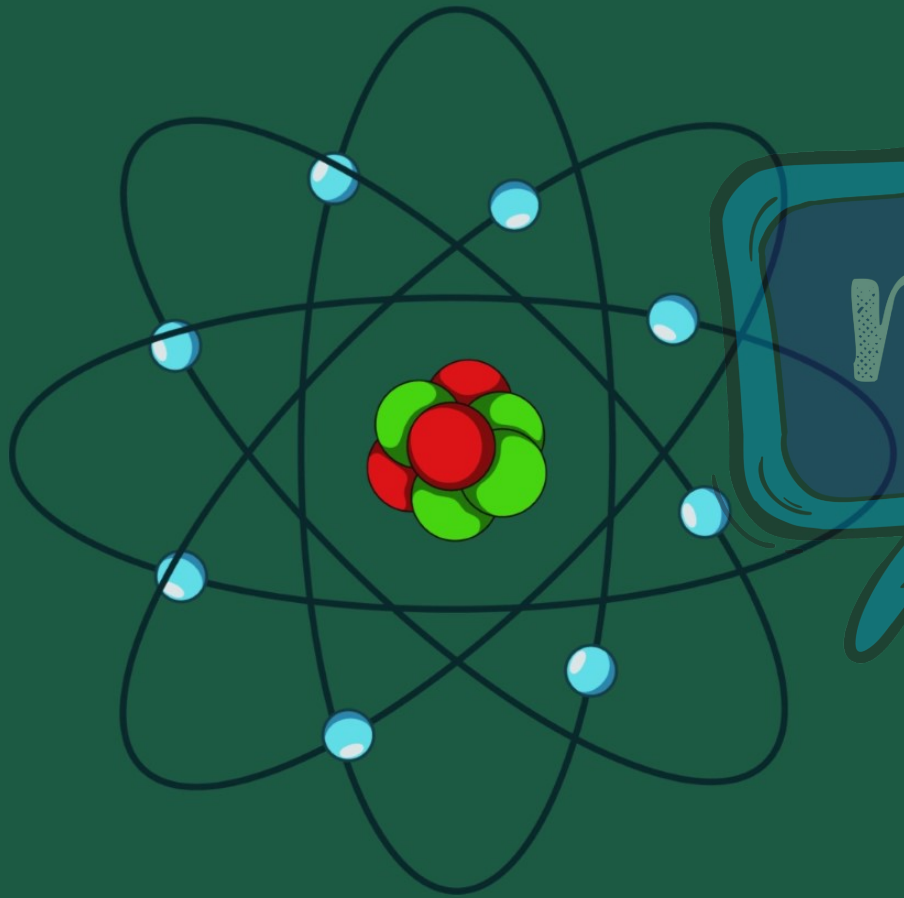
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Class–9

