Pakistan School
Kingdom of Bahrain


ربی زدنی علما
BAHRAIN
PAKISTAN SCHOOL
المدرسة الباكستانية

Class: 9th Subject: Chemistry

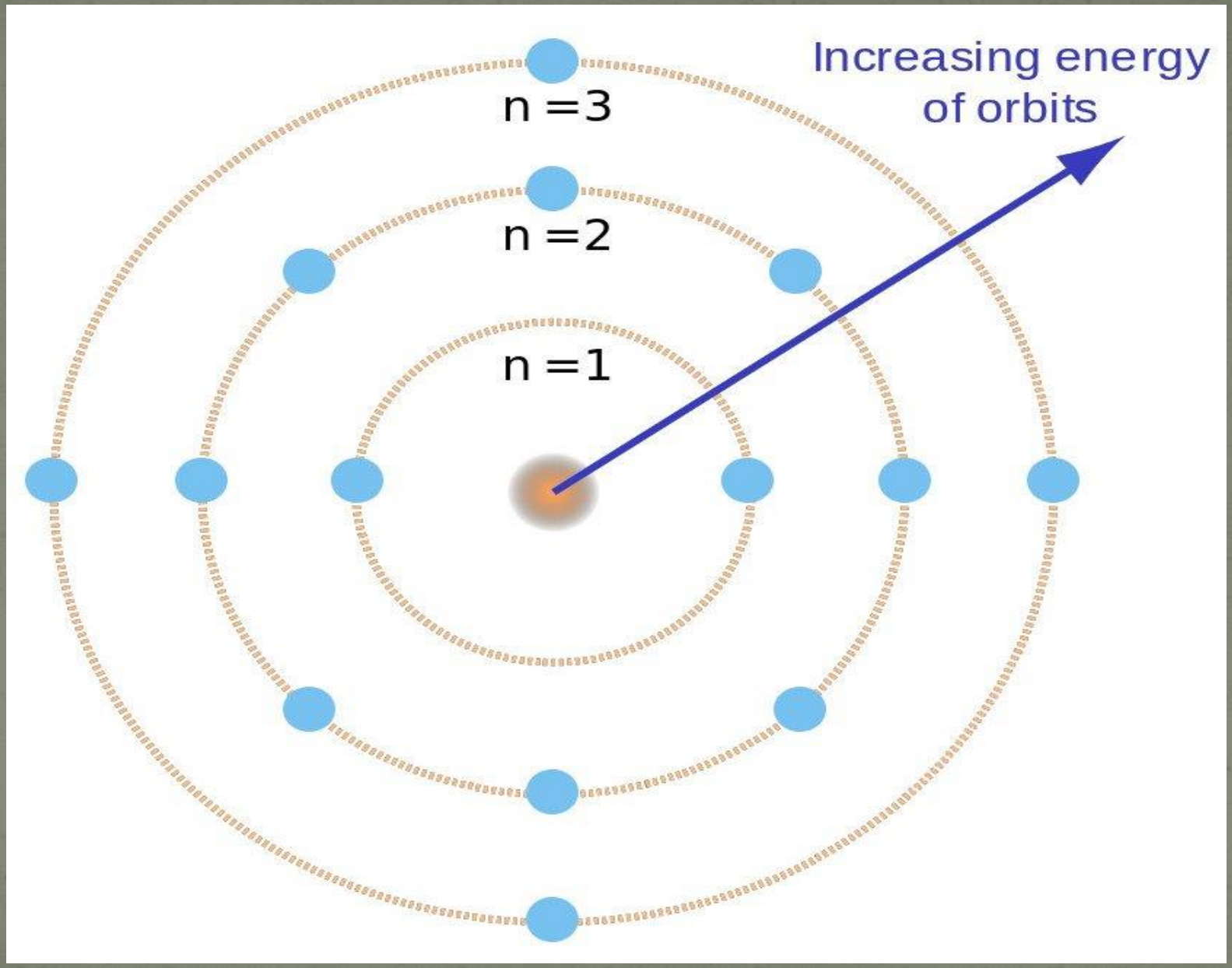
# TOPIC:

