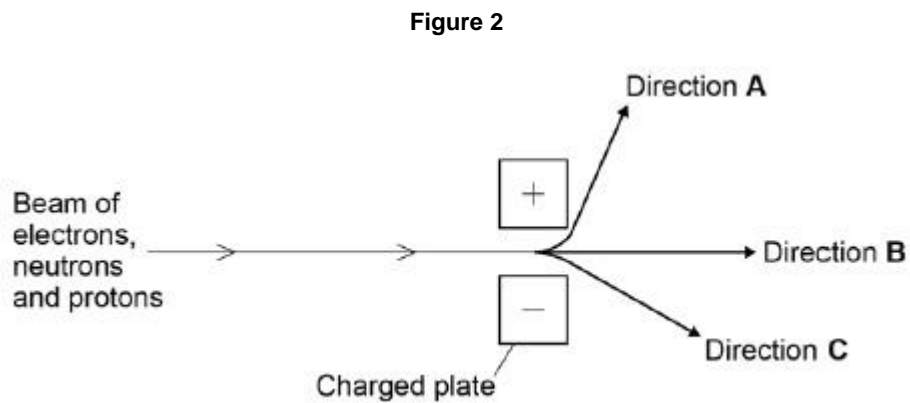
Atoms were thought to be tiny spheres that could not be divided.

(c) Draw **one** line from each scientist to the discovery the scientist made.

Scientist	Discovery the scientist made
	Discovered electrons
Neils Bohr	Electrons orbit the nucleus
	Existence of neutrons
James Chadwick	Mass of atom concentrated at centre
	Proton found in nucleus

(d) A beam of electrons, neutrons and protons can be separated by passing them through an electric field.

Figure 2 shows the directions of the three particles after entering the electric field.



Charged particles are attracted to the oppositely charged plate in the electric field.

Which direction, **A**, **B** or **C**, does each particle follow?

Complete the table.

Particle	Direction
Electron	
Neutron	
Proton	

(e) Calculate the mass of one atom of sodium.

Use the equation:

$$\text{mass of one atom of sodium} = \frac{\text{relative atomic mass}}{\text{Avogadro constant}}$$

Avogadro constant = 6.02×10^{23}

Give your answer to 2 significant figures.

Mass = _____ g

(3)

(f) The radius of a sodium atom is 227 picometres.

1 picometre = 10^{-12} metres (m)

The radius of a nucleus is $\frac{1}{10\,000}$ of that of the atom.

Which calculation shows the radius of a sodium atom's nucleus?

Tick **one** box.

$227 \times 10\,000$ m

$227 \times \frac{1}{10\,000}$ m

$227 \times 10^{-12} \times 10\,000$ m

$227 \times 10^{-12} \times \frac{1}{10\,000}$ m

(1)

(Total 11 marks)

Q1.

(a)

name of particle	relative mass	charge
proton	(1)	(+1)
neutron	1	0
electron	(very small)	-1

1 + 1
1

*allow words instead of numbers
allow neutral or no charge for the neutron*

(b) (protons) 3

1

(neutrons) 4

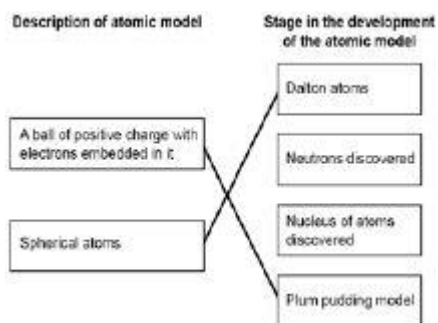
1

(electrons) 3

1

allow words instead of numbers

(c)



1
1

[8]

Q4.

(a) group 0

1

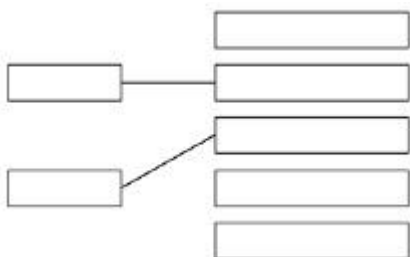
(b) left gaps

1

in some places changed the order based on atomic weights

1

(c)



1
1

(d) (electron) **A**

(neutron) **B**

(proton) **C**

3 correct answers scores **2** marks
1/2 correct answers scores **1** mark

2

(e) $\frac{23}{6.02 \times 10^{23}}$

1

$3.820598... \times 10^{-23}$

1

3.8×10^{-23}

an answer of 3.8×10^{-23} scores **3** marks

1

(f) $227 \times 10^{-12} \times \frac{1}{10\,000} \text{ m}$

1

[11]