Inside the Atom

EXERCISE [PAGE 38]

Exercise | Q 1.1 | Page 38

Answer the following:

What is the difference in the atomic models of Thomson and Rutherford?

Solution:

Thomson Theory	Rutherford Theory
States that electron is embedded in a positively charged solid material which is spherical in shape	States that an atom is composed of an atomic nucleus around which electrons are revolving in an orbit
Does not give any detail about the atomic nucleus	Explains about the atomic nucleus
States that electrons are uniformly distributed in an atom	States that electrons are located around a central solid material
Indicates that the atom is spherical in shape	Indicates that an atom has a central solid core called a nucleus surrounded by the electrons
Does not give any idea about constituents of the nucleus	States that the nucleus is composed of protons and neutrons

Exercise | Q 1.2 | Page 38

Answer the following :

What is meant by valency of an element ? what is the relationship between the number of valence electron and valency ?

Solution: **Valency of an element** : It is the number of electrons of an atom of the element uses to combine with atoms of other elements.

It is the combining power of an atom of the element.

Valency of an atom is determined by its electronic configuration.

It gives idea about the number of electrons loss or gain in order to achieve the nearest noble gas configuration.

For example: Na(11) = 2,8,1 So, its valency is 1

Cl(17) = 2,8,7 So, its valency is also 1

Number of valence electron : It is defined as the number of electrons present in the outermost shell of an atom.

It is not necessary that all the valence electrons take part in bonding.

For example: Na(11) = 2,8,1 So, its number of valence electron is 1

Cl(17) = 2,8,7 So its number of valence electron is 7

It can be seen that valency of an element is related to number of valence electrons in that atom.

Exercise | Q 1.3 | Page 38

Answer the following :

What is meant by atomic mass number ? Explain how the atomic number and mass number of carbon are 6 and 12 respectively.

Solution: Atomic Mass Number : It is the sum of total number of protons and neutrons present in a nucleus.

Atomic mass number = number of protons + number of neutrons.

Atomic number = number of protons = number of electrons. It is denoted by Z.

Mass number = number of protons + number of neutrons. It is denoted by A.

For example : Carbon atom its, Number of proton = 6

Number of neutrons = 6

Number of electron = 6

Atomic number(Z) = number of protons = number of electrons = 6.

Mass number(A) = number of proton + number of neutrons = 6 + 6 =12.

Exercise | Q 1.4 | Page 38

Answer the following :

what is meant by subatomic particle ? give brief information of three subatomic particles with refrence to electrical charge, mass and location.

Solution: Subatomic particles : A subatomic particle is a structural and functional unit of the matter. That means all the matters are made up of these fundamental particles. According to modern atomic theory, an atom has a nucleus, which is present in its center or core. These nucleus contain subatomic particles like protons and neutrons. Difference between subatomic particles are as follows :

Electron

1. Electrons are present outside the nucleus of an atom.

2. Electrons are negatively charged that is

$(1.6 \times 10^{-19}$ coulomb).

3. The mass of an electron is considered to negligible. It is 1800 times less than that of

a hydrogen

4. Relative mass = 1/ 1840 times hydrogen

5. It revolves around the nucleus in the discrete orbit.

Proton

1. Protons are present in the nucleus of an atom.

2. Protons are positively charged that is $(1.6 \times 10^{-19}$ coulomb).

3. The mass of a proton is approximately 1u(1Dalton) that is $(1u = 1.66 \times 10^{-27}$ g).

4. They are closely bound in the nucleus.

Neutron

1. Neutrons are present in the nucleus of an atom.

2. Neutrons are neutral.There is no charge.

3. The mass of a neutron is nearly equal to the mass of a proton that is 1u(1Dalton) that

is $(1u = 1.66 \times 10^{-27}$ g).

4. They are closely bound in the nucleus.

Exercise | Q 2.1 | Page 38

Give seicentific reason.

All the mass of an atom is concenrated in the nucleus.

