

Atoms and Isotopes

Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.4 Atomic Structure
Sub-Topic	Atoms and Isotopes
Difficulty Level	Silver Level
Booklet	Question Paper

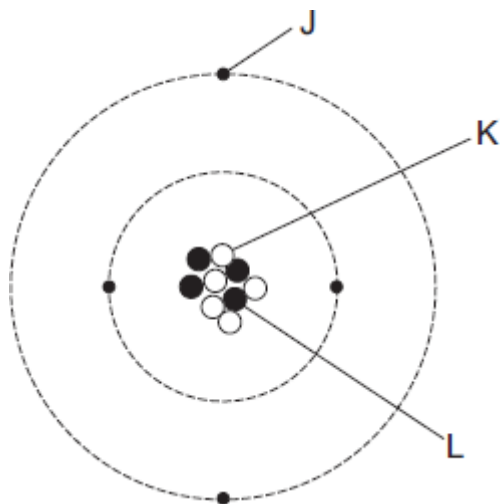
Time Allowed: 43 minutes

Score: /43

Percentage: /100

Grade Boundaries:

Q1. The diagram represents an atom of beryllium.



- (a) Complete the following statements by writing one of the letters, **J**, **K** or **L**, in each box.

Each letter should be used only **once**.

The particle with a positive charge is

The particle with the smallest mass is

The particle with no charge is

(2)

- (b) Give the reason why all atoms have a total charge of zero.

.....

.....

(1)

- (c) Complete the following sentence.

There are several isotopes of beryllium. Atoms of different beryllium isotopes will have different numbers of

(1)

- (d) What happens to the structure of an atom to change it into an ion?

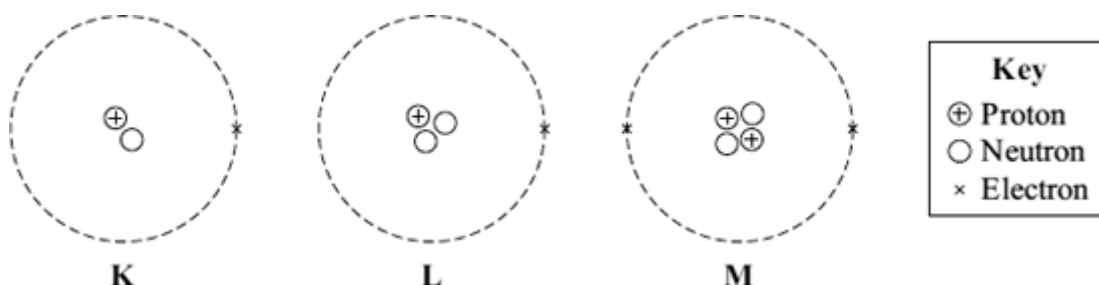
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(1)

(Total 5 marks)

- Q2.** (a) The diagram represents 3 atoms, **K**, **L** and **M**.



- (i) Which **two** of the atoms are isotopes of the same element?

..... and

(1)

- (ii) Give a reason why the **two** atoms that you chose in part (a)(i) are:

(1) atoms of the same element

.....

(2) different isotopes of the same element.

.....

.....

(2)

- (b) The table gives some information about the radioactive isotope thorium-230.

mass number	230
atomic number	90

- (i) How many electrons are there in an atom of thorium-230?

.....

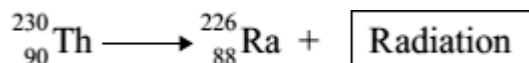
(1)

- (ii) How many neutrons are there in an atom of thorium-230?

.....

(1)

- (c) When a thorium-230 nucleus decays, it emits radiation and changes into radium-226.



What type of radiation, alpha, beta or gamma, is emitted by thorium-230?

.....

