

$$m = \frac{90.51}{100} \times 20 + \frac{0.27}{100} \times 21 + \frac{9.22}{100} \times 22$$
$$= 20.18 \text{ amu}$$

## Nuclear constitution summary:

- protons, neutrons, (A, Z, a.m.u., MeV/c<sup>2</sup>)
- Nuclear force
- Shape, Size, Density



# Classifications of Nuclei

- 1<sup>st</sup> Classification: based on **similarity**
- 2<sup>nd</sup> Classification: based on **stability**



## 1<sup>st</sup> Classification of Nuclei: on similarity basis

First Periodic Table (1869) → by Dimitri Mendeleev  
↳ 63 elements known @ that time  
↳ Acc. to Atomic masses. (A)

Moseley's Characterization (1913-14)

↳ He arranged the elements according to atomic no. (Z)

What is an Element → Atomic No. (Z) can be called as "identity" of an element.

# 1<sup>st</sup> Classification of Nuclei: on similarity basis

First Periodic Table (1869)

Moseley's Characterization (1913-14)





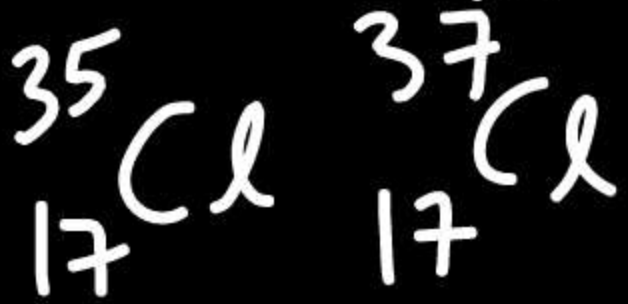
# 1<sup>st</sup> Classification of Nuclei

same - protons

1). Isotopes :- Atoms of same element, but different

(same Z)

number of nucleons.



Ex.



proton  
H-atom



Deuterium  
(Heavy Hydrogen)

same  $\leftarrow [Z \rightarrow$   
diff  $[A \rightarrow$   
           $[N \rightarrow$

6p

6p

12

14

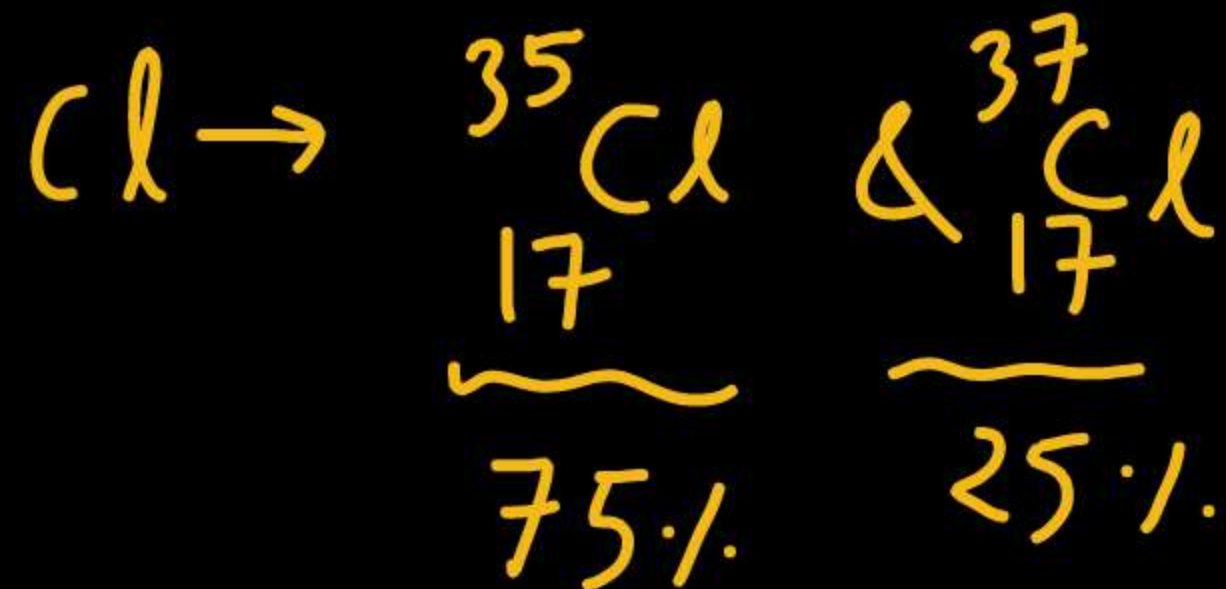
6

8



# 1<sup>st</sup> Classification of Nuclei

Fractional Atomic Mass  $\rightarrow$  The reason for this is



$$m = 0.75 \times 35 + 0.25 \times 37$$

$$\approx \underline{35.5 \text{ amu}}$$

availability of atoms/nuclei in the mixture form

$$\rightarrow n_1 A_1 + n_2 A_2$$

$n_1$  &  $n_2 \rightarrow$  fractions/percentages of each nuclei (naturally)  
 $A_1$  &  $A_2 \rightarrow$  At. masses of all isotopes.

both (p & n)

# 1<sup>st</sup> Classification of Nuclei

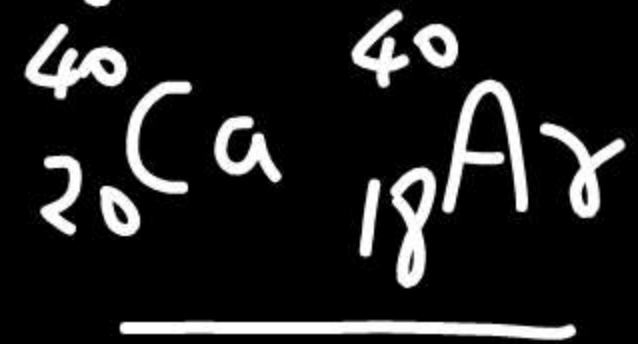
2). **Isobars** → These are the atoms of different elements (diff.  $Z$ ), with same total no. of nucleons

$$(N + P) \equiv A \rightarrow \text{same}$$

$Z \rightarrow \text{diff}$

$N \rightarrow \text{diff}$

14	14
6 <sup>C</sup>	7 <sup>N</sup>
p → 6	7
n → 8	7
(n+p) → 14	14





no. of neutrons

# 1<sup>st</sup> Classification of Nuclei

2). Isotones → These are the atoms of different elements with same no. of neutrons

		${}^7_3\text{Li}$	${}^8_4\text{Be}$
diff. ←	}	Z	4
		3	4
		A	8
Same →	}	N	4
		4	4