## Isotopes

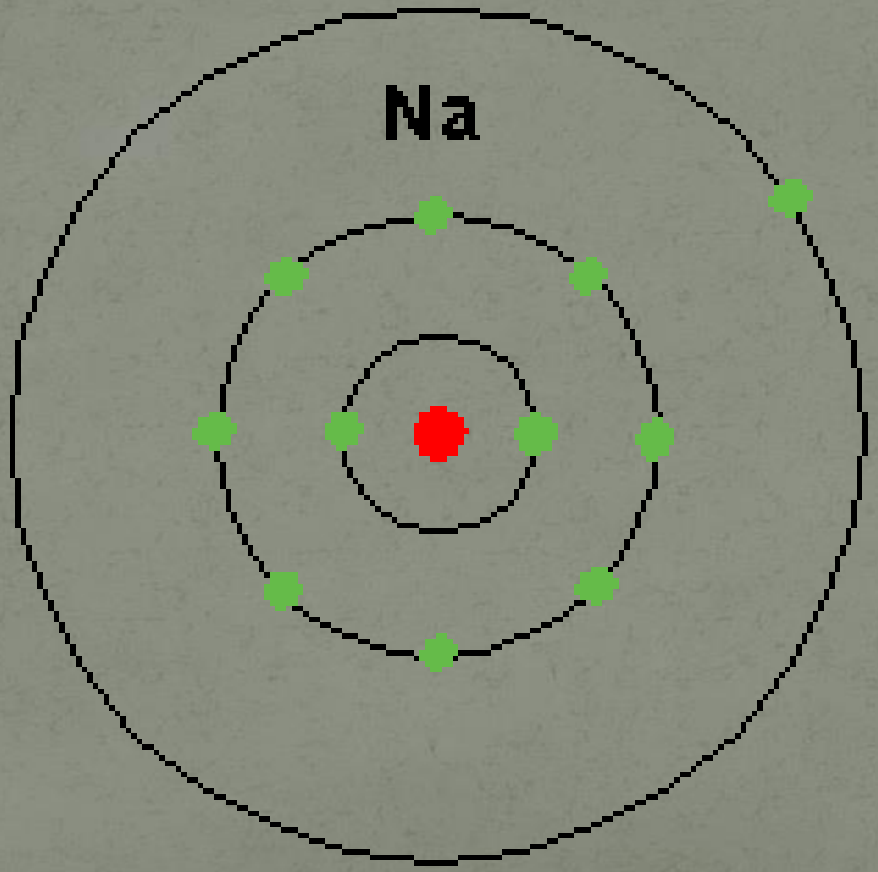
# Objective

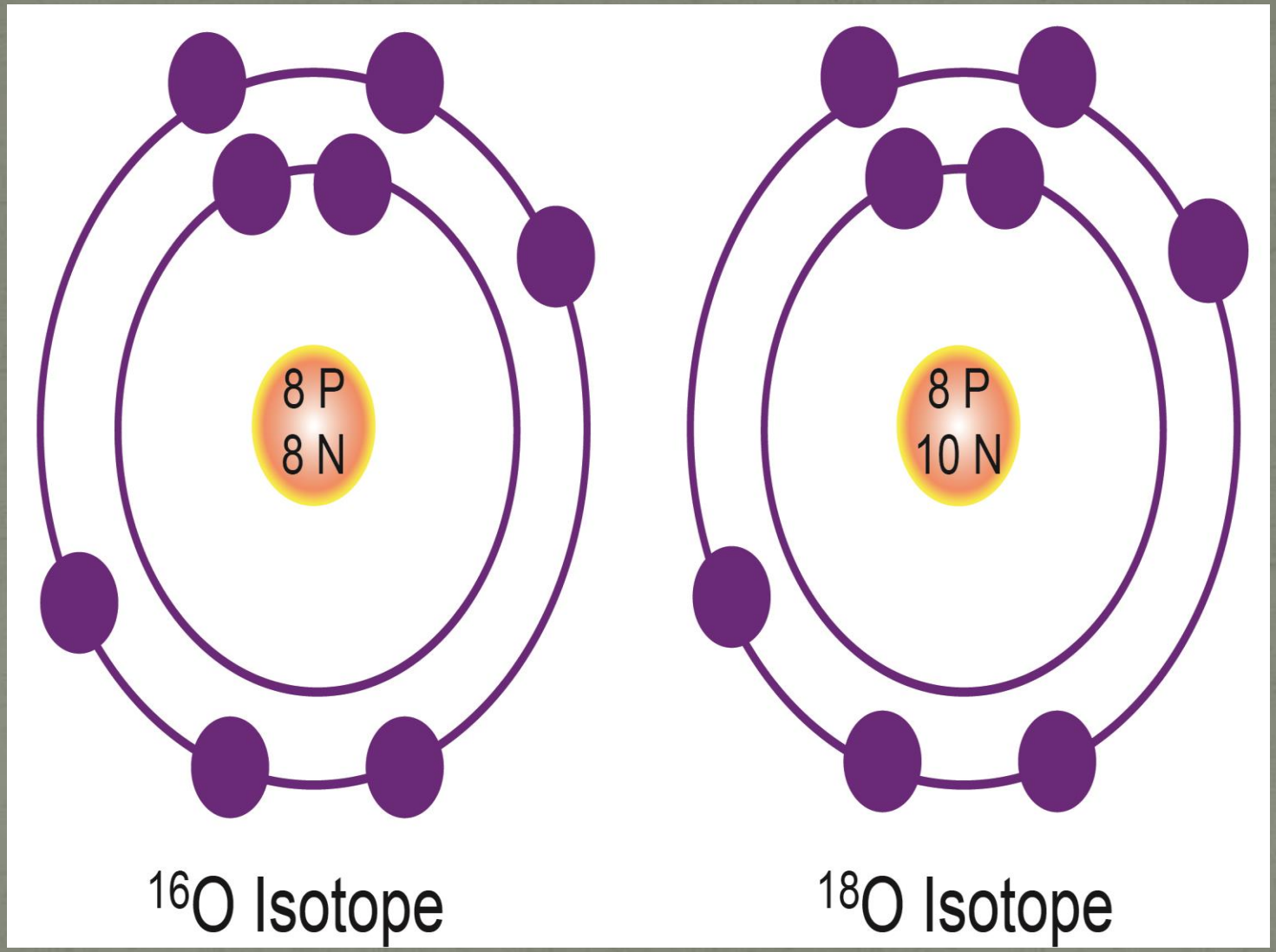
At the end of this lesson Students will be able to:

- Define and explain isotopes
- Draw the Structure of different isotopes from mass no and atomic no.


Increasing energy
of orbits
n =3
n =2
n =1

# Aromic No: 11 Mass No: 23




8 P
8 N
8 P
10 N
$^{16}$O Isotope
$^{18}$O Isotope

# Difference:

- Both have same no of :

1. Proton
2. Electron

- Same Atomic No

BUT

- Different no of neutron
- Different mass no Due to different no of neutron

## Isotopes:

- Nuclei of the same element having same atomic number but different mass number are known as isotopes.

  **OR**

- Nuclei of same element having same number of proton but different number of neutron are knows as isotopes.
- The word Isotope was first used by Soddy. It is a Greek word isos" means same and tope" means place.

- Isotopes are chemically alike and differ in their physical properties.

