

5.1 The Nuclear Atom

Question Paper

Level	IGCSE
Subject	Physics (0625)
Exam Board	Cambridge International Examinations(CIE)
Topic	Atomic Physics
Sub Topic	5.1 The Nuclear Atom
Booklet	Question Paper

Time Allowed: 30 minutes

Score: /25

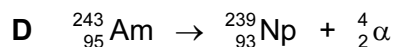
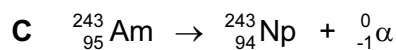
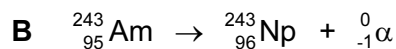
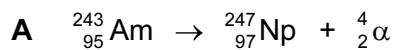
Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	75%	60%	45%	35%	25%	<25%

- 1 A nucleus of americium ${}_{95}^{243}\text{Am}$ emits an α -particle to form a nucleus of neptunium (Np).

Which equation represents this decay?



- 2 A certain element has several isotopes.

Which statement about these isotopes is correct?

- A** They must have different numbers of electrons orbiting their nuclei.
B They must have the same number of neutrons in their nuclei.
C They must have the same number of nucleons in their nuclei.
D They must have the same number of protons in their nuclei.

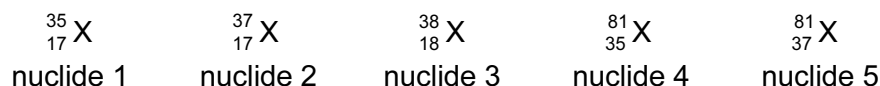
- 3 A very important experiment increased scientists' understanding of the structure of matter.

In the experiment, particles scattered as they passed through a thin metal foil.

Which particles were used, and to which conclusion did the experiment lead?

	particles	conclusion
A	alpha particles	matter is made up of atoms
B	alpha particles	atoms have a very small nucleus
C	beta particles	matter is made up of atoms
D	beta particles	atoms have a very small nucleus

- 4 Below are the symbols for five different nuclides.



Which two nuclides are isotopes of the same element?

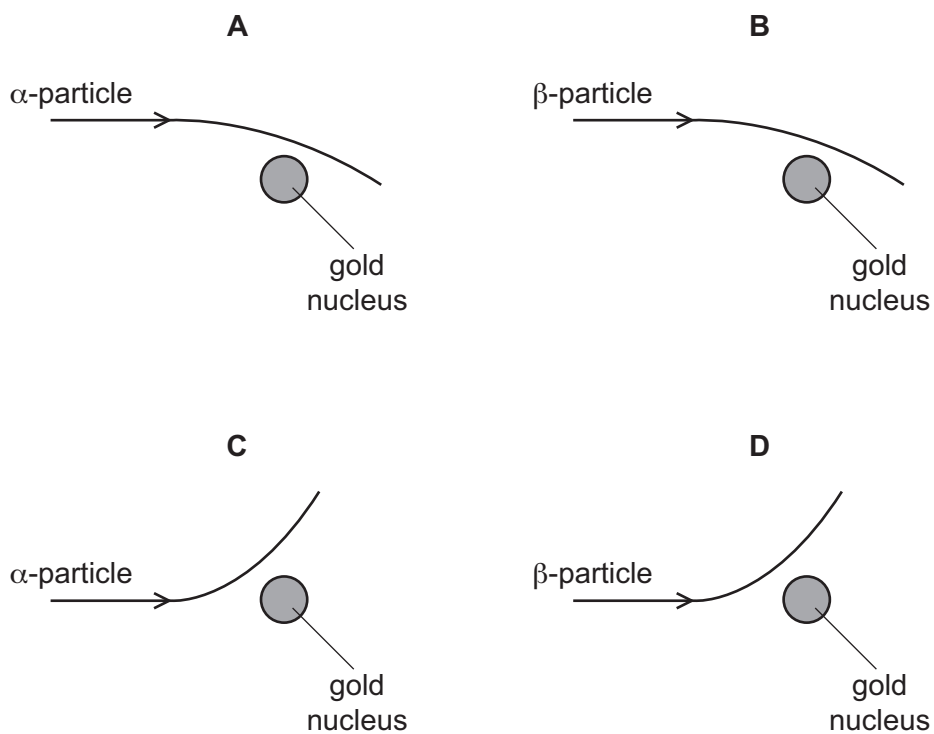
- A** nuclide 1 and nuclide 2
B nuclide 2 and nuclide 3
C nuclide 2 and nuclide 5
D nuclide 4 and nuclide 5

5 Below are four statements about isotopes of a certain element.

Which statement about the isotopes **must** be correct?

