

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

বিস্মিল্লাহির রাহমানির রাহীম



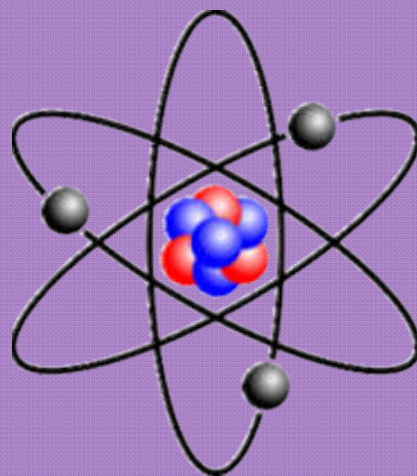
উদ্দামা

একাডেমিক এন্ড এডমিশন কেয়ার

Class: 9 Chemistry, (Chapter-03)

Structure of matter

Lecture: C-06



Isotope

→ More than one atom of same element if,

- i. Proton number is same
- ii. Mass number is different
- iii. Neutrons number is different

same ← Isotope → proton
 A_ZX
proton number same

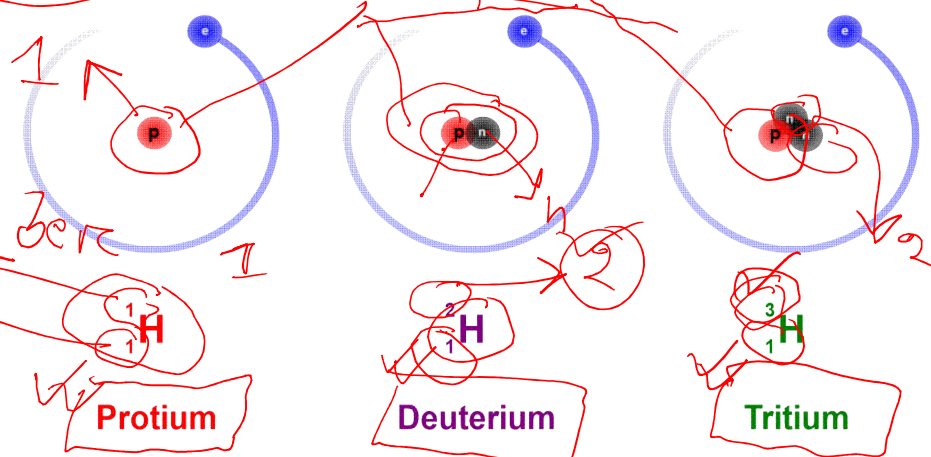
Latest:

7 isotope H

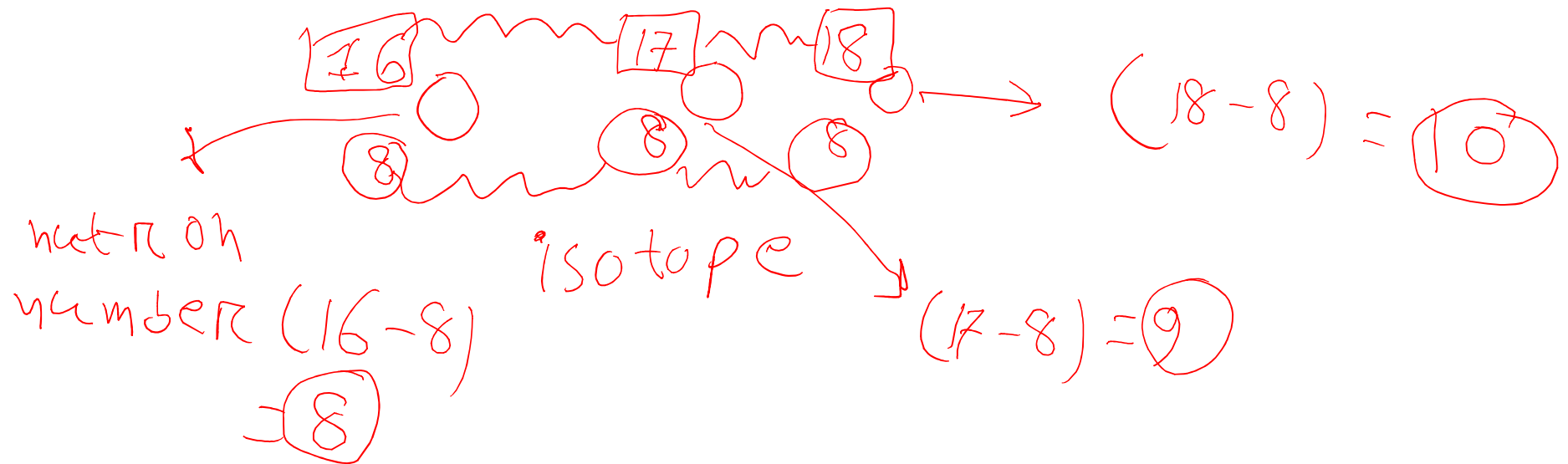
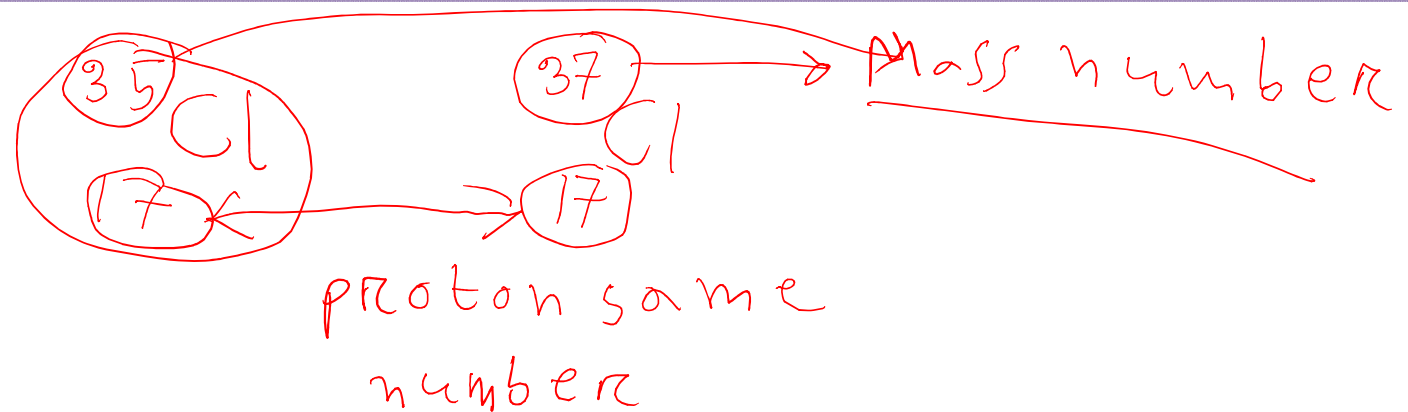


