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UNIT 5

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Radiopharmaceuticals.

classmate

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Page

✓ Radiopharmaceuticals →

These are the pharmaceutical which have radio activity and are used as drugs.

✓ Radioactivity →

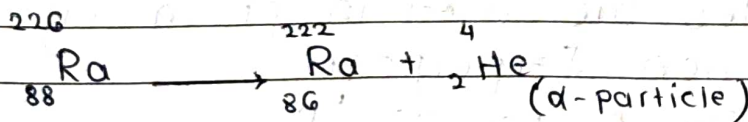
It is continuous emission of α , β , γ radiations from the radioactive sub.

* properties of α , β , γ radiation →

✓ α radiation →

- (i) These are positively charged particles
- (ii) penetration power of α - radiations is low.
- (iii) Ionisation power of α - particles is very high.
- (iv) They have low speed.
- (v) They don't have any application in pharmacy field
- (vi) α - particle is identical with the helium nucleus (${}^4_2\text{He}$)
- (vii) when α - particle is emitted, atomic number decreases by two and mass number ↓ by 4.

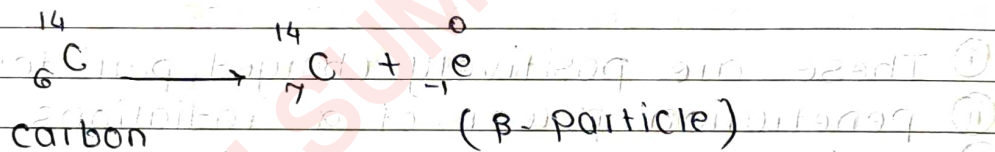
e.g....



Radium

2) β - particles \rightarrow

- ① They are negatively charged particle
- ② Penetration power is more than α - particles
- ③ Ionisation power is less than α - particles
- ④ β - particles have more speed than α - particles
- ⑤ They have any application in pharmacy field
- ⑥ It is represented as (electrons) ${}_{-1}^0e$
- ⑦ When β - particle is emitted, atomic number is \uparrow by 1 and mass number is not changed
e.g...



3) γ - particles \rightarrow

- ① They do not have any charge but have energy.
- ② Penetration power is more than α and β particles.
- ③ Ionisation power is very less.
- ④ They have equal speed as that of light
- ⑤ γ particles are used in pharmacy for the sterilization purpose
- ⑥ It is represented as ${}^0_0\gamma$
- ⑦ When γ - radiations are emitted, there is no change in atomic number and mass number

marks

* Precaution to be taken in handling and storage of radioactive materials →

- ① R.M is stored in area such that it should be away from exposure to human being.
- ② α and β emitters are stored in thick glass shielding while γ emitters are stored in lead shield.
- ③ Exposure to radioactive radiation may produce blood cancer hence precaution should be taken while handling of R.M.
- ④ R.M should be never touched with hand but should be handled with forceps.
- ⑤ Smoking, drinking, eating should be avoided in the area where R.M is kept.
- ⑥ Sufficient protective clothing should be used while handling of R.M.
- ⑦ The area where R.M is kept should be tested regularly.
- ⑧ There should be proper disposal of radioactive material.
- ⑨ There should be minimum movement of the workers.
- ⑩ The benches, cupboards in that area should be of plastic.

* Applications of the RM →

Any 4

The radiopharmaceuticals have various applications as follows.

- ① Diagnosis
- ② Therapy or treatment
- ③ Research
- ④ Sterilization
- ⑤ Agriculture

① Diagnosis →

① Co^{57} is used for measuring glomerular filtration rate.

② Fe^{59} is used in haematological disorders.

③ Ca^{44} and Ca^{45} are used to study bone structure and to treat bone cancer.

④ I^{131} is used to study thyroid gland function.

⑤ Au^{198} is used to study blood circulation in liver.

⑥ Co^{59} and Co^{60} are used to study vitamin B_{12} absorption.

② Therapy / Treatment →

① I^{131} is used to treat thyroid cancer.

- ② B^{10} is used to treat tumor
- ③ Au^{198} is used to treat uterus, and urinary bladder cancer.
- ④ $Vit_{B_{12}}$ (cyano-cobalamine) is used in diagnosis of anemia.
- ⑤ O^{17} & O^{18} are used in photosynthetic study.
- ⑥ C^{14} is used to study metabolism of Carbohydrate (Sugars) and fats.

③ Research →

Excellent biological and medicinal study can be carried out with radioactive isotopes

e.g.

C^{14} and Tritium are most commonly radio pharmaceutical used in research.

④ Sterilization →

Vit., hormones, antibiotics, surgical instrument can be sterilized by strong radiation sources

e.g.

Co^{60} is used to sterilized surgical instrument.

⑤ Agriculture →

Some radio-pharmaceuticals found application in agriculture also

e.g...

α -radiation are used to kill pests and found use in agriculture.

* Half life of pharmaceuticals ($t_{1/2}$) →

It is the time required for a radioactive material to decay to $\frac{1}{2}$ of its original volume at any given point of time, it is represented as follows.

$$t_{1/2} = \frac{0.693}{\lambda}$$

λ = disintegration constant

* Units of radioactivity →

① Curie →

② Roentgen

③ RAD (Radiation absorbed dose)

④ RBE (Relative biological effectiveness)

* Methods or measurement of radioactivity
OR
devices used to measure radiations:

- ① Ionization Chamber
- ② Proportional Counter
- ③ Geiger Muller (G.M Counter)
- ④ Scintillation Counter
- ⑤ Semiconductor detector
- ⑥ Photographic plate method.

Monograph → NaI¹³¹