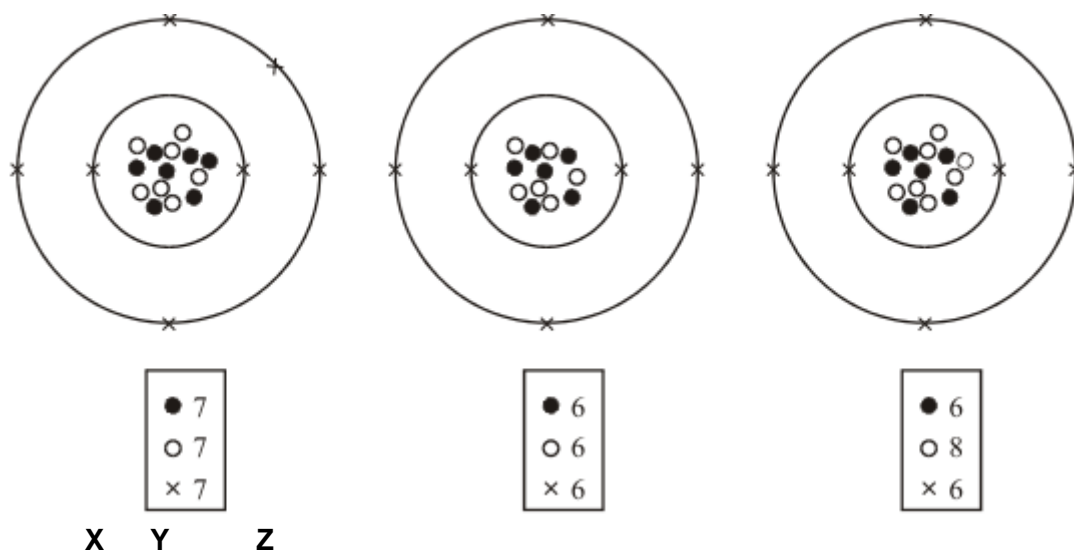
Explain the reason for your answer.

.....

(3)

(Total 8 marks)

Q3. (a) The diagrams represent three atoms **X**, **Y** and **Z**.



Which **two** of the atoms are from the same element?

.....

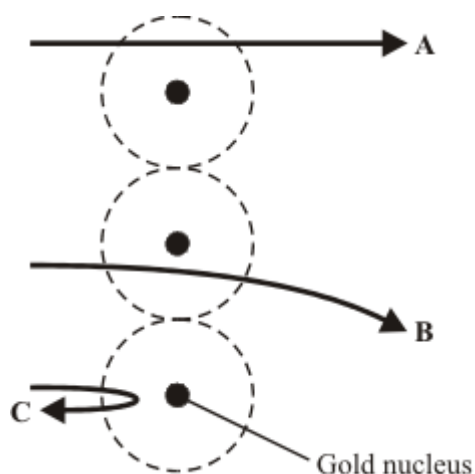
Give a reason for your answer.

.....

.....

(2)

- (b) In the early part of the 20th century some scientists investigated the paths taken by positively charged alpha particles into and out of a very thin piece of gold foil. The diagram shows the paths of three alpha particles.



Explain the different paths **A**, **B** and **C** of the alpha particles.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

.....

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.....

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(3)
(Total 5 marks)

Q4.

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

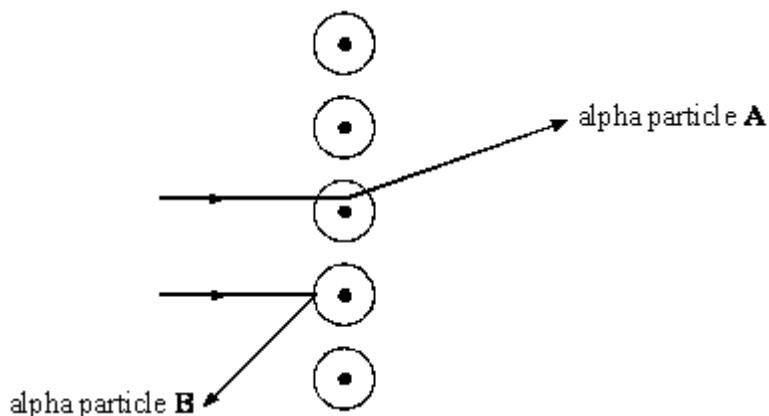
Complete the table below to show the relative mass and charge of a neutron and an electron. The relative mass and charge of a proton has already been done for you.

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)

- Q5.** Use the Data Sheet to help you answer this question.
This question is about elements and atoms.