H

Mass number
Atomic



The isotope of oxygen and chlorine



Poll question: 01

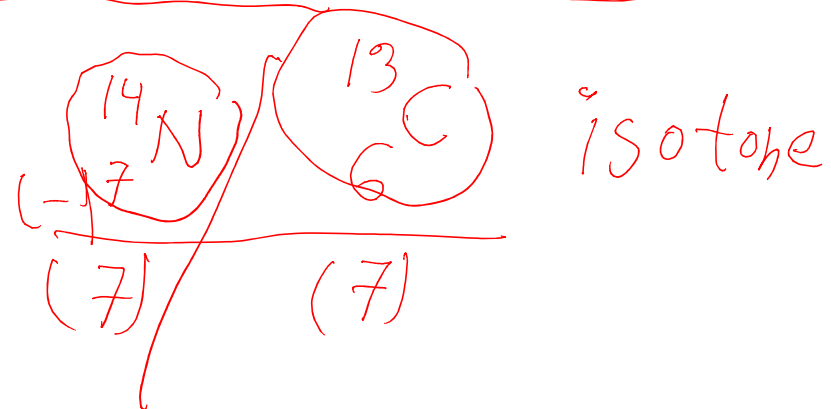
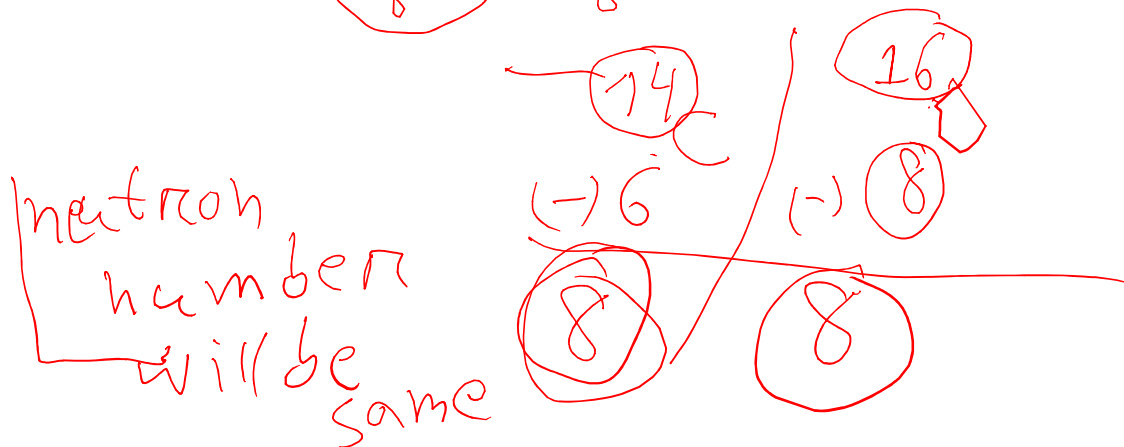
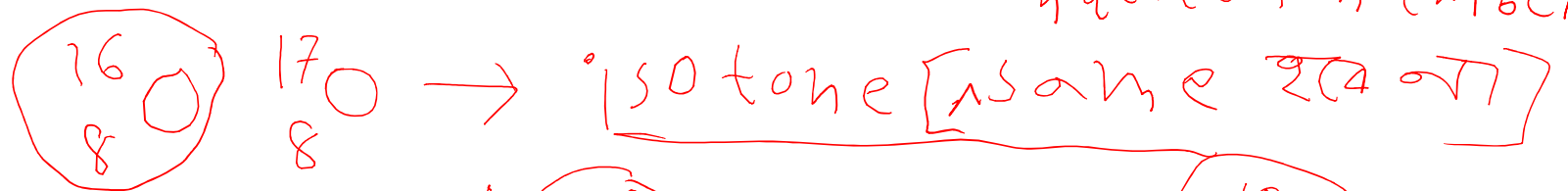
➔ Which of the following is the example of isotope ?