# Properties of Isotopes

- Chemical properties are primarily determined by the **number of electrons**
- All isotopes has the same number of electrons, so they have **nearly identical** chemical properties even though they have different masses.
- **Physical properties** often **depend on the mass** of the particle, so among isotopes they will have slightly different physical properties such as density, rate of diffusion, boiling point…

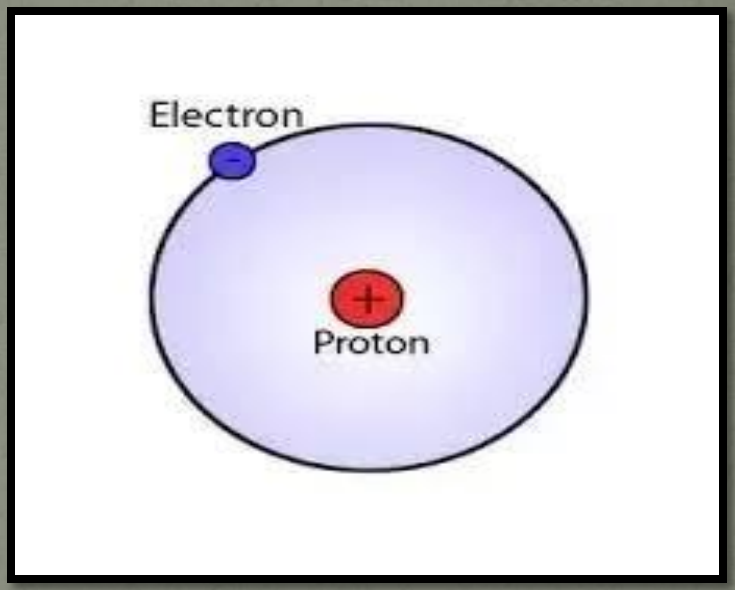
- **Isotopes Of Hydrogen**

There are three isotopes of hydrogen.

- Protium
- Deuterium
- Tritium

# Protium

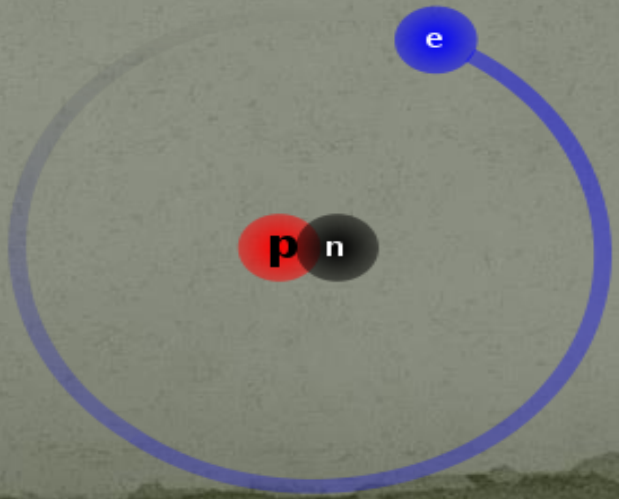
- Ordinary hydrogen is knows as protium .
- It has one electron ,one proton but it has no neutron.
- Mass number : 1
- Charge number : 1
- Symbol : $_1H^1$




**Percentage in natural hydrogen: 99.98%**

# Deuterium

- It has one electron one proton and one neutron.
- Mass number: 2
- Charge number: 1
- Symbol: $_1H^2$ or D
- **Percentage In Natural Hydrogen: 0.0156%**
- **Structure**
  Heavy water($D_2O$) consists of deuterium isotope of hydrogen.

