Radioactive Pollution

- BOT 346
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The radioactive pollution

Radioactive pollution is characterized as the introduction of radioactive substances into the environment, resulting in the physical contamination of living species and their surrounding habitat.

- Radioactivity is a natural occurrence characterized by the spontaneous emission of proton (alpha-particles), electrons (beta-particles), and gamma rays (short wave electromagnetic waves). This emission arises from the breakdown of atomic nuclei in certain elements.
- The biological damage caused by the radiation is determined by the intensity of radiation and duration of the exposure.
- At even higher doses, the cells cannot be replaced fast enough and tissues fail to function. An example of this would be "**radiation sickness**." This is a condition that results after high doses is given to the whole body (>100 rem).

Radioactive pollution Sources

- **Artificial Sources**
  - Accidents in nuclear power plants and nuclear waste.
  - Nuclear weapon testing and explosion (Nuclear fallout). The fall Out contains radioactive substances such as **strontium-90, cesium-137, iodine-131**, etc.
  - Uranium mining and mining of other radioactive material like **thorium.**
  - Radiation therapy and direct exposures to radiation for diagnostic purposes (e.g. X-rays), chemotherapy etc.

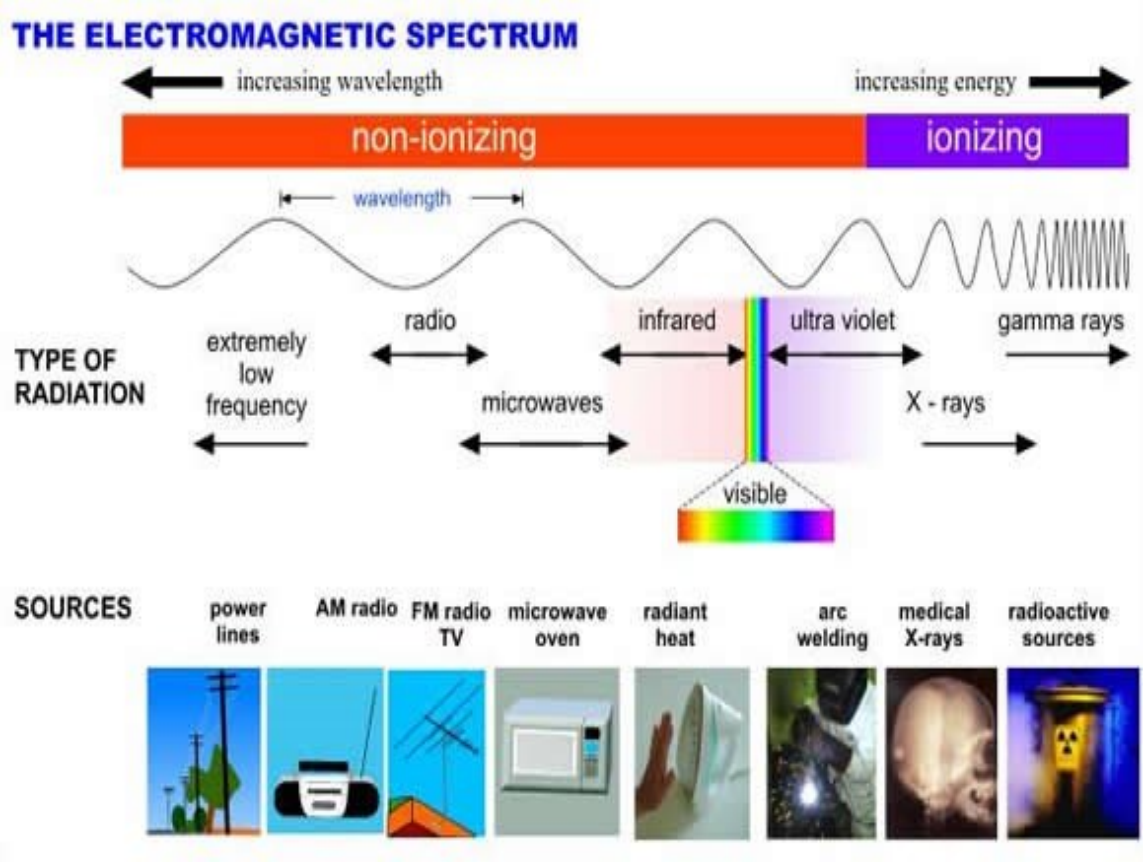
- **Natural Sources**
  - They include cosmic rays from space and terrestrial radiations from radio-nuclides present in earth's crust such as **radium-224, uranium-238, thorium-232, potassium-40, carbon-14**, etc.
  - Some species of animals and plants preferentially accumulate specific radioactive, materials. For example, oysters deposit 65Zn, fish accumulate 55Fe, marine animals selectively deposit 90Sr.