- isotope*
- (a) ${}^{12}_6\text{C}$, ${}^{13}_6\text{C}$, ${}^{14}_6\text{C}$ →
- (b) ${}^{16}_8\text{O}$, ${}^{17}_8\text{O}$, ${}^{18}_8\text{O}$
- (c) ${}^{14}_7\text{N}$, ${}^{15}_7\text{N}$
- (d) All of them

Isotone

→ In this case, Neutron number will be same

Elements different



Poll question 2

➔ Which of the following is the example of isotone ?

$(12-6)=6$ $(13-6)=7$ $(14-6)=8 \rightarrow$ neutron number

~~(a) $^{12}_6\text{C}$, $^{13}_6\text{C}$, $^{14}_6\text{C}$~~

~~(b) $^{16}_8\text{O}$, $^{17}_8\text{O}$, $^{18}_8\text{O}$~~ $\rightarrow (18-8)=10 \rightarrow$, ,

~~(c) $^{14}_7\text{N}$, $^{13}_6\text{C}$~~ $\rightarrow (17-8)=9$, ,

~~(d) all of them~~ $\rightarrow (16-8)=8$, ,

$(14-7)=7$ $(13-6)=7$

neutron number is same

Isobar

same

mass number

→ In this case, mass number will be same

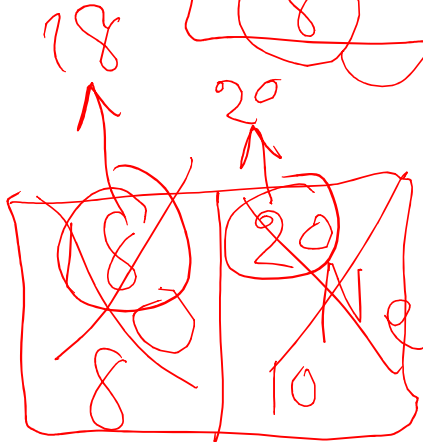
→ Different elements & 22

~~Isobar~~



mass number same

Isobar



Atomic number different.

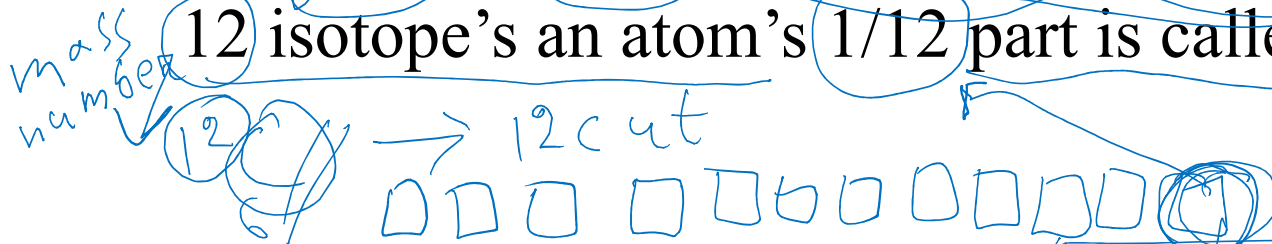
$$18 \neq 20$$

Isotope → Proton number same

Isotone → Neutron number same

Relative atomic mass

→ The ratio of mass of one atom of any element and mass of Carbon-12 isotope's an atom's $1/12$ part is called relative atomic mass.



→ The relative mass of element = $\frac{\text{mass of one atom of element}}{\text{of mass of a Carbon 12 isotope}}$

$R.A.M = \frac{\text{mass of one atom}}{1.66 \times 10^{-24}}$

→ $1/12$ part of mass of Carbon-12 isotope's an atom is = 1 Dalton
| The value of 1 Dalton is 1.66×10^{-24} g.