SCIENCE

Chapter – 4

Structure of the Atom

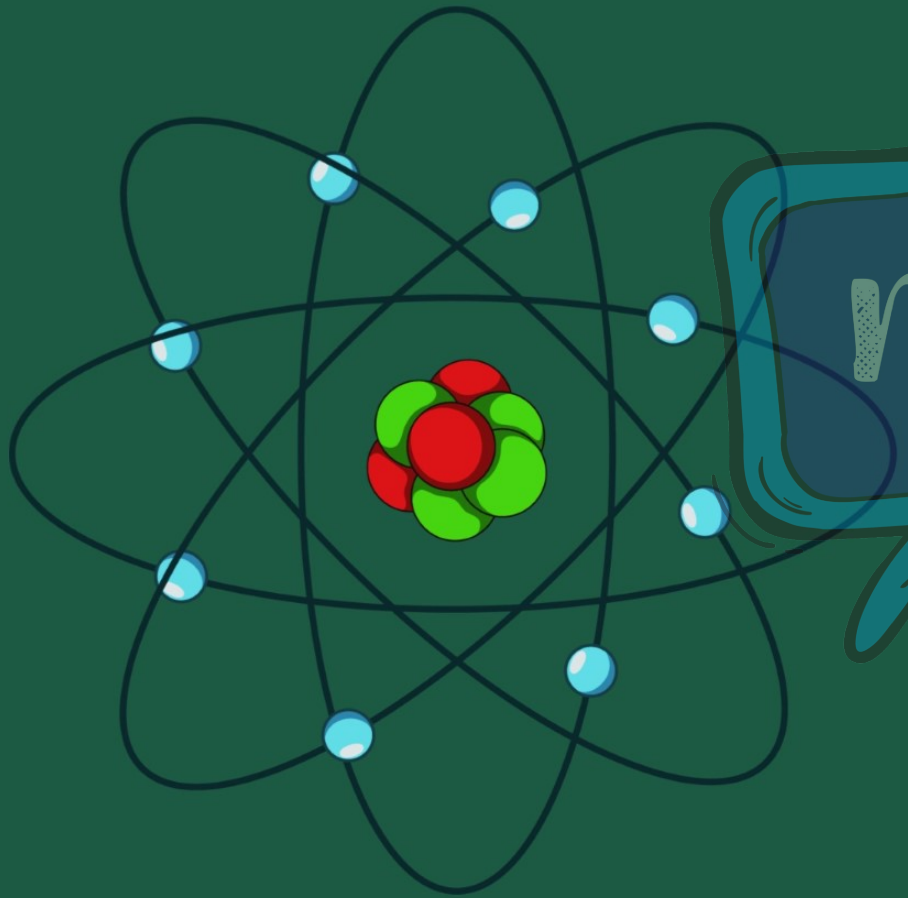
Part – 3
Atomic Number & Mass Number

Deeksha Pahilajani

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OVERVIEW

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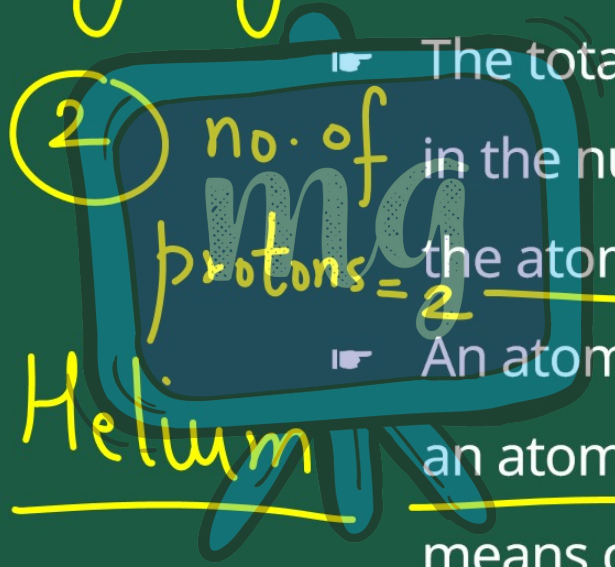
1. Models of an atom
2. Electron Distribution & Valency
3. Atomic Number & Mass Number

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ATOMIC NUMBER

- The total number of protons present in the nucleus of any atom is called the atomic number.
- An atomic number is the identity of an atom, changing atomic number means changing the atom.



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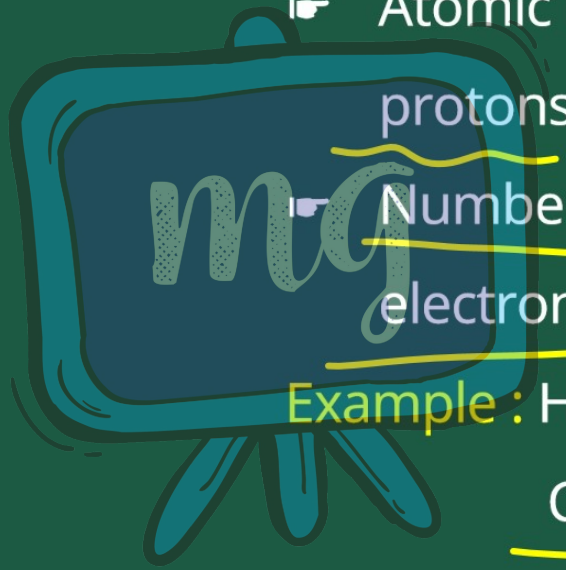
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Z = G

- Atomic number is denoted by 'Z'.
- Atomic number = number of protons.
- Number of protons = number of electrons.

Example : Hydrogen, Z = 1.

Carbon, Z = 6.



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Mass Number

- It is the sum of number of protons and number of neutrons lying in the nucleus of an atom.
- It is denoted by 'A'.
- Mass number = number of protons + number of neutrons.
- A = P + n or Z + n.
- n = A – Z.

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$A = 35$ Cl

$Z = 17$

Example: Calculate number of protons and neutrons for $^{35}_{17}Cl$.

- No. of electrons = No. of protons = 17
- Mass number of Cl = 35.
- No. of neutrons = 35 – 17 = 18.