Solution: All the mass of an atom is concentrated in the nucleus because atom
contains three subatomic particles like electron, proton and neutron.Out of which,
nucleus present at the centre of an atom contains two subatomic particles that's protons
and neutrons and the mass of nucleus is the sum of mass of protons and neutrons
located at the centre of an atom.

Exercise | Q 2.2 | Page 38

Give seicentific reason.

Atom is electrically neutral.

Solution: Atom is electrically neutral because in an atom electrons and protons carry charges and each atom has equal numbers of protons (positively charged) and electrons (negatively charged).

Exercise | Q 2.3 | Page 38

Give sceintific reason.

Atomic mass number is a whole number.

Solution: Atomic mass number is a whole number because it is the sum of numbers of protons and numbers of neutrons present in an atom.Which is present in the form of integers.

Exercise | Q 2.4 | Page 38

Give sceintific reason.

Atoms are stable though negatively charged electron are revolving within it.

Solution: Atoms are stables though negatively charged electrons are revolving within it because each atom contains equal numbers of protons and electrons. So, charge on negatively charged electrons are balanced by charge on positively charged proton. Therefore, atom is electrically neutral and stable.

Exercise | Q 3.1 | Page 38

Define the following form:

Atom

Solution: An atom is defined as the structural and functional unit of a matter. The term "atom" comes from the Greek word which means indivisible, because atoms are the smallest things in the universe and could not be divided. atoms are made up of three subatomic particles like protons, neutrons and electrons.

Exercise | Q 3.2 | Page 38

Define the following form :

Isotope

Solution: Isotopes are atoms that have same atomic number but different mass number. Isotopes have same numbers of protons but different numbers of neutrons.
These are some common examples of isotopes: ^3_2He, ^4_2He, $^{12}_6\text{C}$, $^{14}_6\text{C}$, $^{235}_{92}\text{U}$, $^{239}_{92}\text{U}$, $^{289}_{92}\text{U}$.

Exercise | Q 3.3 | Page 38

Define the following form:

Atomic number

Solution: The number of protons in the nucleus of an atom, which is characteristic of a chemical element and determines its place in the periodic table. Atomic number is also equal to numbers of electrons in an atom.
For example :
Atomic number of carbon = 6
Atomic number of nitrogen = 7
Atomic number of oxygen = 8
Atomic number of magnesium = 12

Exercise | Q 3.4 | Page 38

Define the following form :

Atomic mass number

Solution: It is the sum of total number of protons and neutrons present in a nucleus.
atomic mass number = number of protons + number of neutrons.
Atomic number = number of protons = number of electrons.It is denoted by Z.
Mass number = number of protons + number of neutrons. It is denoted by A.
For example : Carbon atom its, Number of proton = 6
Number of neutrons = 6
Number of electron = 6

Atomic number (Z) = number of protons = number of electrons = 6

Mass number (A) = number of proton + number of neutrons = 6 + 6 =12

Exercise | Q 3.5 | Page 38

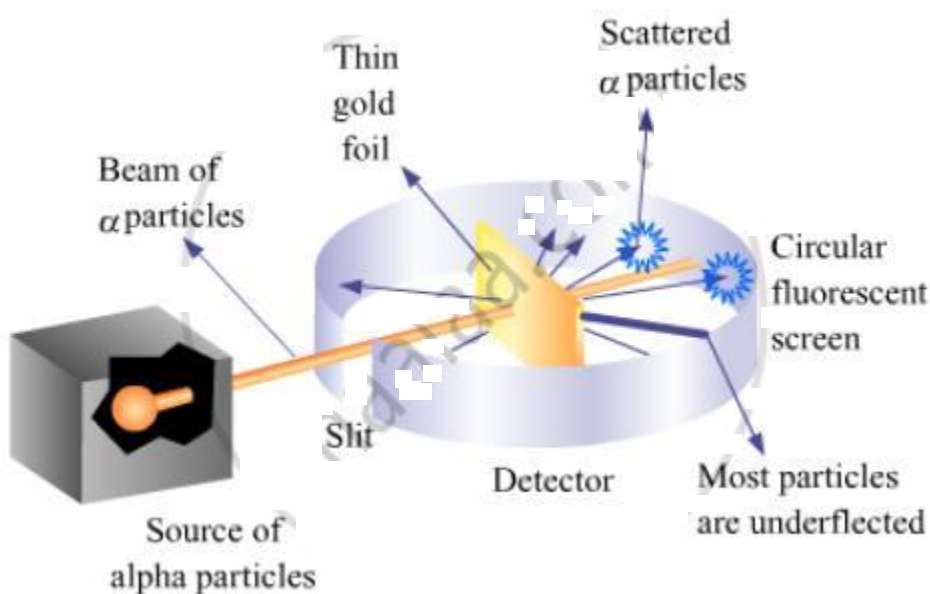Define the following form :