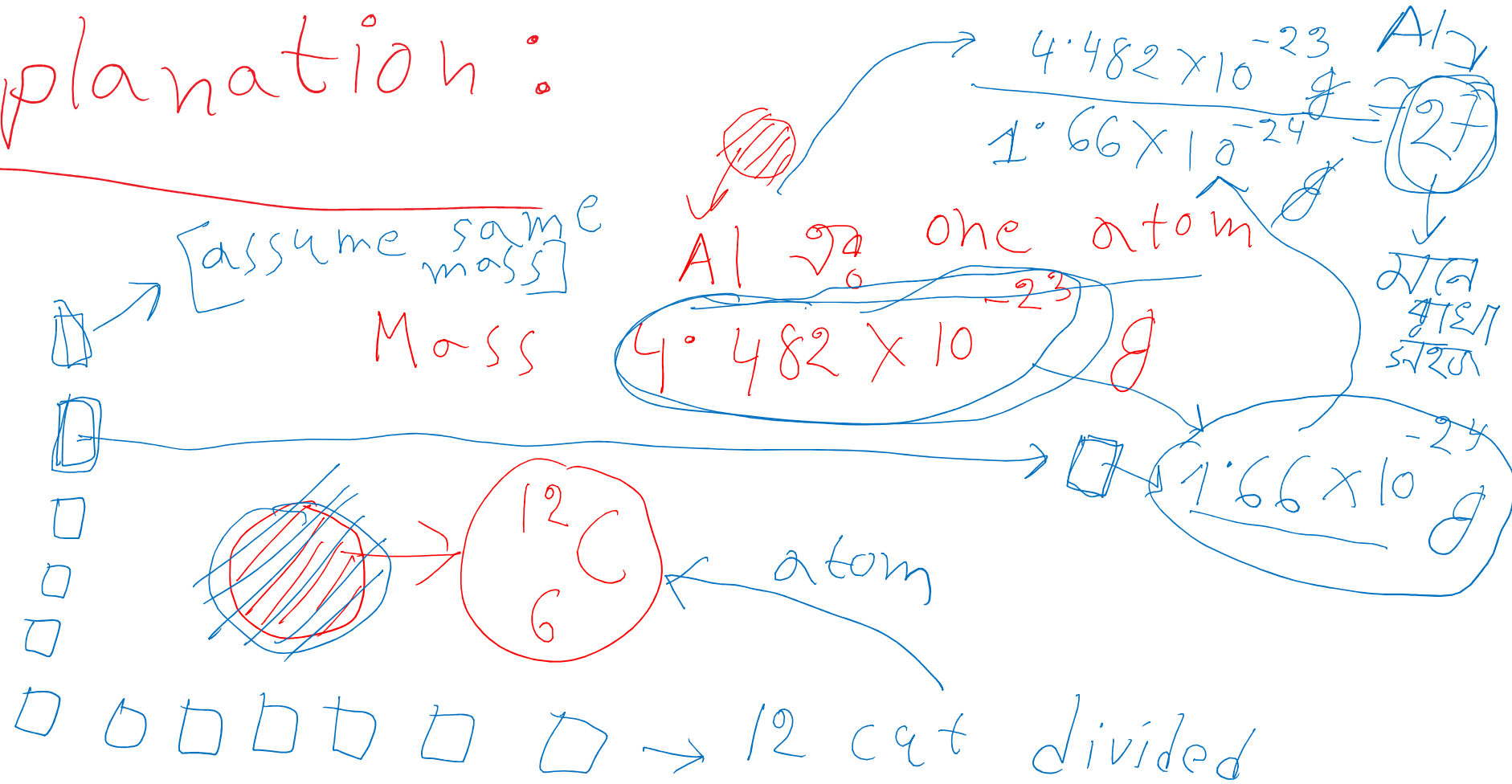
Math

- ➔ If the mass of one atom of element $31.54 \times 10^{-24} \text{ g}$ then
The relative mass of that element will be what?

$$\begin{aligned} \text{Relative atomic mass} &= \frac{\text{mass of one atom}}{1.66 \times 10^{-24} \text{ g}} \\ &= \frac{31.54 \times 10^{-24} \text{ g}}{1.66 \times 10^{-24} \text{ g}} \\ &= 18.98 \approx 19 \end{aligned}$$

→ $\begin{matrix} 19 \\ 9\text{F} \end{matrix}$

Explanation:



Math

➔ If The relative mass of an element is 23 then the mass of one atom of element will be what?

$$\text{Relative atomic mass} = \frac{\text{mass of an atom}}{1.66 \times 10^{-24} \text{ g}}$$
$$\downarrow$$
$$\textcircled{23} = \frac{\text{mass of an atom of an element}}{1.66 \times 10^{-24} \text{ g}}$$

$$\text{Mass of an atom of an element} = 23 \times 1.66 \times 10^{-24} \text{ g}$$
$$= 3.818 \times 10^{-23} \text{ g}$$

Poll question: 03

➔ Which one is the unit of Relative atomic mass ?

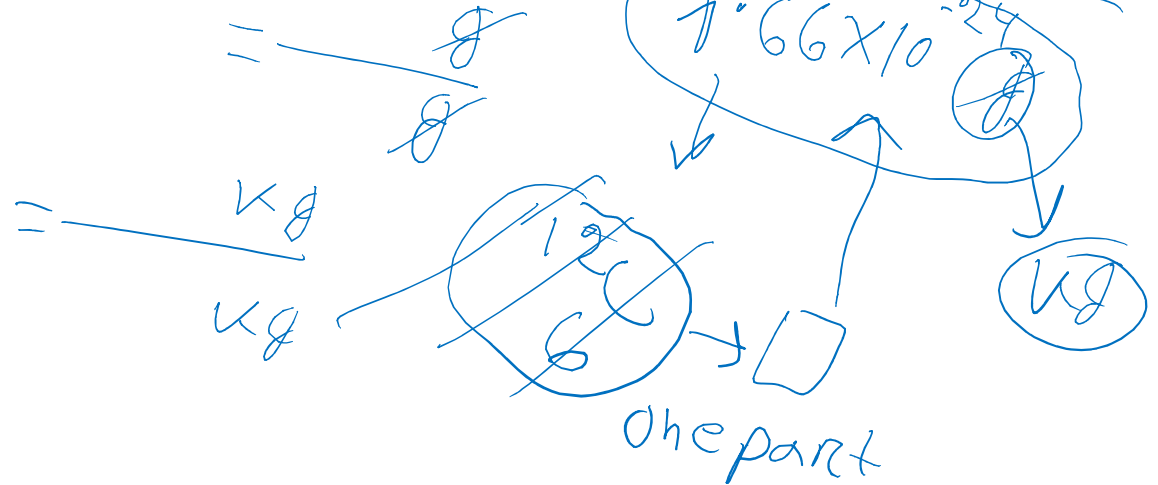
~~i) g~~

~~ii) kg~~

~~iii) m~~

iv) it has no unit

Relative atomic mass = ~~mass of an atom~~



Periodic table

3.5

$1.001 \approx 1$
 $1.00001 \approx 1$

$1.98 \approx 2$

$1.99 \approx 2$

Element name	Atomic number	Atomic mass	Element name	Atomic number	Atomic mass
Hydrogen	1	1	Sodium	11	23
Helium	2	4	Magnesium	12	24
Lithium	3	7	Aluminium	13	27
Beryllium	4	9	Silicon	14	28
Boron	5	11	Phosphorus	15	31
Carbon	6	12	Sulphur	16	32
Nitrogen	7	14	Chlorine	17	35.5
Oxygen	8	16	Argon	18	40
Fluorine	9	19	Potassium	19	39
Neon	10	20	Calcium	20	40

999

Average relative atomic mass of element

➔ Most of the elements in nature have more than one isotope.