$\therefore$

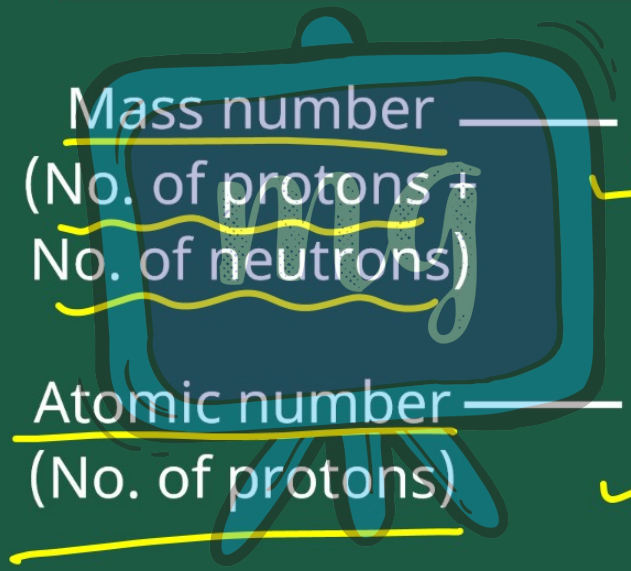
$A = Z + n$

$n = A - Z$

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NOTATION FOR AN ATOM



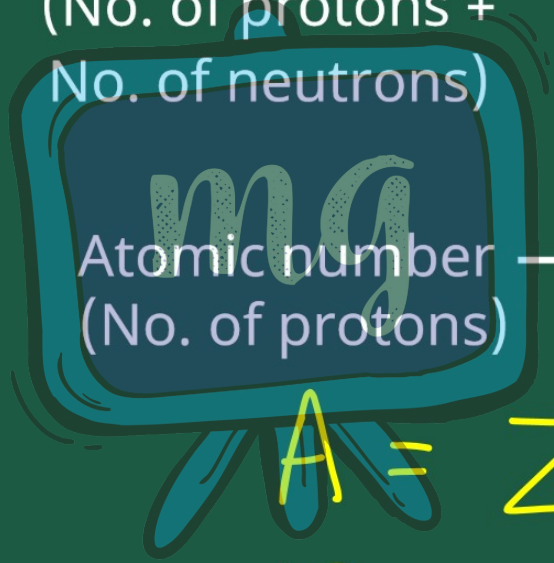
Mass number (No. of protons + No. of neutrons) — A

Atomic number (No. of protons) — Z

X — Symbol of element

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Mass number — 12

(No. of protons + No. of neutrons)

C — Symbol of element

Atomic number — 6

(No. of protons)

$A = Z + n$

$12 = 6 + n$

$n = 12 - 6 = 6$

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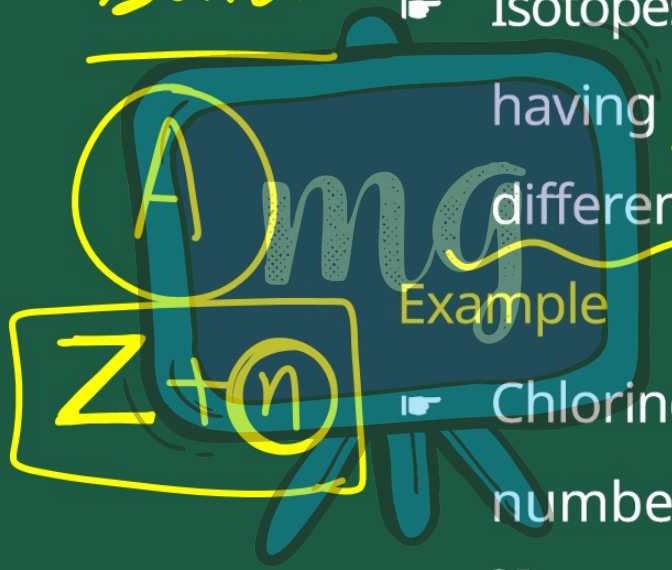
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no. of protons are same

Hydrogen

Isotopes

- Isotopes are atoms of same element having same atomic number and different mass number.



Example

- Chlorine has two isotopes of mass numbers 35 and 37 respectively.