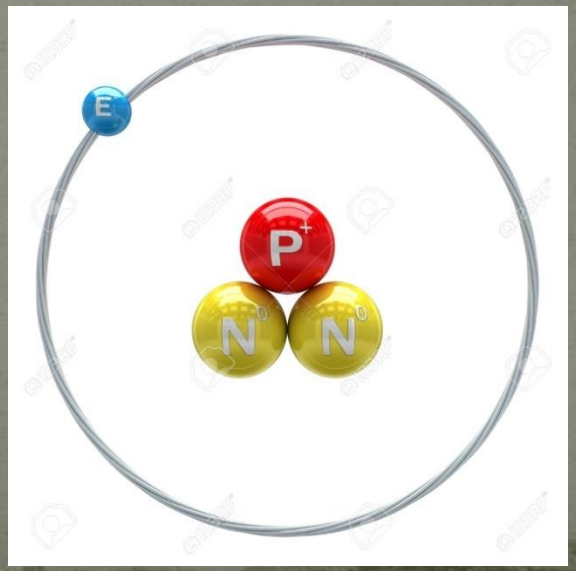


# Properties of Heavy Water and Ordinary Water

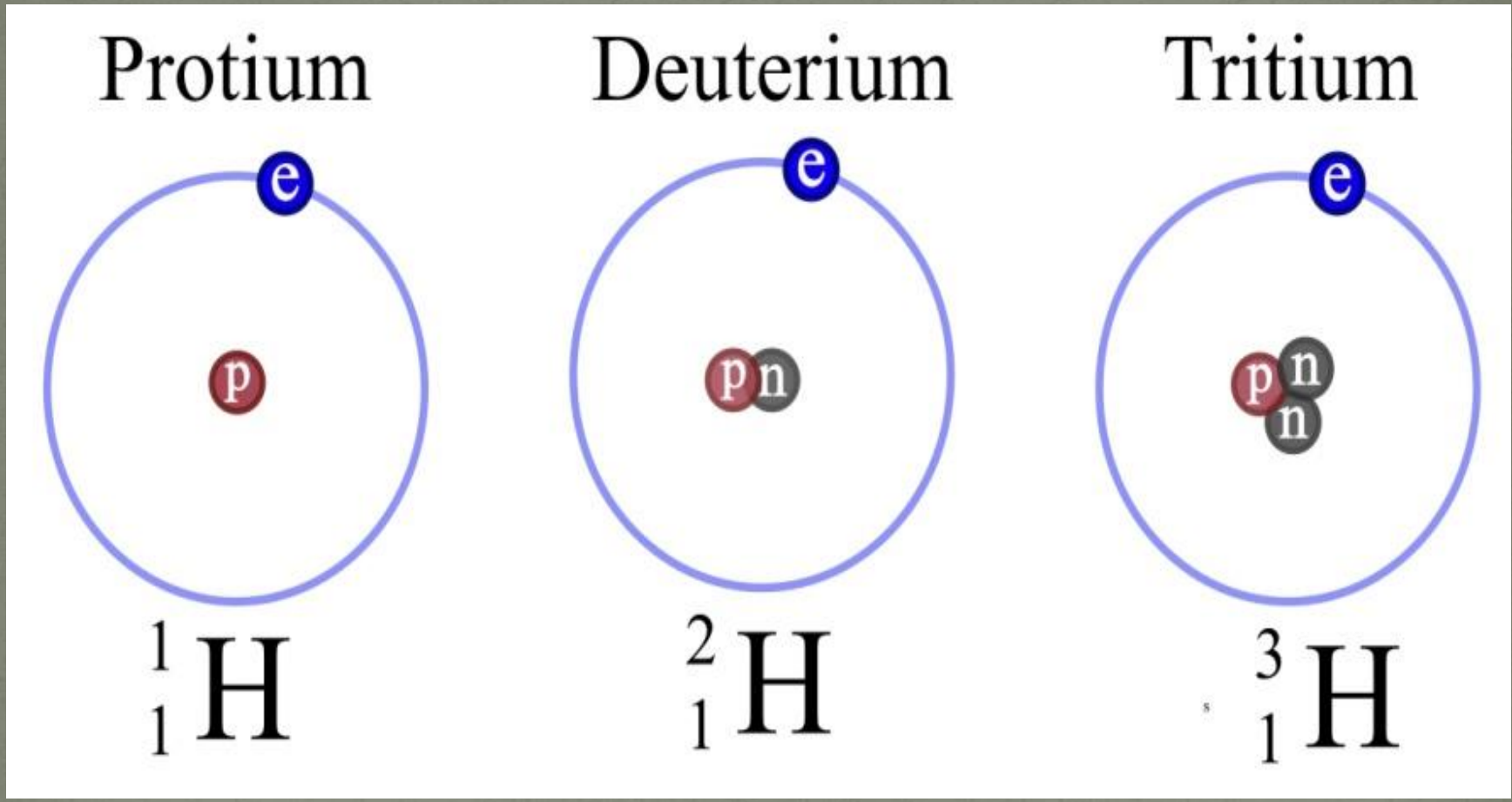
| PROPERTY | ORDINARY WATER | HEAVY WATER |
|---|---|---|
| Molecular Mass | 18 grams/mol | 20 grams/mol |
| Density at 25 DC | 0.997 g/cc | 1.105 g/cc |
| Temperature at max. Density | 4.0 °C | 11.6 °C |
| Melting Point | 0.00 °C | 3.802 °C |
| Boiling Point | 100.0 °C | 101.42 °C |

