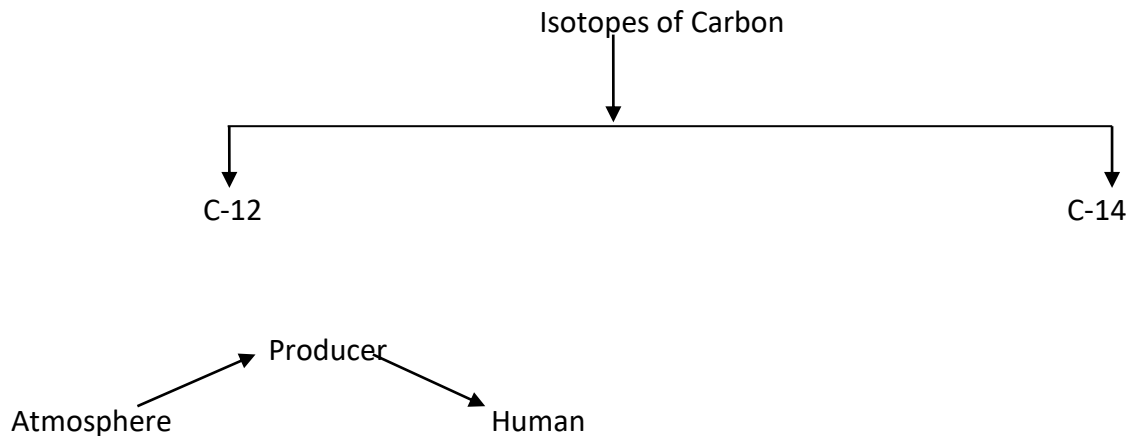
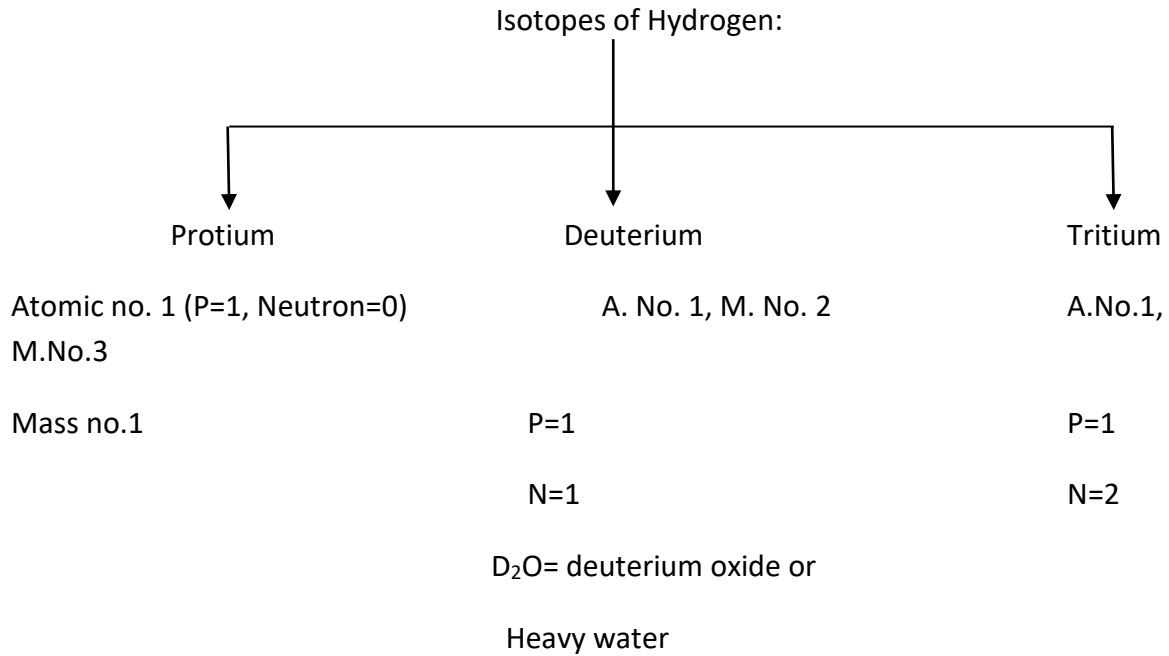


## ATOMIC ENERGY

Isotopes have same atomic number but different atomic mass or mass no.



In Living: There is continuous supply of C-12 and C-14 organism

Carbon Dating

**Carbon Dating**

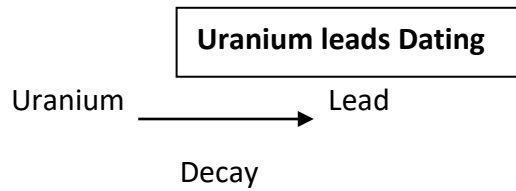
After death C-14 decays into C-12

C-14 Radioactive → C-12

Ratio of C-14 to C-12 is used to calculate the age of fossil.