- (a) About how many different elements are found on Earth?
Draw a **ring** around the correct number.

40 50 60 70 80 90

(1)

- (b) The following are parts of an atom:

electron neutron nucleus proton

Choose from the list the one which:

- (i) has no electrical charge;
- (ii) contains two of the other particles;
- (iii) has very little (negligible) mass.

(3)

- (c) Scientists have been able to make new elements in nuclear reactors. One of these new elements is fermium. An atom of fermium is represented by the symbol below.

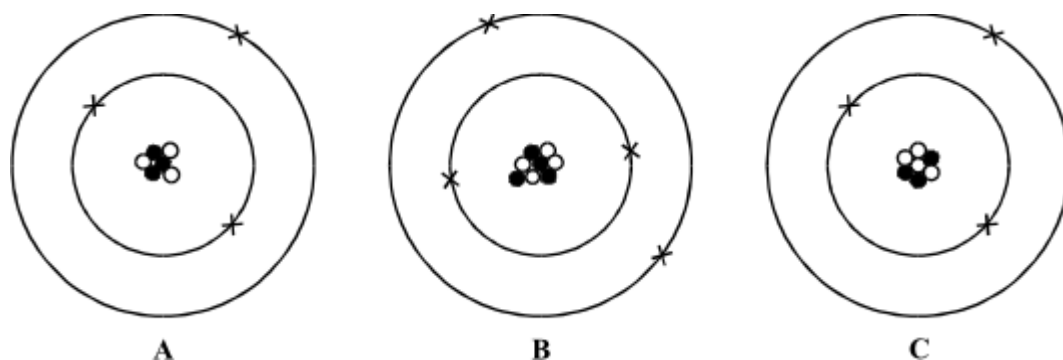


- (i) How many protons does this atom contain?
- (ii) How many neutrons does this atom contain?

(2)

(Total 6 marks)

Q6. The diagrams below represent three atoms, **A**, **B** and **C**.



(a) Two of the atoms are from the **same** element.

(i) Which of **A**, **B** and **C** is an atom of a different element?

(ii) Give **one** reason for your answer.

.....

(2)

(b) Two of these atoms are isotopes of the same element.

(i) Which **two** are isotopes of the same element? and

(ii) Explain your answer.

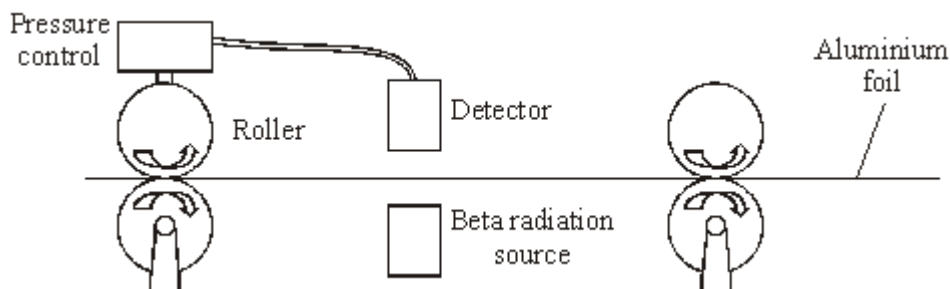
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(3)

(Total 5 marks)

Q7. The diagram shows how the thickness of aluminium foil is controlled. The thicker the

aluminium foil, the more radiation it absorbs.



(a) The designers used a beta radiation source for this control system.

(i) Why would an alpha radiation source be unsuitable in this control system?

.....

(1)

(ii) Why would a gamma radiation source be unsuitable in this control system?

.....

(1)

(b) The substance used in the beta radiation source is radioactive.

(i) Why are some atoms radioactive?

.....

(1)

(ii) Explain why radiation is dangerous to humans.

.....

.....
.....

(2)
(Total 5 marks)

Q8. (a) Complete the sentences about atoms.

In an atom, the number of electrons is equal to the number of

All atoms of an element have the same number of

Isotopes of the same element have different numbers of

(3)

(b) Complete the sentence.

When an atom of a radioactive element emits alpha radiation, an atom of a different element is formed. A different element is formed because the radioactive element has lost

.....

(1)
(Total 4 marks)