We calculate the average relative mass of those elements having more than one isotope from their percentage of availability in nature.



Determining the average relative mass of an element

- ➔ First we have to multiply the mass number of all isotopes of that element with the percentage of natural availability of those isotopes. Then we have to sum all those result. Finally, we have to divide the result by 100 for getting the average relative mass of an element.

$$\begin{array}{l} \textcircled{35} \text{Cl} \rightarrow 75\% \\ 17 \\ 37 \text{Cl} \rightarrow 25\% \\ 17 \end{array} \quad \frac{(35 \times 75) + (37 \times 25)}{100} = \textcircled{35.5}$$

Math

If the amount of $^{35}_{17}\text{Cl}$ is 75% in nature and $^{37}_{17}\text{Cl}$ is 25% in nature then what is the average relative atomic mass of Chlorine?

Solve :

~~35~~

Cl

17

~~37~~

Cl

17

~~75~~

%

75 %
100 %

~~25~~

%

Average Relative atomic mass

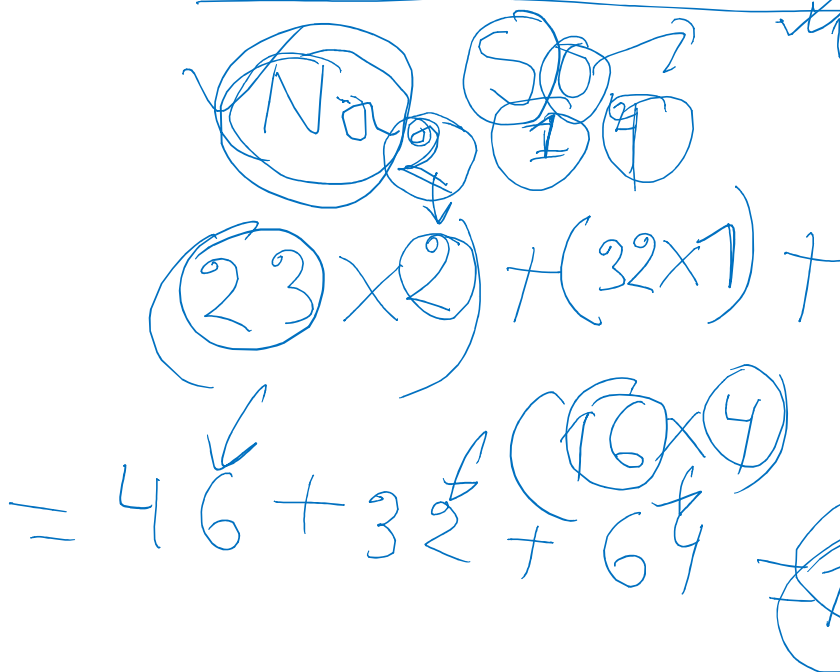
$$= \frac{(\cancel{35} \times \cancel{75}) + (\cancel{37} \times 25)}{100}$$

$$= 35.5$$

unit \rightarrow No

RELATIVE MOLECULAR MASS

- ➔ To determine the relative molecular mass we have to know how much atom there are in that molecule and also we have to know relative atomic mass of each atom .



Element name	Atomic number	Atomic mass	Element name	Atomic number	Atomic mass
Hydrogen	1	1	Sodium	11	23
Helium	2	4	Magnesium	12	24
Lithium	3	7	Aluminium	13	27
Beryllium	4	9	Silicon	14	28
Boron	5	11	Phosphorus	15	31
Carbon	6	12	Sulphur	16	32
Nitrogen	7	14	Chlorine	17	35.5
Oxygen	8	16	Argon	18	40
Fluorine	9	19	Potassium	19	39
Neon	10	20	Calcium	20	40

Relative

23

32

16

More examples

Handwritten calculations and annotations:

$\downarrow 1^0 2$
 $(12 \times 1) + (16 \times 2)$
 $= 12 + 32 = 44$
 $H \rightarrow 1$
 $S \rightarrow 32$
 $O \rightarrow 16$

Annotations:

- No unit
- 2
- $(16 \times 2) = 32$

Element name	Atomic number	Atomic mass	Element name	Atomic number	Atomic mass
Hydrogen	1	1	Sodium	11	23
Helium	2	4	Magnesium	12	24
Lithium	3	7	Aluminium	13	27
Beryllium	4	9	Silicon	14	28
Boron	5	11	Phosphorus	15	31
Carbon	6	12	Sulphur	16	32
Nitrogen	7	14	Chlorine	17	35.5
Oxygen	8	16	Argon	18	40
Fluorine	9	19	Potassium	19	39
Neon	10	20	Calcium	20	40

