

GCSE Physics (9 – 1)

Atomic Structure

Name:

Group:



Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.

For markers use	
Question	Mark
1	/4
2	/5
3	/6
4	/8
5	/5
6	/6
Total	/34
%	
Grade	

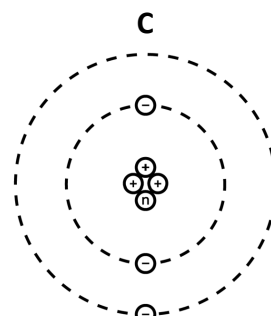
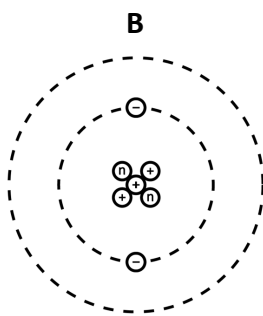
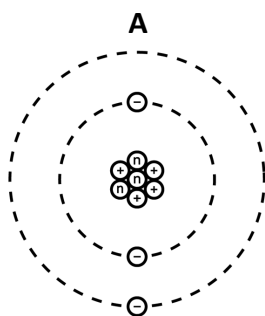
Information

- The maximum mark for this paper is 34 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. Atomic structure is the study of the building blocks of matter and the subatomic particles that make them up. For each of the following questions **circle** the letter of the correct answer.

- a) An atom of lithium has a mass number of 7 and an atomic number of 3.
Which diagram represents a neutral atom of lithium?



(1 mark)

- b) How many neutrons are in a nucleus of Chlorine-37?

A

25

B

35

C

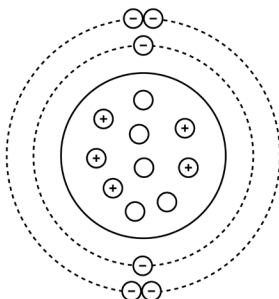
37

D

20

(1 mark)

- c) The diagram represents a carbon atom. What is the mass number for this atom?



A

12

B

6

C

14

D

20

(1 mark)

- d) A nucleus is represented by the symbol shown below. What is the mass number of the nucleus?



A

S

B

S + Q

C

Q

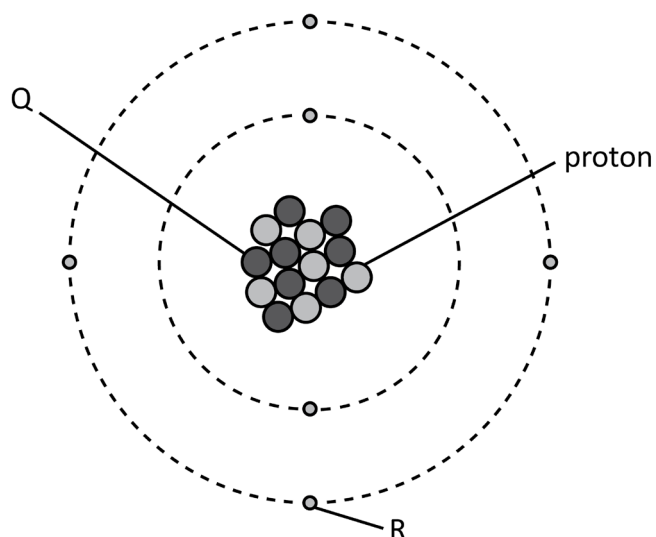
D

S - Q

(1 mark)

(Total for Question 1 is 4 marks)

2. The figure below shows an atom of carbon 14.



a) Identify the particles labelled Q and R.

Q = ...

R = ...

(2 marks)

b) Explain, using the information in the diagram, why this atom of carbon-14 has an overall **neutral charge**.

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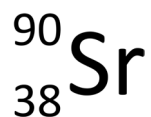
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(3 marks)

(Total for Question 2 is 5 marks)

4. A nucleus of Strontium-90 is shown below.



a. Determine the number of neutrons present in the nucleus of Strontium-90.

Number of neutrons = ...

(2 marks)

b. Determine the number of electrons present in an **atom** of Strontium-90?

Number of electrons = ...

(1 mark)

c. A different atom, gold (Au), has a mass number of 197 and an atomic number of 79.

i. Complete the missing values for the atom of gold.



(2 marks)

ii. Determine the number of neutrons present in the nucleus of gold.

Number of neutrons = ...

(1 mark)

iii. Gold has a number of radioactive isotopes. One of these is Au-210.
What is an isotope?

.....
.....
.....
.....

(2 marks)

(Total for Question 4 is 8 marks)

5. The radius of a typical gold atom is 1.44×10^{-10} m. The radius of a gold nucleus is 3.40×10^{-15} m
- a. Calculate how many times greater the radius of the gold atom is compared to the radius of its nucleus.
Give your answer to **two** significant figures.

.....

(3 marks)

- b. The mass of a neutron is 1.6749×10^{-27} kg. The mass of a proton is 1.6726×10^{-27} kg

Calculate the difference in mass between a single neutron and a single proton.
Give your answer in standard form.

.....

(2 marks)

(Total for Question 5 is 5 marks)

6. A Carbon-12 atom has 6 protons and 6 neutrons in its nucleus.

The mass of a single proton and a single neutron is approximately the same: 1.67×10^{-27} kg.

The radius of a Carbon-12 nucleus is 2.70×10^{-15} m

The volume of a sphere can be calculated using the equation: $V = \frac{4}{3} \pi r^3$

Calculate the density of the Carbon-12 nucleus.

Give your answer in standard form to 3 significant figures.

Density of the Carbon-12 nucleus = ...

(6 marks)

(Total for Question 6 is 6 marks)