- A They are radioactive.
- B They are unstable.
- C They have the same number of neutrons.
- D They have the same number of protons.

6 Which diagram represents an experiment that provided evidence for the nuclear atom?



- 7 The scattering of α -particles by a thin metal foil supports the nuclear model of an atom.

Why are α -particles used rather than neutrons?

- A because they always travel more slowly
- B because they are heavier
- C because they are larger in diameter
- D because they have a positive charge

- 8 ${}^{14}_6\text{C}$ is a nuclide of carbon.

What is the composition of one nucleus of this nuclide?

	neutrons	protons
A	6	8
B	6	14
C	8	6
D	14	6

- 9 A nuclide has the symbol ${}^{22}_{10}\text{Ne}$.

What is the proton number of a nucleus of this nuclide?

- A** 10 **B** 12 **C** 22 **D** 32

- 10 The nucleus of an americium atom contains 146 neutrons and 95 protons. It decays by emitting an α -particle.

How many neutrons and how many protons remain in the nucleus when this form of americium decays?

	number of neutrons remaining	number of protons remaining
A	142	93
B	142	95
C	144	93
D	144	95

11 Which statement is correct for the nucleus of **any** atom?

- A The nucleus contains electrons, neutrons and protons.
- B The nucleus contains the same number of protons as neutrons.
- C The nucleus has a total charge of zero.
- D The nucleus is very small compared with the size of the atom.

12 The nuclide symbol for radioactive polonium is ${}^{210}_{84}\text{Po}$

A nucleus of this type of polonium emits an α -particle.

What is the proton number (atomic number) of the nucleus after it has emitted the α -particle?

- A 82 B 83 C 84 D 85

13 The nuclide notation for radium-226 is ${}^{226}_{88}\text{Ra}$.

How many electrons orbit the nucleus of a neutral atom of radium-226?

- A 0 B 88 C 138 D 226

14 A radioactive nucleus contains 128 nucleons. It emits a β -particle.

How many nucleons are now in the nucleus?

- A 124 B 127 C 128 D 129

15 The nuclide notation for radium-226 is ${}^{226}_{88}\text{Ra}$.

How many electrons orbit the nucleus of a neutral atom of radium-226?

- A 0 B 88 C 138 D 226

16 A nuclide has the symbol ${}_{6}^{44}\text{C}$.

How many protons are there in one nucleus of this nuclide?

- A** 6 **B** 8 **C** 14 **D** 20

17 A lithium nucleus contains 3 protons and 4 neutrons.

What is its nuclide notation?

- A** ${}_{4}^{3}\text{Li}$ **B** ${}_{3}^{4}\text{Li}$ **C** ${}_{3}^{7}\text{Li}$ **D** ${}_{4}^{7}\text{Li}$

18 A particular nuclide of chlorine can be represented by the symbol shown.



How many electrons are there in a neutral atom of this nuclide?

- A** 17 **B** 20 **C** 37 **D** 54

19 A nuclide is represented by the symbol ${}_{\text{Q}}^{\text{P}}\text{X}$.

How many neutrons are in one nucleus of the nuclide?

- A** P **B** Q **C** P + Q **D** P – Q

20 Which statement about the nuclei of all atoms is correct?

- A They are very small compared with the size of the atoms.
- B They always contain the same number of protons as neutrons.
- C They contain electrons, neutrons and protons.
- D They have a total charge of zero.

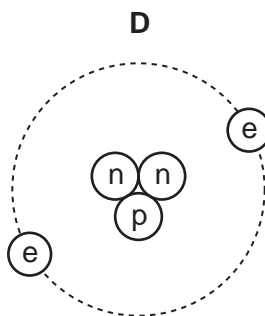
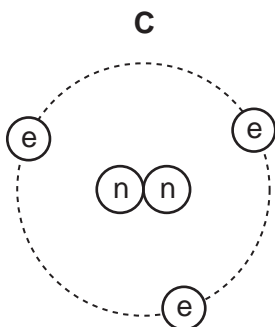
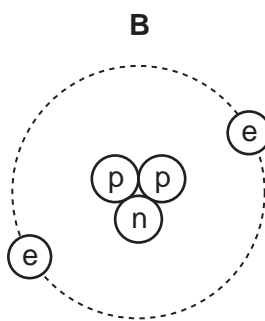
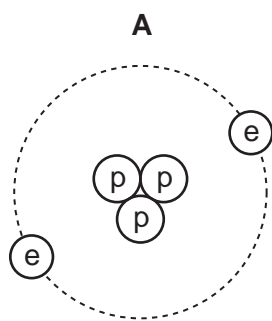
21 A nuclide of substance X has the symbol ${}_{12}^{26}\text{X}$.