Poll question: 04

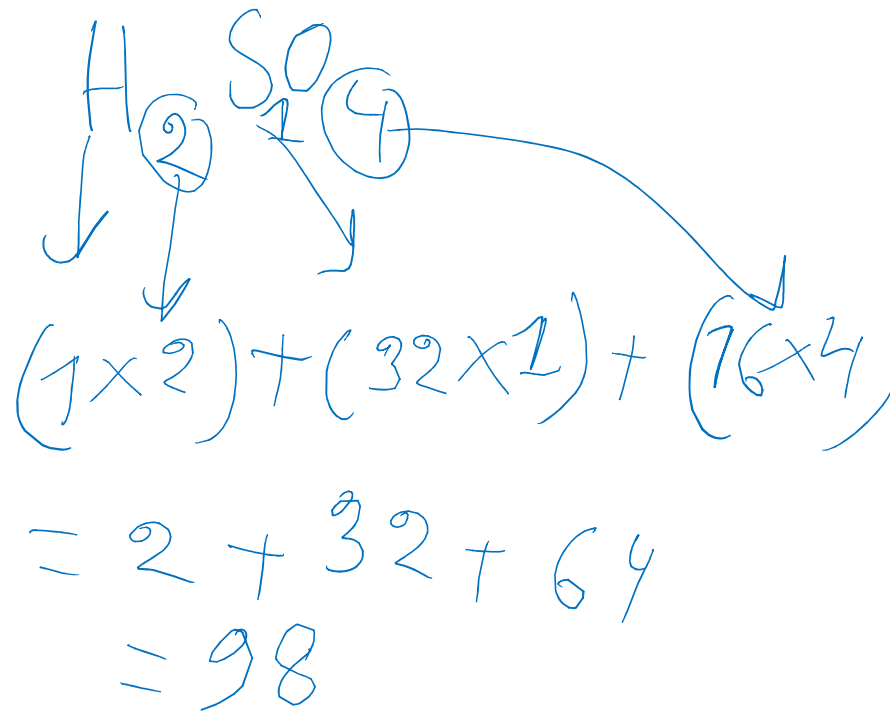
➔ What is the RELATIVE MOLECULAR MASS of H_2SO_4 ?

