EP_4A N5 Atomic Structure

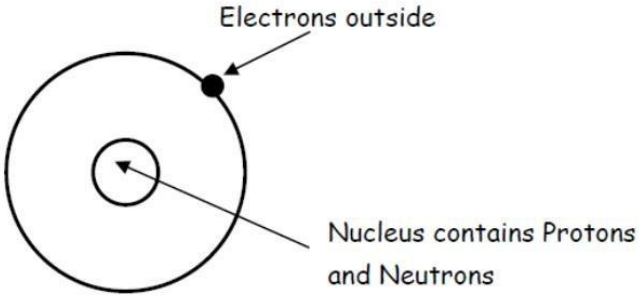
Write the date in the margin of your jotter.Write the title of this Exercise as a heading: EP_4A N5 Atomic Structure

SUMMARY

8. **Atomic structure**

Elements are made up of tiny identical particles called ATOMS.

Structure of an atom



Particle	Charge	Mass
Electron	1-	0
Proton	1+	1
Neutron	0	1

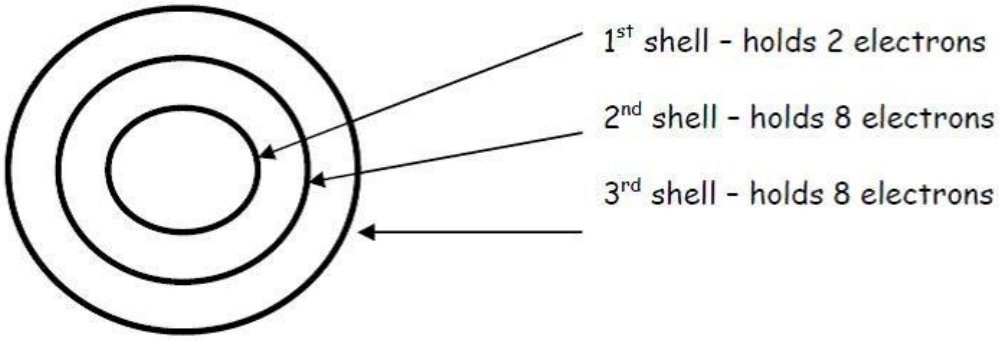
Atomic Number = number of protons

Mass Number = number of protons + number of neutrons

In a NEUTRAL atom,

NUMBER OF PROTONS = NUMBER OF ELECTRONS

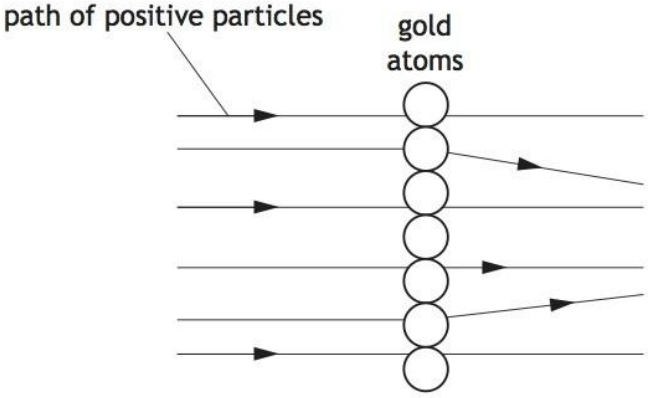
Outside the nucleus, the electrons fill shells, (or energy levels)



QUESTIONS

1.

In 1911, Ernest Rutherford carried out an experiment to confirm the structure of the atom. In this experiment, he fired positive particles at a very thin layer of gold foil. Most of the particles passed straight through but a small number of the positively charged particles were deflected.



(a) What caused some of the positive particles to be deflected in this experiment?

(b) Gold is the heaviest element to have only one naturally occurring isotope.

The isotope has a mass number of 197.

(i) Complete the table to show the number of each type of particle in this gold atom.

You may wish to use the data booklet to help you.