$^{35}_{17}Cl.$ and $^{37}_{17}Cl.$

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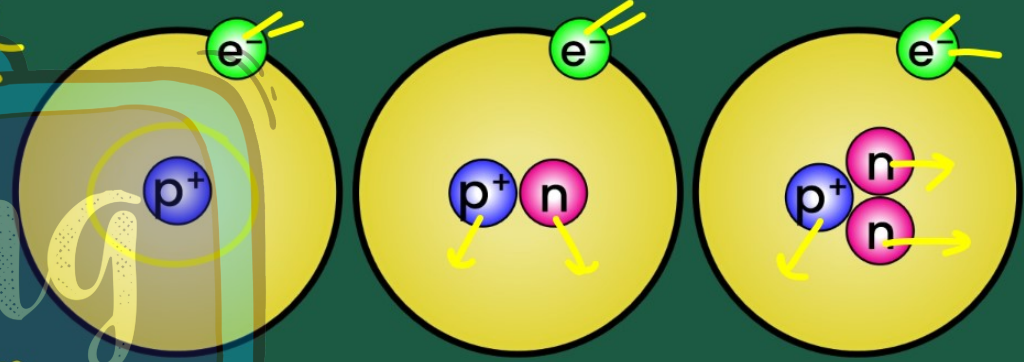
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Chemical properties are same

Example

Physical properties are different

Hydrogen



Protium	Deuterium	Tritium
$_{1}^{1}H$	$_{1}^{2}H$ or D	$_{1}^{3}H$ or T
1p		

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Uses of Isotopes

(i) Uranium isotope is used as fuel in nuclear reactors.

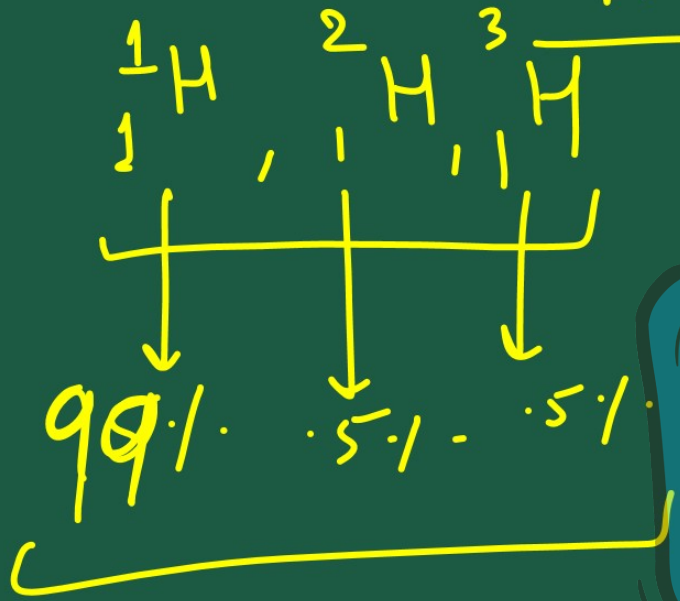
(ii) Isotope of cobalt is useful in treatment of cancer.

(iii) An isotope of iodine is used in the treatment of goitre.

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Protons & Neutrons



Isotopes and Relative Atomic Mass

☛ Isotopes are atoms of the same element that have different number of neutrons.

E.g. Chlorine has two isotopes

18 neutrons	20 neutrons
17 protons	17 protons
17 electrons	17 electrons
Abundance: 75%	Abundance: 25%
$^{35}_{17}Cl$	$^{37}_{17}Cl$

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☛ The relative atomic mass of an element is the average mass of all the isotopes of the element. It takes into account the percentage abundance of the isotopes.

Relative atomic mass =

$(75\% \times 35) + (25\% \times 37) = 35.5\ u$

$\frac{75}{100} \times 35 + \frac{25}{100} \times 37$

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ISOBARS

- Isobars are the atoms of different elements which have the same mass number but different atomic numbers.