(a) 90

☒ (b) 98

(c) 106

(d) 120

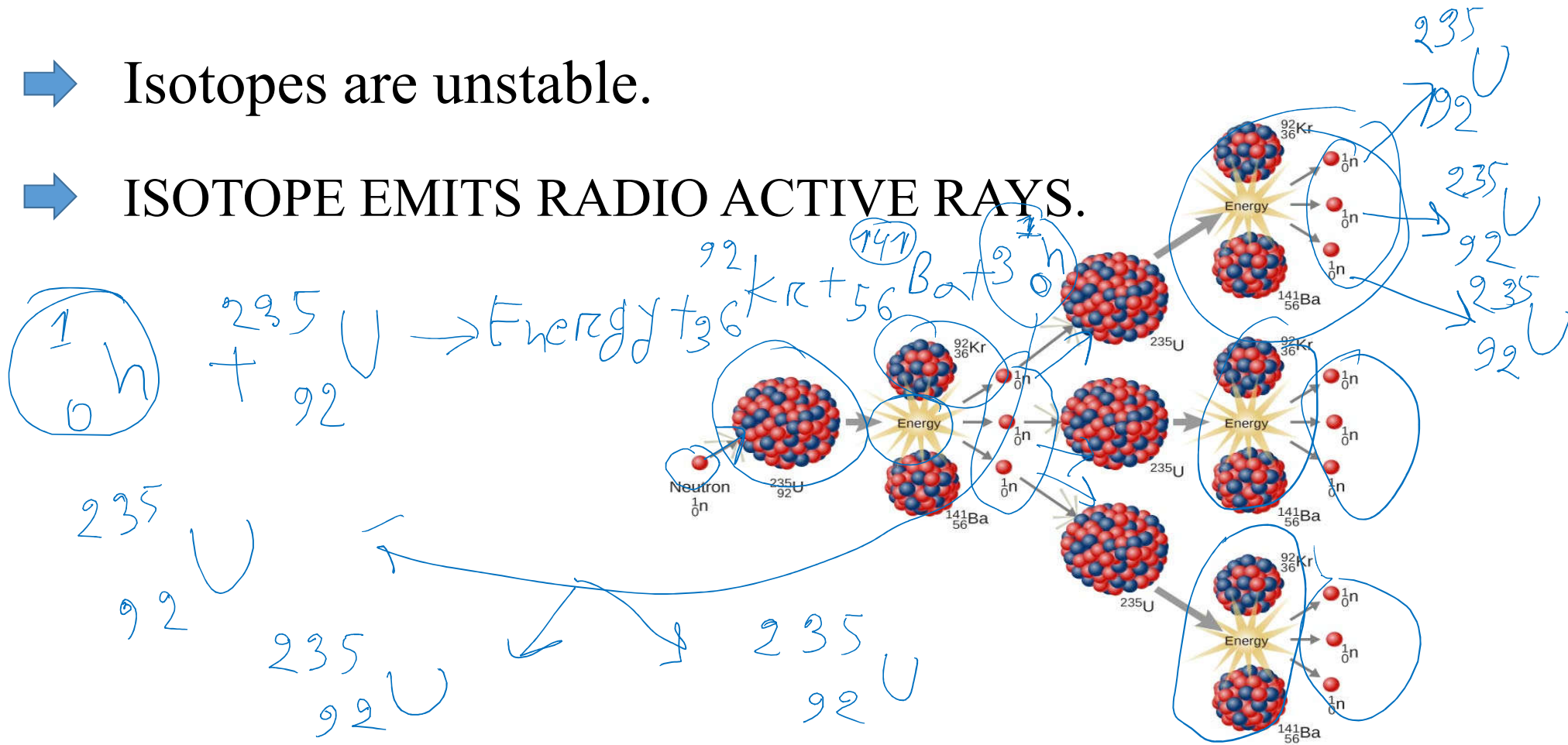


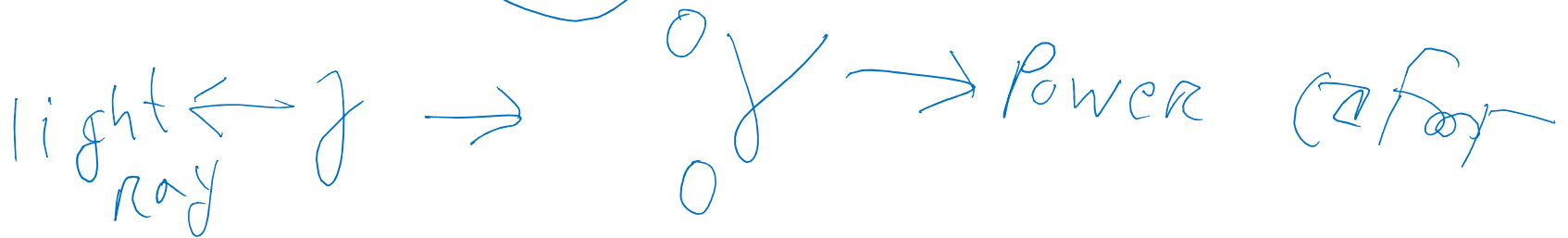
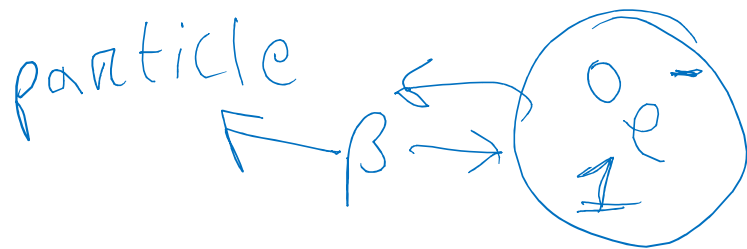
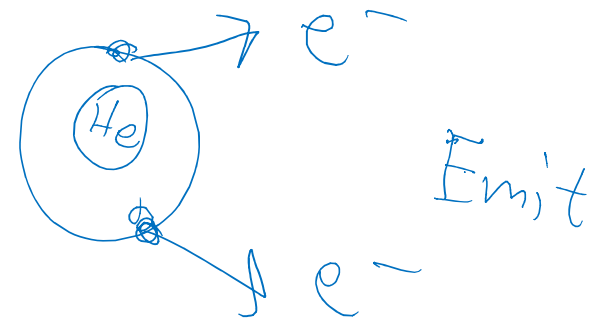
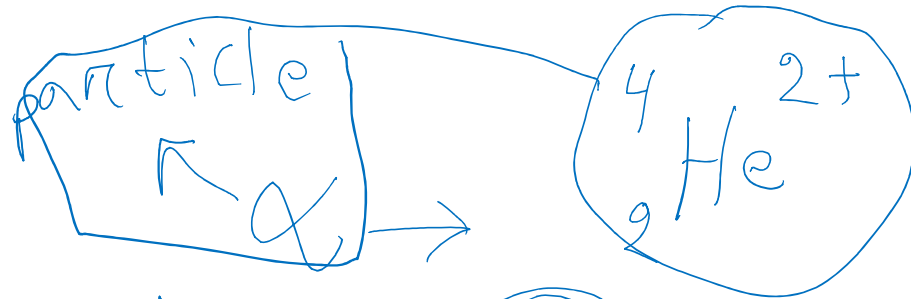
Handwritten notes:

2Na
Na 2ଟି 2ଟି
atom
 $\text{Na}_2 \times$
Molecule 2ଟି
2ଟି Atom 2ଟି

Isotope's properties

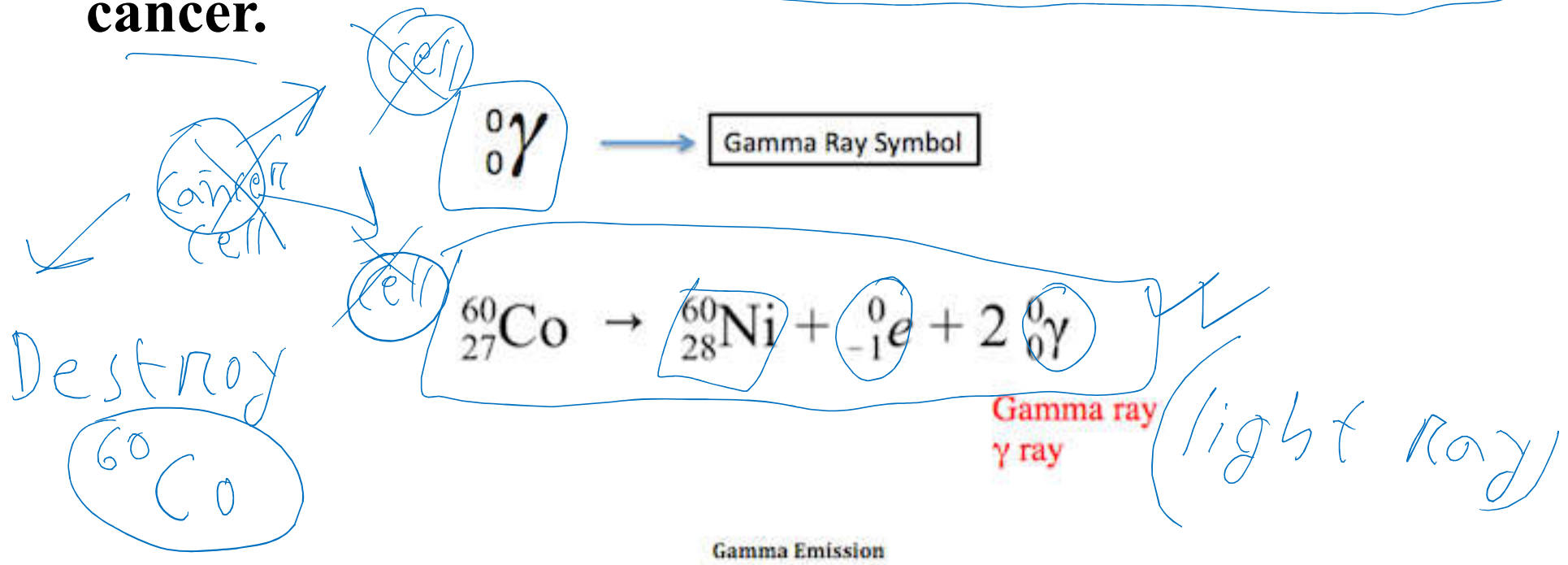
- ➔ Isotopes are unstable.
- ➔ ISOTOPE EMITS RADIO ACTIVE RAYS.





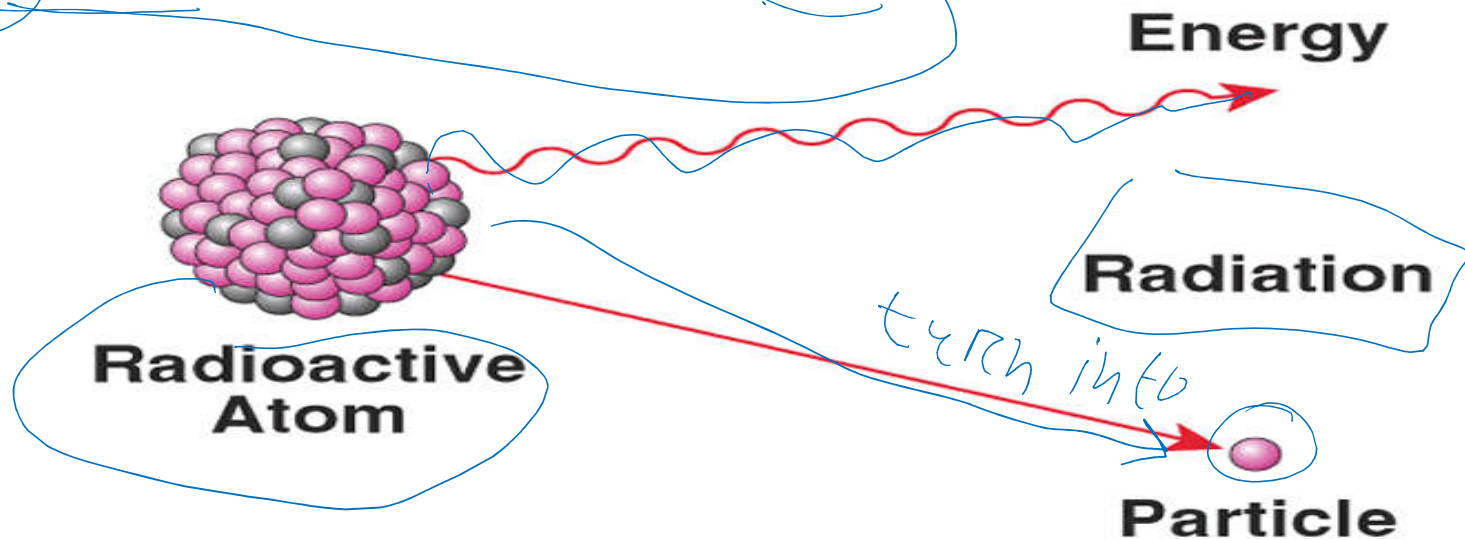
Uses of isotopes

- ➔ Radio active isotope is very usefull for us. Cobalt-60 isotope is used to burn unusual cell which has probability to create cancer.



Uses of isotopes

- 14
6
- ➔ **Carbon- 14** is used to determine the age of **death animals or trees**. Determining age of death animals or plants by this process is called 'Radioactive Date determining'.
 - ➔ **Iodine** isotope is used to treat Goitre patient.



Uses of isotopes

- ➔ Artificial radio active isotopes are used to monitor Chemical reactions. They are also used to detect how a compound works on animal's or plant's body.
- ➔ To detect many diseases isotopes are used now a days.
- ➔ To control harmful insects radioactive isotopes are used .
- ➔ Bacteria is killed by radioactive rays. That's why radio active isotopes are used to preserve food and commodities.

pesticide

লেগে থাকো সৎভাবে,
স্বপ্ন জয় তোমারই হবে

উদ্ভাস-উন্মেষ শিক্ষা পরিবার

এখানেই Chapter শেষ

Thank you everyone