How many electrons are there in a neutral atom of substance X?

- A 12
- B 14
- C 26
- D 38

22 A nucleus of helium has the symbol ${}^3_2\text{He}$.

Which diagram represents an atom of ${}^3_2\text{He}$?



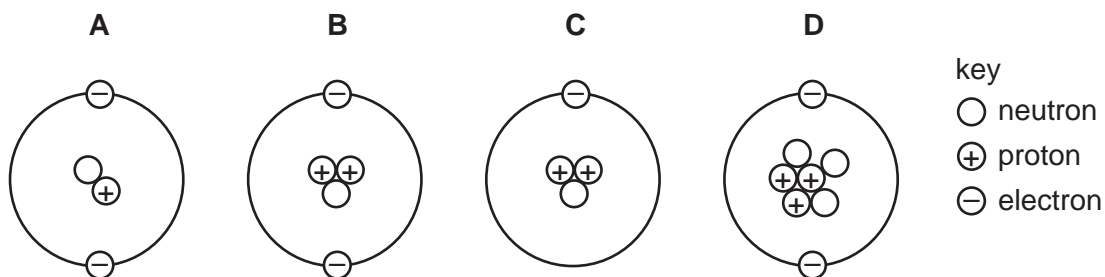
key

(p) = proton

(n) = neutron

(e) = electron

23 Which diagram could represent the structure of a neutral atom?

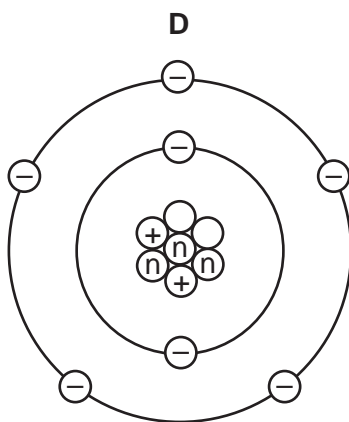
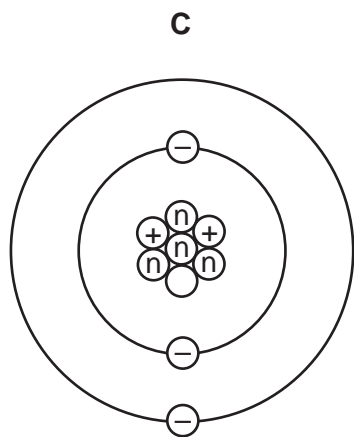
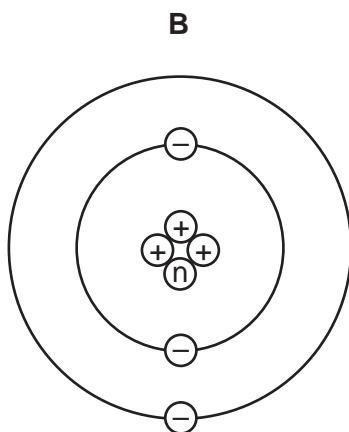
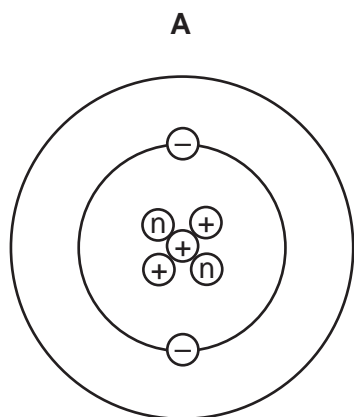


24 Which statement about a neutral atom of $^{226}_{88}\text{Ra}$ is correct?

- A** It has an equal number of neutrons and protons.
- B** It has more electrons than neutrons.
- C** It has more electrons than protons.
- D** It has more neutrons than protons.

25 An atom of the element lithium has a nucleon number of 7 and a proton number of 3.

Which diagram represents a neutral atom of lithium?



key

(n) = a neutron

(+) = a proton

(-) = an electron

(not to scale)