

Easter HW 1 Combined science - Physics (Higher)

Physics Paper 1

Topic P4 Atomic Structure

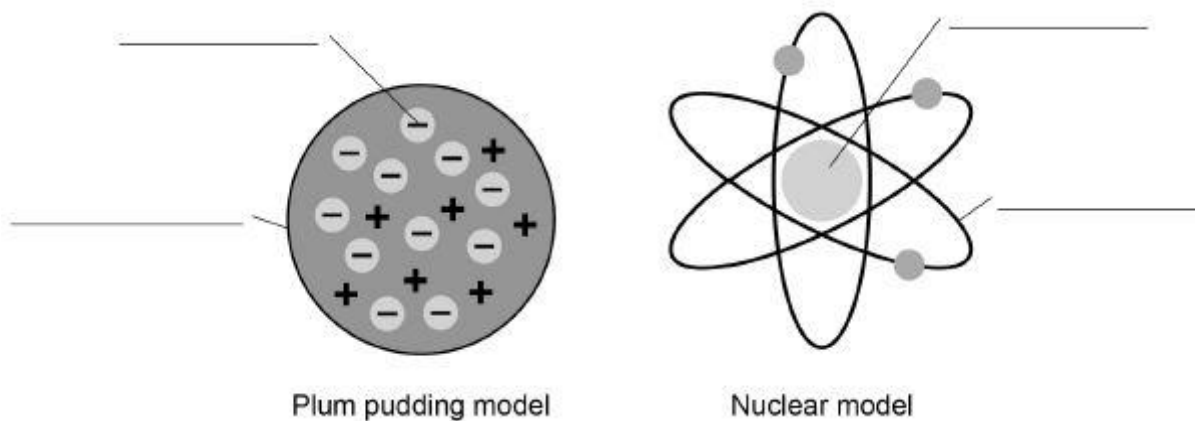
6.4.1 Atoms and isotopes

You must complete this homework on Lined/ plain A4 paper and bring it in to school on 19/04/22

Q1.

Figure 1 shows two models of the atom.

Figure 1



(a) Write the labels on **Figure 1**

Choose the answers from the box.

atom	electron	nucleus
neutron	orbit	proton

(4)

(b) Explain why the total positive charge in every atom of an element is always the same.

(2)

(c) The results from the alpha particle scattering experiment led to the nuclear model. Alpha particles were fired at a thin film of gold at a speed of 7% of the speed of light. Determine the speed of the alpha particles.

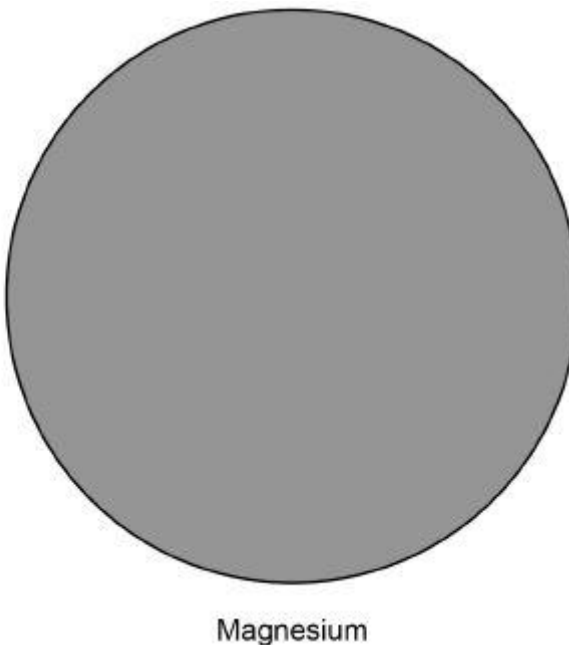
Speed of light = 300 000 000 m/s

Speed = _____ m/s

(2)

(d) **Figure 2** shows two atoms represented as solid spheres.

Figure 2



A hydrogen atom has a radius of 2.5×10^{-11} m

Determine the radius of a magnesium atom.

Use measurements from **Figure 2**

Radius = _____ m

(2)

(Total 10 marks)

Q2.

Some street lamps contain sodium.

Below are two isotopes of sodium.



(a) What are isotopes?

(2)

(b) How many protons and neutrons are in a nucleus of ${}_{11}^{23}\text{Na}$?

Number of protons = _____

Number of neutrons = _____

(2)

- (c) The sodium atoms emit light.

What would cause light to be emitted from a sodium atom?

Tick **one** box.

Electrons being emitted from the nucleus.

Electrons falling to a lower energy level.

Electrons leaving the atom when it is ionised.

Electrons moving to a higher energy level.

(1)

- (d) In a street lamp, solid sodium is melted and vaporised.

Describe how the arrangement of the sodium atoms changes as the sodium goes from solid to liquid to gas.

(4)

The table shows the power ratings of some types of sodium lamp.

Type of sodium lamp	Power in Watts
A	35
B	50
C	70
D	100
E	150

- (e) Some main roads are lit by type **E** sodium lamps.

Calculate the energy transferred by one type **E** sodium lamp in 1 hour.

Energy transferred = _____ J

(3)

(f) Many housing estates are lit by type **A** sodium lamps.

Suggest **two** advantages of using type **A** sodium lamps on housing estates.

1. _____

2. _____

(2)

(Total 14 marks)

Q3.

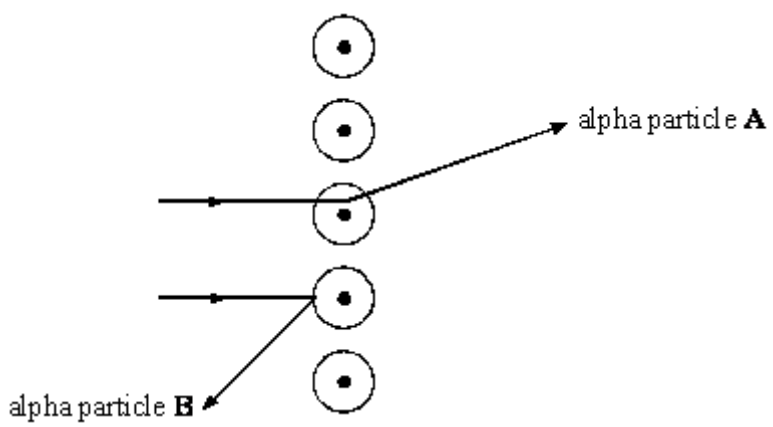
(a) Atoms are made up of three types of particle called protons, neutrons and electrons.

Complete the table below to show the relative mass and charge of a neutron and an electron. The relative mass and charge of a proton has already been done for you.

PARTICLE	RELATIVE MASS	RELATIVE CHARGE
proton	1	+1
neutron		
electron		

(2)

(b) The diagram below shows the paths of two alpha particles **A** and **B**, into and out of a thin piece of metal foil.



The paths of the alpha particles depend on the forces on them in the metal.
Describe the model of the atom which is used to explain the paths of alpha particles aimed at thin sheets of metal foil.

(3)
(Total 5 marks)