Example

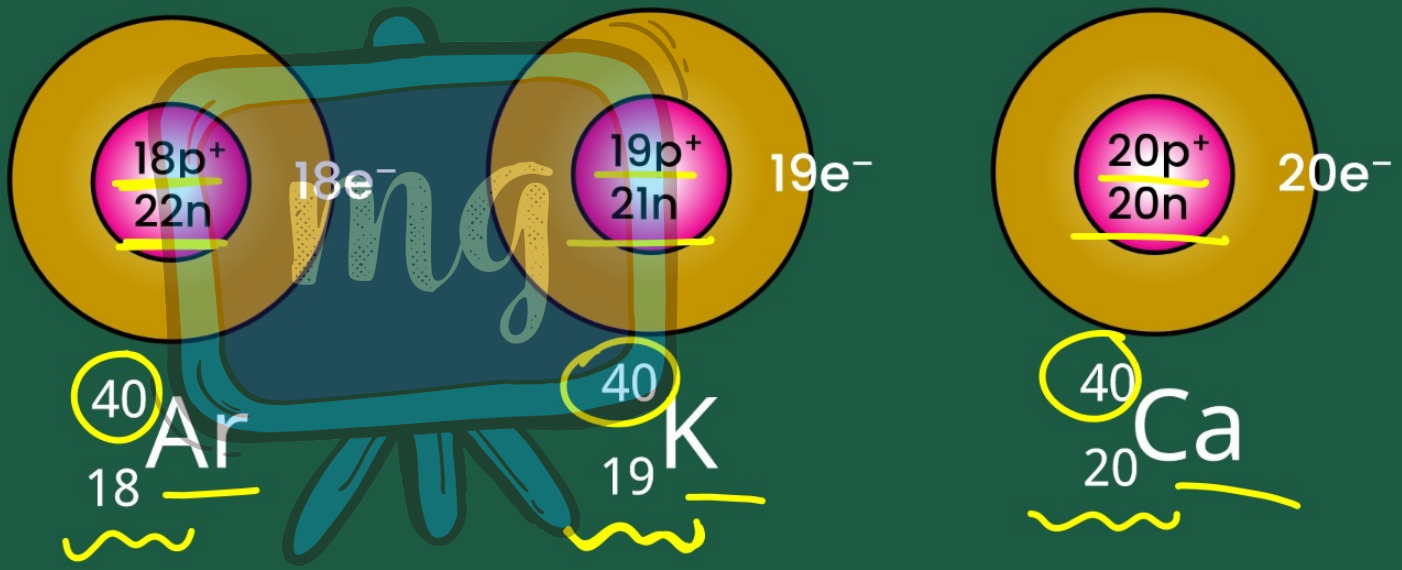
$^{40}_{20}Ca$ and $^{40}_{18}Ar$.

$^{14}_{7}N$ and $^{14}_{6}C$.

$^{12}_{6}C$

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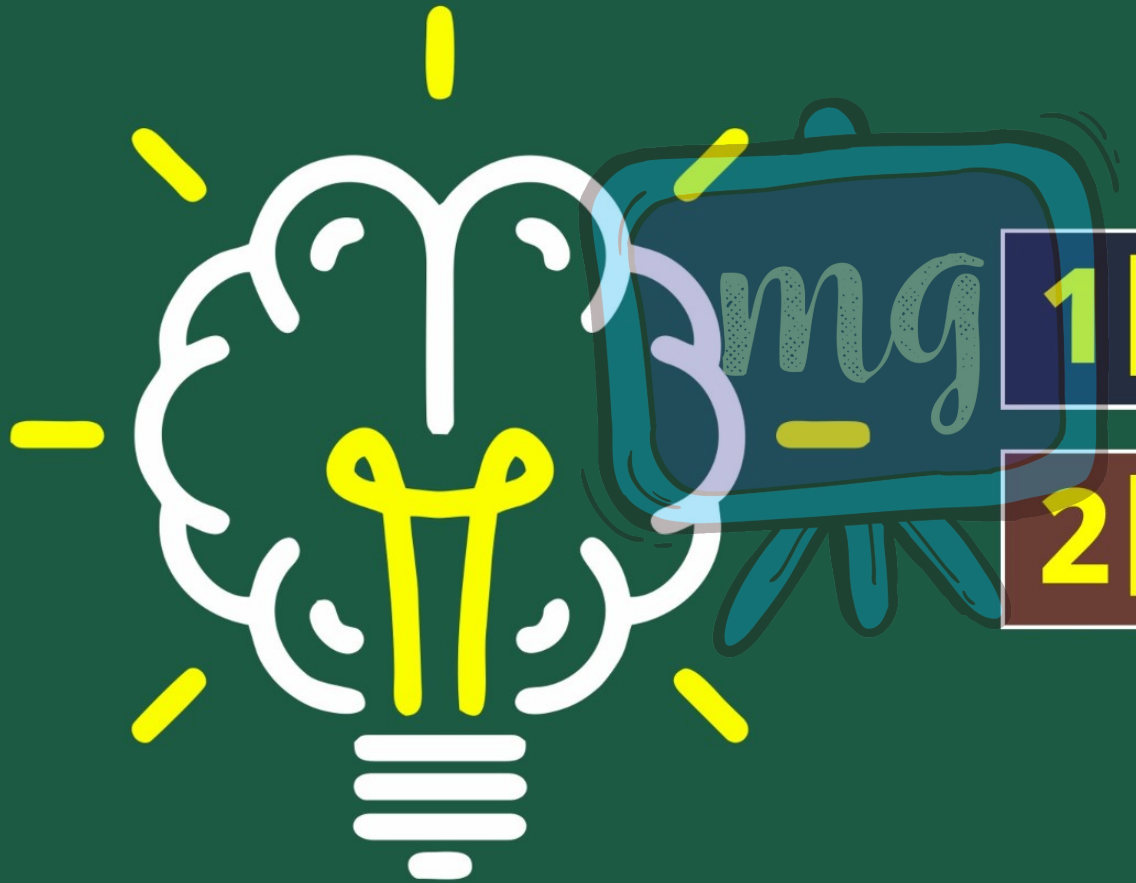