Ionizing and Non-Ionizing Radiation

Radiations can be categorized into two groups namely the non-ionizing radiations and the ionizing radiations.

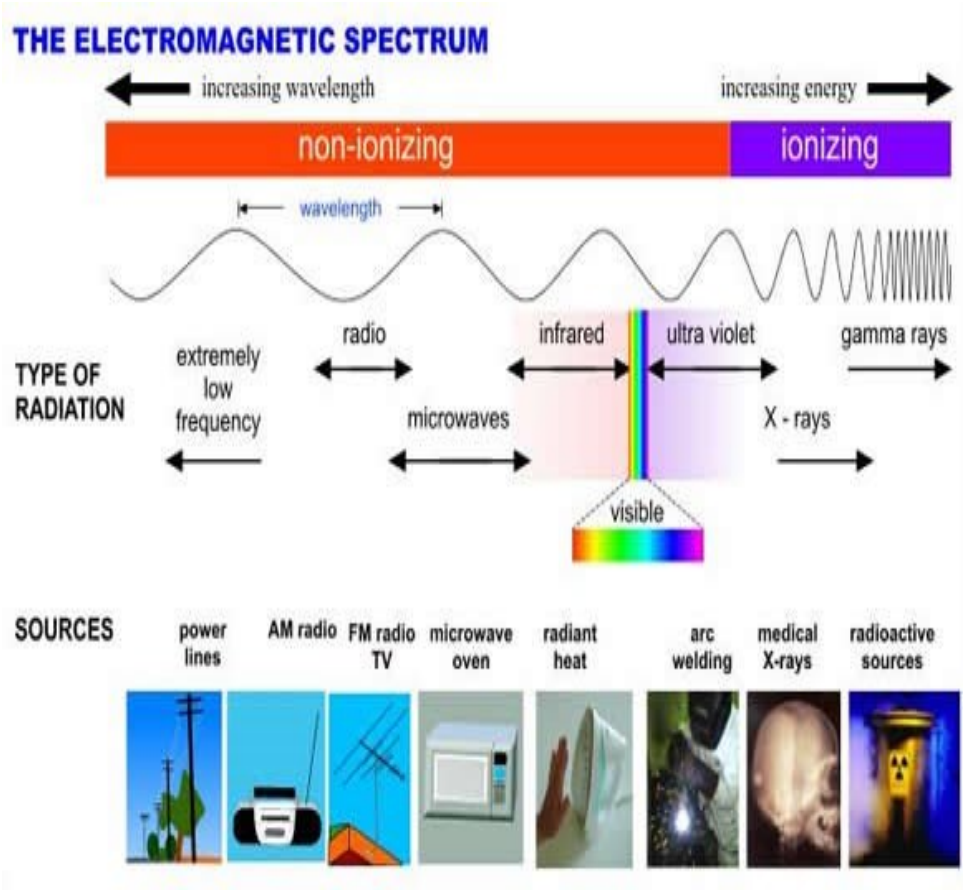
Non-ionizing radiations are constituted by the electromagnetic waves at the **longer wavelength** of the spectrum ranging from near **infra-red rays to radio waves** [include **higher wavelength ultraviolet rays, microwaves**].

These waves have energies enough to excite the atoms and molecules of the medium through which they pass, causing them to vibrate faster but **not strong enough to ionize them**.
In a microwave oven the radiation causes water molecules in the cooking medium to vibrate faster and thus raising its temperature



Non-ionising radiations affect only those components which absorb them and have low penetrability.