# Tritium

- It has one electron, one proton and two neutrons.
- Mass number : 3
- Charge number : 1
- Symbol : ${}_{1}H^{3}$
- It is a radioactive isotope. Not occurring naturally
- It emits radioactive rays.
- It is present in traces.

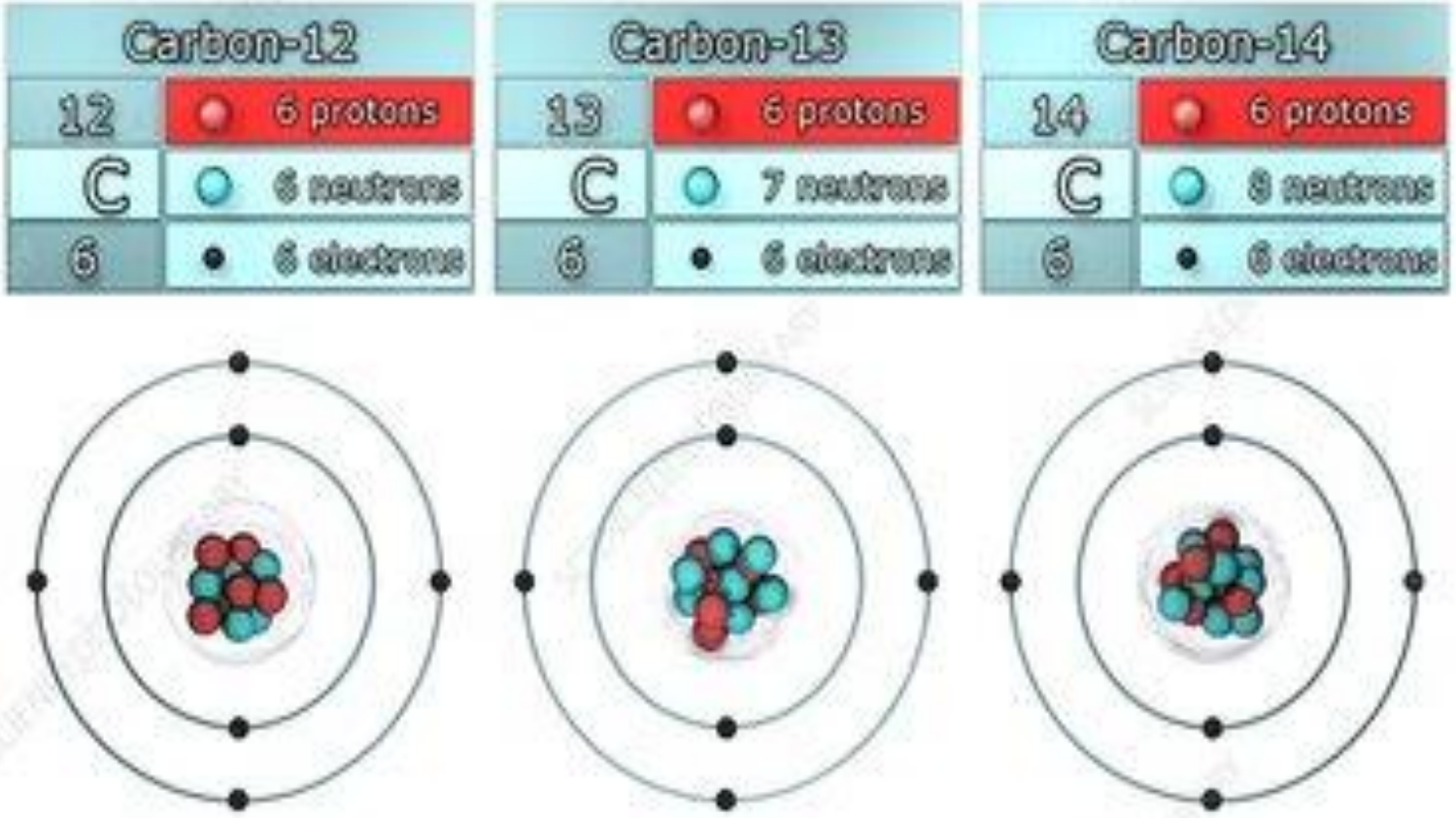


**radioactive isotope**, also called **radioisotope**, any of several species of the same chemical element with different masses whose nuclei are unstable and dissipate excess energy by spontaneously emitting radiation in the form of alpha, beta, and gamma rays.


Protium
e
p
$^{1}_{1}H$
Deuterium
e
p
n
$^{2}_{1}H$
Tritium
e
p
n
n
$^{3}_{1}H$

## Isotopes Of Carbon

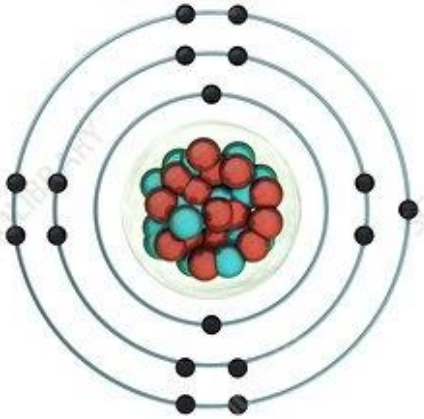
- Carbon has three isotopes: C-12, C-13, C-14.
- Almost all carbon is carbon-12,
- its symbol is $_{6}C^{12}$.
- Its %age in nature is 98.9% , C-13 1.1% in nature. C-14 is radioactive.


Carbon-12
12
C
6
6 protons
6 neutrons
6 electrons
Carbon-13
13
C
6