Particle	*Number*
Proton	
Electron	
Neutron	

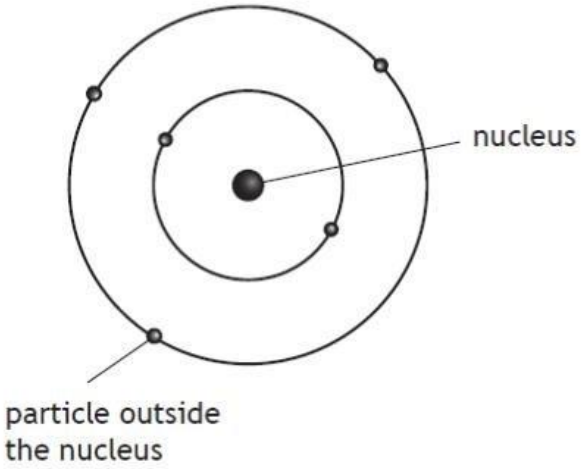
2.

Copy and complete the following table

Element	Atomic number	Mass number	Number protons	Number neutrons	Electron arrangement
Carbon	6	12			
Potassium		39			2,8,8,1
			18	22	

3.

Elements are made up of atoms.



(a) Complete the tables to show the missing information.

(i)

In the Nucleus		
Particle	*Relative Mass*	*Charge*
proton		+1
neutron	1	

1

(ii)

Outside the Nucleus		
Particle	*Relative Mass*	*Charge*
	almost zero	

1

(b) A sample of nitrogen was found to contain equal amounts of two isotopes. One isotope has mass number 14 and the other has mass number 15.

What is the relative atomic mass of this sample of nitrogen? 1

4.

Name the elements with the following electron arrangements:

(i) 2,8,1 **(ii)** 2,8,8 **(iii)** 2,4 **(iv)** 2,8,7

5.

Electrons can be removed from all atoms.

The energy required to do this is called the ionisation energy.

The first ionisation energy for an element is defined as the energy required to remove one mole of electrons from one mole of atoms, in the gaseous state.

The equation for the first ionisation energy of chlorine is

$$Cl(g) \longrightarrow Cl^{+}(g) + e^{-}$$

(a) State the electron arrangement for the Cl^{+} ion. 1

You may wish to use the data booklet to help you.

6.

Electrons are particles which

a. ○ can have either a positive or negative charge
b. ○ have a negative charge
c. ○ have no charge
d. ○ have a positive charge

7.

Which line in the table correctly describes a proton?

	Mass	Charge	Location
A	negligible	0	outside nucleus
B	negligible	−1	outside nucleus
C	1	+1	in nucleus
D	1	0	in nucleus

8.

An atom has 26 protons, 26 electrons and 30 neutrons. The atom has

A atomic number 26, mass number 56

B atomic number 56, mass number 30

C atomic number 30, mass number 26

D atomic number 52, mass number 56.

12.

The nucleus of an atom

a. ○ is positively charged
b. ○ is negatively charged
c. ○ contains both positive and negatively charged particles
d. ○ has no charged particles

13.

Which line in the table describes a **neutron**?

	Mass	Charge
A	1	−1
B	negligible	0
C	1	+1
D	1	0

14.

An atom is neutral because

A the number of electrons equals the total number of protons plus neutrons

B the number of neutrons equals the total number of electrons plus protons

C the number of protons equals the number of neutrons

D the number of electrons equals the number of protons.

9.

Which of the following is the electron arrangement for a noble gas?

(You may wish to use page 1 of the data booklet to help you.)

A 2, 5

B 2, 6

C 2, 7

D 2, 8

10.

2,8,8 is the electron arrangement for an atom of an element belonging to the

A halogens

B noble gases

C alkali metals

D transition metals.

11.

An atom has atomic number 23 and mass number 51.

The number of electrons in the atom is

A 23

B 28

C 51

D 74.

15.

The table shows information about an **ion**.

Particle	Number
protons	19
neutrons	20
electrons	18

The charge on the ion is

A 1+

B 1–

C 2+

D 2–.

16.

Which of the following particles contains a different number of electrons from the others?

You may wish to use the data booklet to help you.

A Cl^-

B S^{2-}

C Ar

D Na^+

17.

Which of the following numbers is the same for lithium and oxygen atoms?

A atomic number

B number of occupied electron shells

C mass number

D number of outer electrons

NOW CHECK YOUR ANSWERS