Half life:- The time in which the amount of radioactive nuclei is reduced to 50%

Half life of C-14 is 5700 years



It is used to find the age of geological structure.

**Isotopes of Uranium:**

U - 235 – 0.7% - undergoes fission larger nuclei breading into smaller nuclei

U – 238 – 99.3% - doesn't undergo fission

→ neutrons are bombarded on U-238 it is converted into plutonium



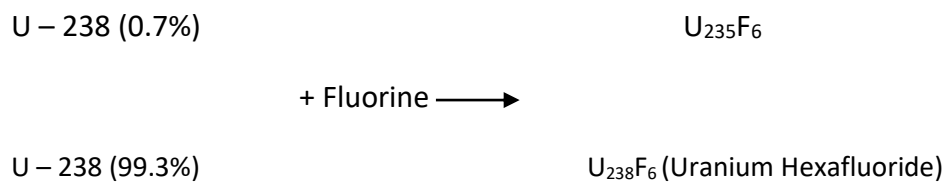
→ In Nuclear bombs U-235 and Plutonium

→ U-233 (it is a man made isotope)

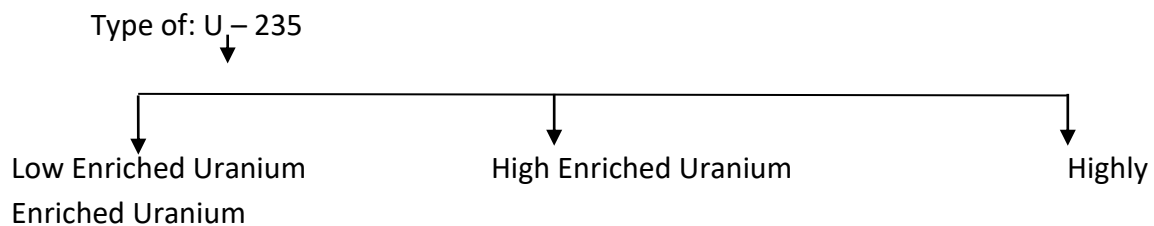


When neutrons are bombarded on thorium it is concerted.

Enrichment of uranium: through centrifugation



Nuclear centrifuge: Centrifuge things are repeated on the basis of molecular masses



-U- 235 is 5-10%

U-235 is 20-25%

U-235 is more than 85%

- used in power reactors  
purpose

used in nuclear reactor of submarine

It is uses in weapon

INS- Arihant (In our first nuclear submission)

Also used in research reactors for isotope

Production

**IAEA:-** International Atomic Energy Agency

Objective: Inspection of Nuclear facilities to find out level of enrichment for peaceful  
programmer enrichment required 20-25%

Alter the Indo- US Nuclear agreement India has divided its nuclear facilities into:

Civilian and military grade reactor. The civilian facilities will be open for inspection b y IAEA

**DAE: Department of Atomic Energy**

**AMD:**

Atomic mineral directorate.

The survey and exploration of atomic minerals and rare earth minerals

Headquarter: Hyderabad

**UCIL**

Uranium Corporation of India limit

Mining of Uranium

H.Q. - West Singhbhum (Jharkhand) and

it is one no.1 in Uranium production jadhugoda, Bhatin nar, warpahar

2. Andhra – Pradesh:

Tumalpalle

Lambapur

3. Meghalaya:

Working mine Wakhyn Domiarat

4. Rohil (Rajasthan)

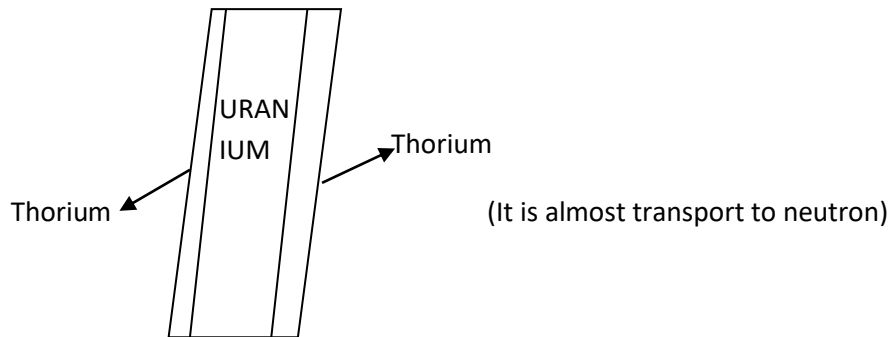
Bhima Basin (Karnataka)

Uranium ore is also called as – Yellow cake

**NFC** : Nuclear fuel complex

H.Q. – Hyderabad

Function:- Fabrication of fuel rods.