Example of Isobar

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LEARNING OUTCOMES

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1. Atomic number and Mass number
2. Isotopes and Isobars

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ASSESSMENT

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1 Isotopes of an element have

A ~~The same~~ different physical properties

B ~~Different~~ Same chemical properties

C Different number of neutrons

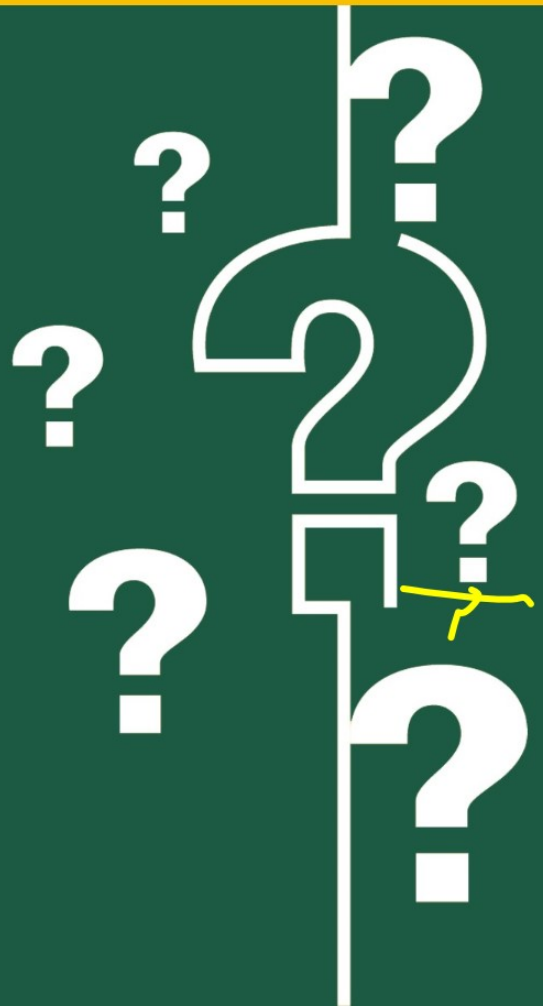
D ~~Different~~ Same atomic numbers.

p+n p+n

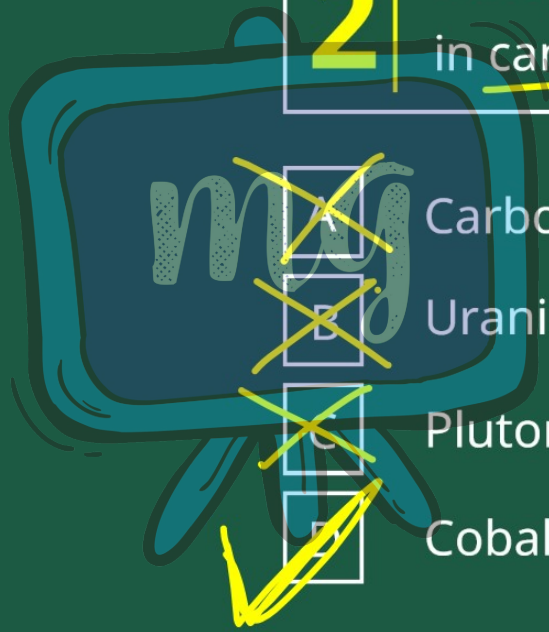
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ASSESSMENT

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2 Isotope of which element is utilized in cancer treatment?



A Carbon

B Uranium

C Plutonium

D Cobalt

nuclear reactors

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ASSESSMENT

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3 The number of protons present in the nucleus of an atom is called:

- A Atomic mass
- B Atomic number
- C Mass number
- D Nucleon number

$A = Z + n$

Z = no. of protons