

QUESTION NO. 3

(d) What are isotopes, isobars and isostones? Give examples of isotopes of Hydrogen.

Answer **ISOTOPES:**

Isotopes are the atoms of the same material having same atomic number (Z) but different mass number (A). Every chemical element has one or more isotopes.

Literal Meaning:

Iso + topes

Same forms

Literally means same forms or same species.

Example:

i) Hydrogen: Protium (${}^1\text{H}$), Deuterium (${}^2\text{H}$), Tritium (${}^3\text{H}$)

ii) Carbon: Carbon-12, Carbon-13, carbon 14.

iii) **Uranium:** Uranium-235, Uranium-238

These isotopes have the same number of protons but different number of neutrons in their nuclei.

(b) **ISOBARS:**

Isobars are the atoms of the same material having same mass number (A) but different atomic number (Z).

Literal Meaning:

Iso + Bars

Same weight or pressure

Therefore, isobars literally means "same weight" or "equal weight"

Examples:

i) **Potassium-40**

Has 19 protons and 21 neutrons.

ii) **Calcium-40**

Contains 20 protons & 20 neutrons.

A

Both have a mass number of 40 but differ in their atomic numbers, making them isobars.

(c) ISOTONES:

Isotones are the atoms with the same number of neutrons but different numbers of protons. This means these atoms or nuclei have the same overall mass (sum of proton and neutron) but differ in the number of protons, hence belonging to different elements.

Literal meaning:

Iso + tones
↓ ↓
Same tension/pressure

In the content of atomic physics, isotones means same number of neutrons but different number of protons.

Examples:

i) Chlorine - 37

Has 17 protons and 20 neutrons.

ii) Potassium - 39

Has 19 protons and 20 neutrons.

ISOTOPES OF HYDROGEN

There are three isotopes of hydrogen: protium, deuterium, Tritium. They are also known as hydrogen-1, hydrogen-2, and hydrogen-3.

Atomic Number (Z):

It refers to the "number of protons present in the nucleus of an atom."

It is fundamental property that defines element and its position in the periodic table.

It denotes by the symbol (Z)

Atomic Mass (A):

It refers to the mass of an atom, specifically "the sum of protons and neutrons in the nucleus of an atom".

Atomic mass is not a whole number because it takes into account the average mass of all isotopes. It is denoted by (A)

Illustration of Isotopes of Hydrogen