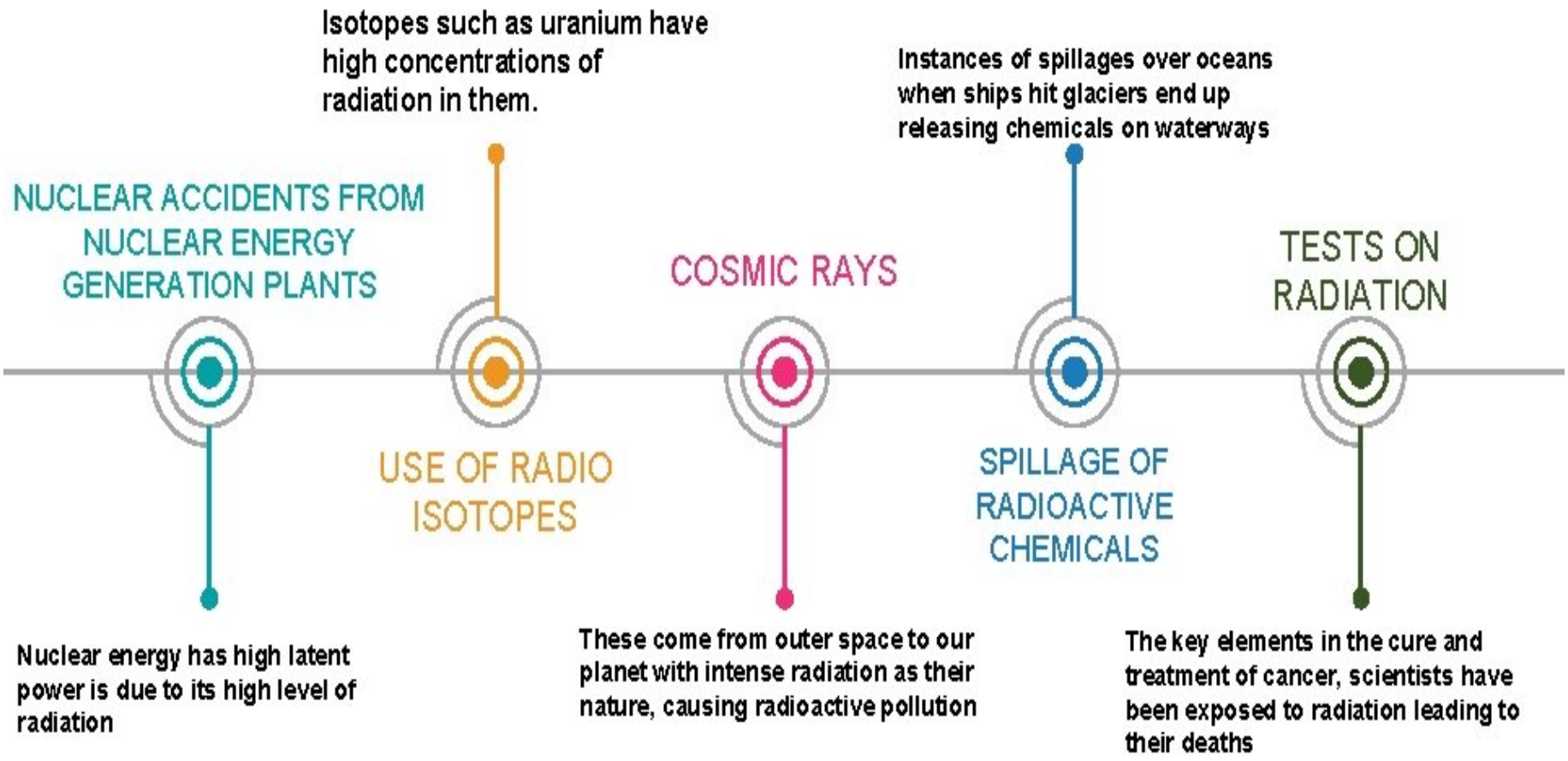
Ionizing and Non-Ionizing Radiation



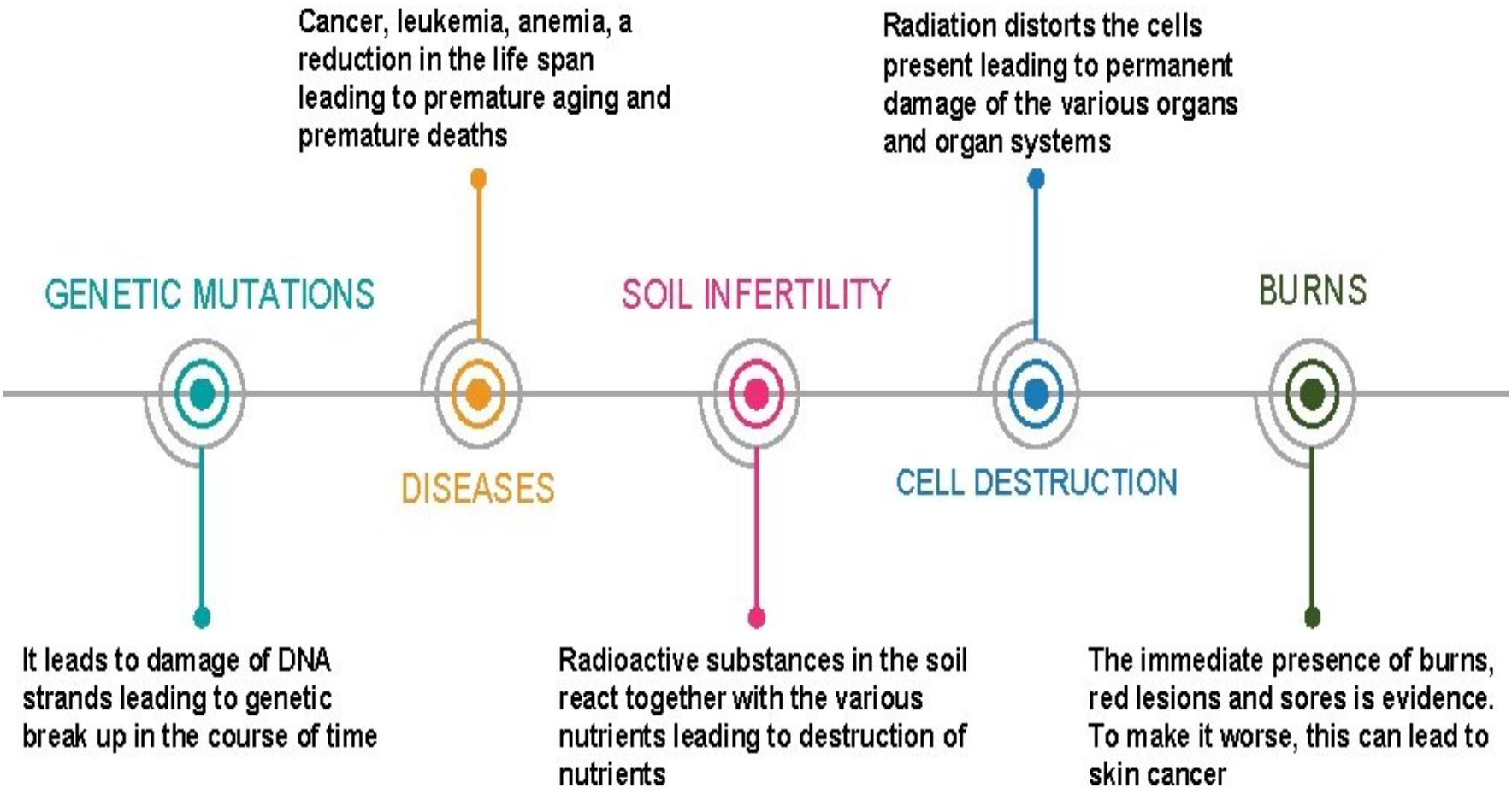
The ions produced in water molecules, for example, can induce reactions that can **break bonds** in proteins and other important molecules.
Ionization is the process by which an atom or a molecule acquires a negative or positive charge by gaining or losing electrons to form ions, often in conjunction with other chemical changes.
Electromagnetic radiations such as **short wavelength ultra violet radiations** (**UV), X-rays** and **gamma rays** and energetic particles produced in nuclear processes, electrically charged particles like **alpha and beta particles** produced in radioactive decay and **neutrons** produced in nuclear fission, are highly damaging to living organisms.

Ionising radiations have high penetration power and cause breakage of macro molecules.

CAUSES OF RADIOACTIVE POLLUTION



EFFECTS OF RADIOACTIVE POLLUTION



Biological Damage Due to Ionizing Radiations

- The biological damage resulting from ionizing radiations is generally termed as radiation damage.
- Radiation damage can be divided into two types:
  - (a) somatic damage (also called radiation sickness)
  - (b)genetic damage.
- Somatic damage refers to damage to cells that are not associated with reproduction. Effects of somatic radiation damage include reddening of the skin, loss of hair, ulceration, fibrosis of the lungs, the formation of holes in tissue, a reduction of white blood cells, and the induction of cataract in the eyes. This damage can also result in cancer and death.
- Genetic damage refers to damage to cells associated with reproduction. This damage can subsequently cause genetic damage from gene mutation resulting in abnormalities. Genetic damages are passed on to next generation.