6 protons
7 neutrons
6 electrons
Carbon-14
14
C
6
6 protons
8 neutrons
6 electrons

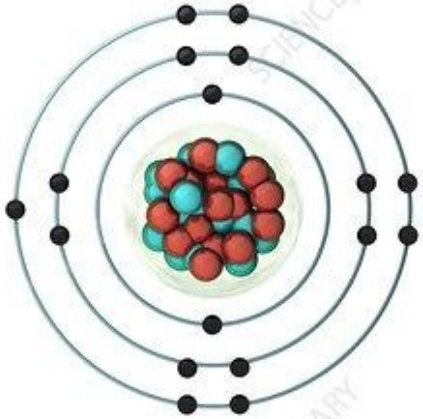
# Isotopes of Chlorine:

- There are two natural isotopes of chlorine, chlorine-35
  and chlorine-37
- Chlorine-35 occur in nature about 75% and chlorine-37 about 25%.
- It is fairly soluble in water.
- Chlorine is a greyish yellow gas with sharp pungent irritating smell.

| Chlorine-35 | |
|---|---|
| 35 | 17 protons |
| Cl | 18 neutrons |
| 17 | 17 electrons |



| Chlorine-37 | |
|---|---|
| 37 | 17 protons |
| Cl | 20 neutrons |
| 17 | 17 electrons |



# Plenary

- How many number of electron, proton and neutron in $_{17}Cl^{35}$ ?
- Hydrogen has____ isotopes.
- Ordinary hydrogen is knows as protium . (T/F)
- The word Isotope was first used by?

  A-Rutherford B- Soddy C- Neil Bohr D- Dalton's
- Define Isotopes?

# Home wrok

- Search and write about isotopes of Uranium?


STAY
home
STAY
safe

# ALLAH HAFIZZ