Moderator in nuclear reactor

Solution: Moderator of a nuclear reactor is a substance that slows down the speed of neutrons. In traditional nuclear reactors, the moderator is the same thing as that of coolant like water.

Exercise | Q 4.1 | Page 38

Draw a neat lablled diagram
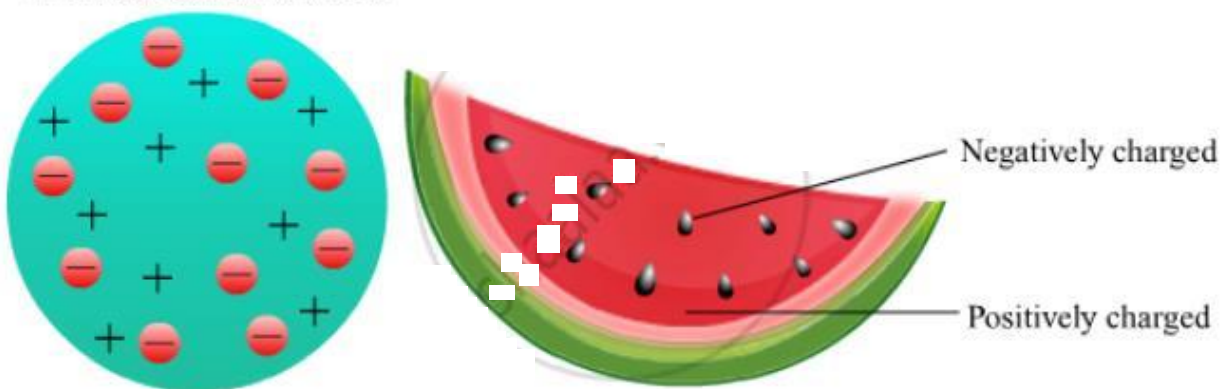
Ruthrford's scattering experiment

Solution:

Exercise | Q 4.2 | Page 38

Draw a neat lablled diagram

Thomson's atomic model

Solution:

Thomson's Atomic Model
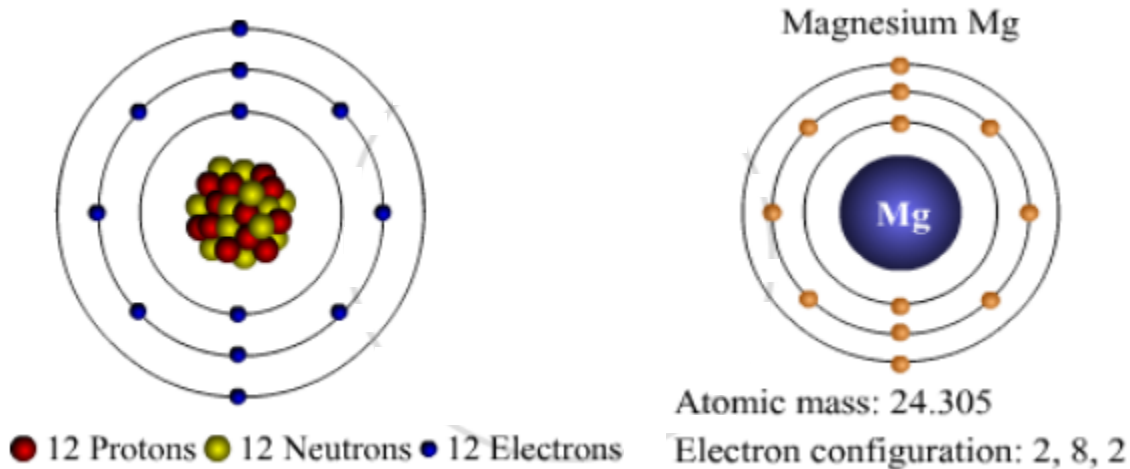

Negatively charged

Positively charged

Exercise | Q 4.3 | Page 38

Draw a neat lablled diagram

Diagramatic sketch of electronic configurations of magnesium (Atomic number 12)

Solution:

● 12 Protons ○ 12 Neutrons ● 12 Electrons

Magnesium Mg

Atomic mass: 24.305
Electron configuration: 2, 8, 2

Exercise | Q 4.4 | Page 38

Draw a neat lablled diagram

Diagramatic sketeh of electronic configuration of Argon (Atomic number 18)

Solution:

Argon
Atomic number is 18

- Electron
- Proton
- Neutron
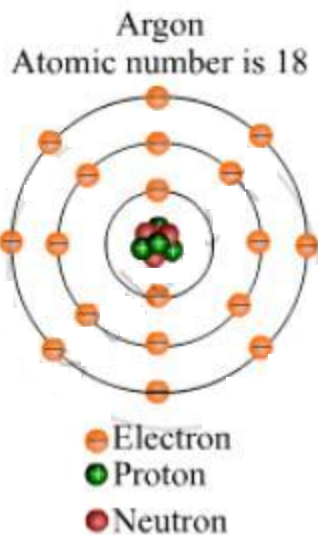
Exercise | Q 5.1 | Page 38

Fill in the blank.

Electron, proton, neutron are the types of _____ in an atom.

Solution: Electron, proton, neutron are the types of **subatomic particles** in an atom.

Exercise | Q 5.2 | Page 38

Fill in the blank.

An electron carries a _____ charge.

Solution: An electron carries a **negative** charge.

Exercise | Q 5.3 | Page 38

Fill in the blank.

The electron shell _____ is nearest to the nucleus.

Solution: The electron shell **K** is nearest to the nucleus.

Exercise | Q 5.4 | Page 38

Fill in the blank.

The electronic configuration magnesium is 2, 8, 2. From this it is understood that the valence shell of magnesium is _____.

Solution: The electronic configuration magnesium is 2, 8, 2. From this it is understood that the valence shell of magnesium is **M shell.**

Fill in the blank.

The valency of hydrogen is 'one as per the molecular formula H_2O . Therefore valency of 'Fe' turns out to be _____ as per the formula Fe_2O_3.

Solution: The valency of hydrogen is 'one as per the molecular formula H_2O . Therefore valency of 'Fe' turns out to be **three** as per the formula Fe_2O_3.

Match the pairs.

Group 'A'	Group 'B'
a. Proton	i. Negatively charged
b. Electron	2. Neutral
c. Neutron	3. Positively charged

Solution:

Group 'A'	Answer
a. Proton	1. Positively charged
b. Electron	2. Negatively charged
c. Neutron	3. Neutral

Deducd from the datum provided.

Datum	To deduce
$^{23}_{11}Na$	Neutron number
$^{14}_{6}C$	Mass number
$^{37}_{17}Cl$	Proton number

Solution:

Datum	To deduce
$^{23}_{11}Na$	Neutron number = Mass number - Number of protons = 23 - 11 = 12
$^{14}_{6}C$	Mass number = 14
$^{37}_{17}Cl$	Proton number = Atomic number = 17