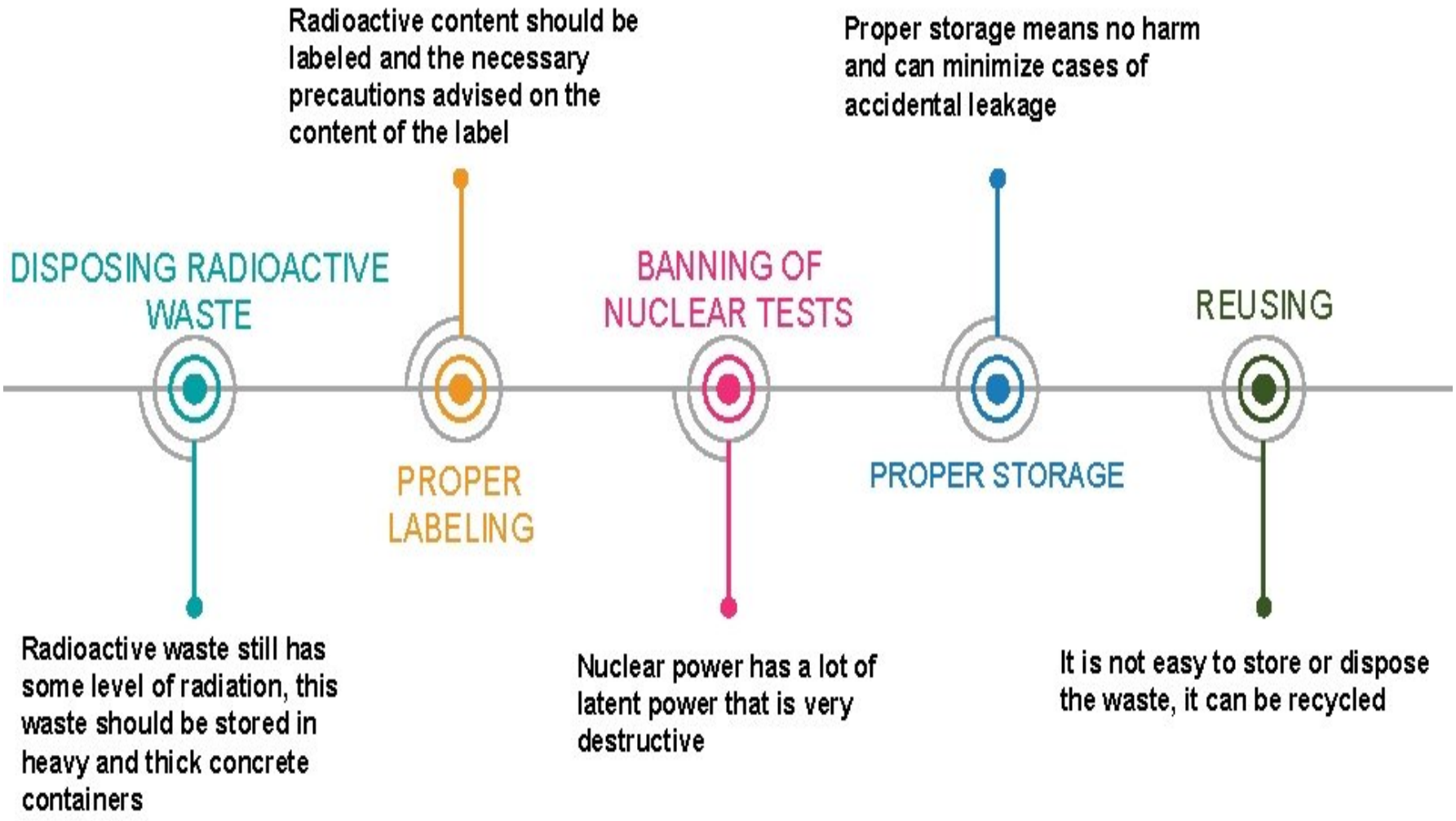
Impact Of Radiation From Mobile Phone Towers

- The radiation that comes from mobile tower radiation is non-ionizing radiation.

Impact on birds

- The surface area of bird is relatively larger than their body weight in comparison to human body so they absorb more radiation.
- Also the fluid content in the body of the bird is less due to small body weight so it gets heated up very fast.
- Magnetic field from the towers disturbs birds' navigation skills hence when birds are exposed to EMR they disorient and begin to fly in all directions.
- A large number of birds die each year from collisions with telecommunication masts.

HOW TO OVERCOME RADIOACTIVE POLLUTION



- What is Hiroshima bombing effect on environment? Does Hiroshima still have radiation? How did radiation effect Hiroshima? please discuss radioactive radiation caused by Hiroshima bombing