**Strategic Reserve in Chitr durga district Bangalore**

And it is not open to IAEA (only for military purpose)

**Heavy water Board**

H.Q. Mumbai

It regulates production of heavy water.

Heavy water plants in India:-

1. Hazira -Gujrat
2. Baroda -Gujrat
3. Thal -Maharashtra
4. Talchar -Odisha

**Nuclear power Companies** :

1. NPCIL: - Nuclear power corporation of India Limited
  - a. NPCIL is operating The first stage nuclear power plant – **PHWR** (Pressured heavy water reactor)
  - b. **Foreign Reactors:-** will be operated by NPCIL Katpakkam 1000 mw\*12 reactor Russian

2. BHA VINI: \_Bhartiya Navkiya Vidyut Nigam Limited.

It is operating the fast breeder reactor at Kalpakkam ( 2<sup>nd</sup> stage Nuclear programme)

**Research Organization**

1. **BARC** : Baba Atomic Research center from bay
2. **IGCAR** : India Gandhi center for Atomic Research Kalpakkam (tamil nadu)  
(PHWR and fast breeder reactor in Kalpakkam and India Gandhi Atomic center)
3. **BRIT** : Board of Radiation and Isotope Technology.  
It provides radio isotope to users in different areas. Radio isotope BRIT deta hai and at the end of its life cycle it has to.

**Nuclear Power plants in India**

Narora - Bulandshehar (west U.P)

Rajasthan - Rawat Bhatta (Kota)

Bombay - Tarapur 1<sup>st</sup> nuclear power and it was supplied by US

Karnataka - Kaiga

OMaharashtra -

Jaitpur

French nuclear reactor will be established rector = 1600mw

Tamil Nadu - Kudankulam 1000\*2 Russian reactor

Tamil Nadu - Kalpakam – both NPCIL plant and Bhavini plant

Q. Why India should have a nuclear power programme:

Energy is the fundamental requirement of any nation. Relevance if energy is more in case of a developing country because energy demand will increase with development power demand becomes stable once a country reaches relative degree of development average energy consumption of an Indian is 1/15 of an American Citizen.

Indian energy dependence on import has increased. India now imports 80% of its crude oil and natural gas.

Fukushima (2011) accident led to public discussion across the globe on utility of nuclear power.

A few European countries have announced to phase out nuclear power in next 2 to 3 decade very few countries have announced setting up to new nuclear power plants.

Nuclear power is facing tough challenge from renewable energy: Solar and wind cost of renewable energy has come down drastically

The Recent proposal in India is below Rs. 3 per unit Renewable energy doesn't general waste like power or nuclear power

The global nuclear industry is still reeling (suffering) from Fukushima impact just 3 of the 42 Japans reactor are currently operative France which produces more than 70% of its power from nuclear energy plans to out it reliance on atomic nuclear energy

New nuclear power has become increasingly uneconomical in the west due to high plant construction cost. This has prompted US and France to expert reactors to new nuclear new commers such as Cash Rich West Asia. But bulks of the new reactors under consideration are planned world wide are located in just 4 countries:

China, Russia, South Korea, India

Nuclear power has percentage of total power production:

1. France : 74%
2. Japan : arrived 30%
3. South Korea : 32%
4. Ukraine : 40%
5. India : 2%

India has vast reserves of thorium which is the nuclear fuel for future India has a 3 stage programme where it will ultimately utilized the thorium reserves.

India recently announced setting up of "10 indigenous 1700 mw PHWE". Despite the Indo US deal in 2006 no agreement has been ringed for commercial supply of reactors from USA, Japan or France. Most of the western nuclear power complains are facing grave economic situation

India plans to have a judicious mix of thermal, renewable, and nuclear power. Nuclear power is relatively claim & stable where as renewable power shows high variability dependent on the environmental and welters condition

India Paris Accord has announced to have 40% of power production from non-fossil- fuel sources by 2030.

## **Thorium As Nuclear Fuel**

- Thorium is more abundant than uranium. It also occurs in pure form.
- Thorium produces 8- times more energy per unit mass as compared to uranium 235 thus the total energy contained in thorium reserve is more than the energy contained in coal, Oil, Gas & uranium put together.
- Uranium – 233 can't be used in weapons (bomb making). Thus it reduces the risk of nuclear proliferation and security threat.
- Cost of production of thermal plant increases with time.