

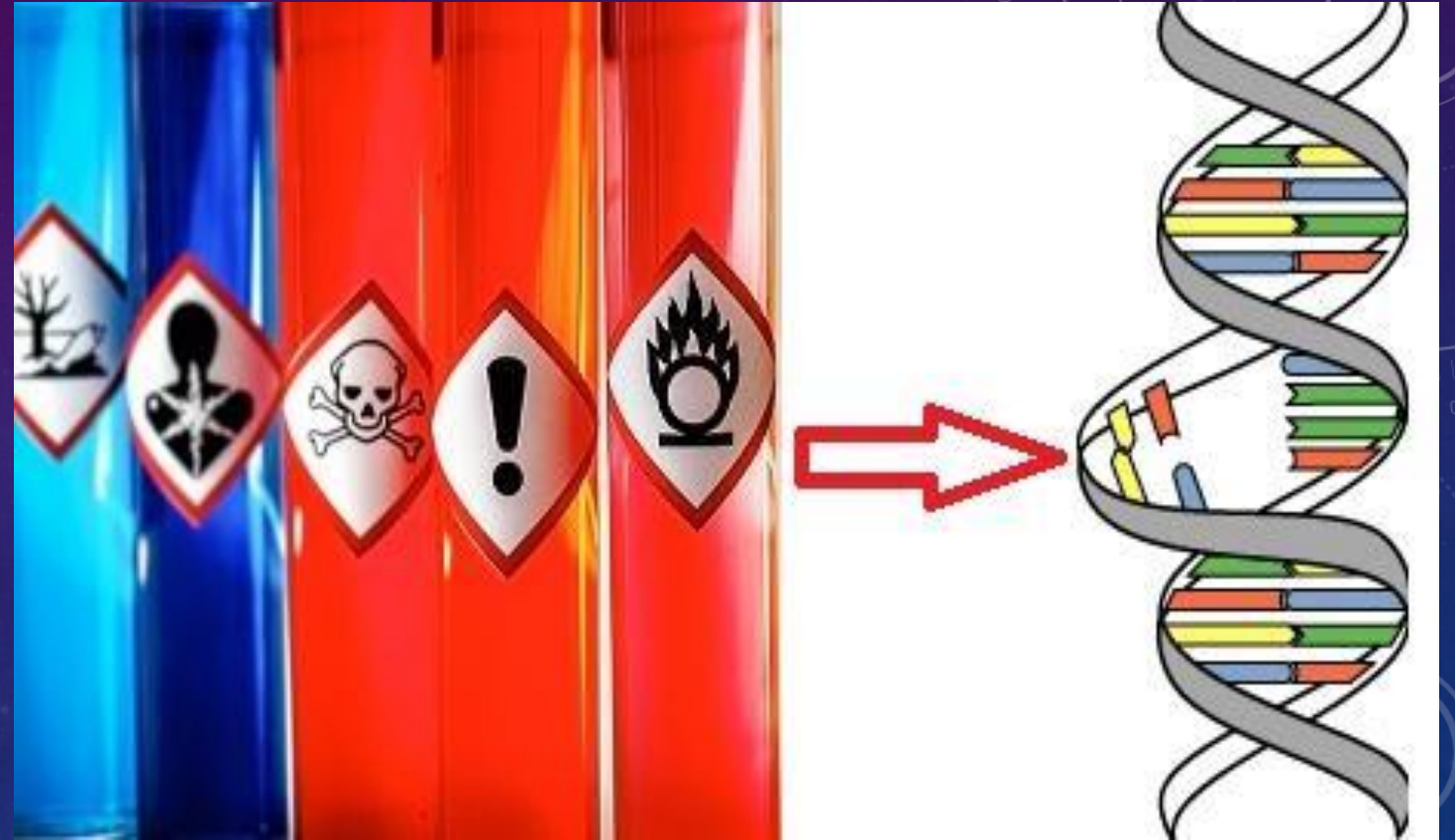
TOPIC : PHYSICAL MUTAGENIC FACTORS.

Group no:

La3-c-o-203(1)

Presented by-

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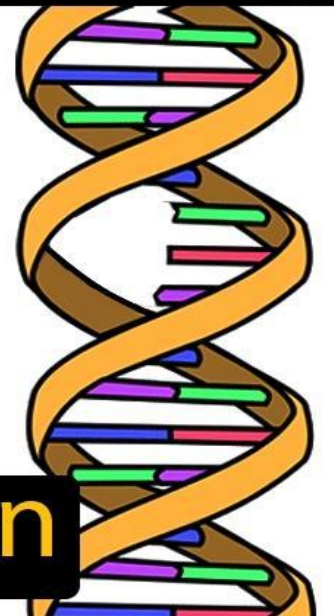
Mutagens



A mutagen is any substance or agent that can cause a mutation, or change in the sequence or structure of dna.



an agent that can cause DNA mutations, like radioactivity



mutagen
Game Smartz flashcard

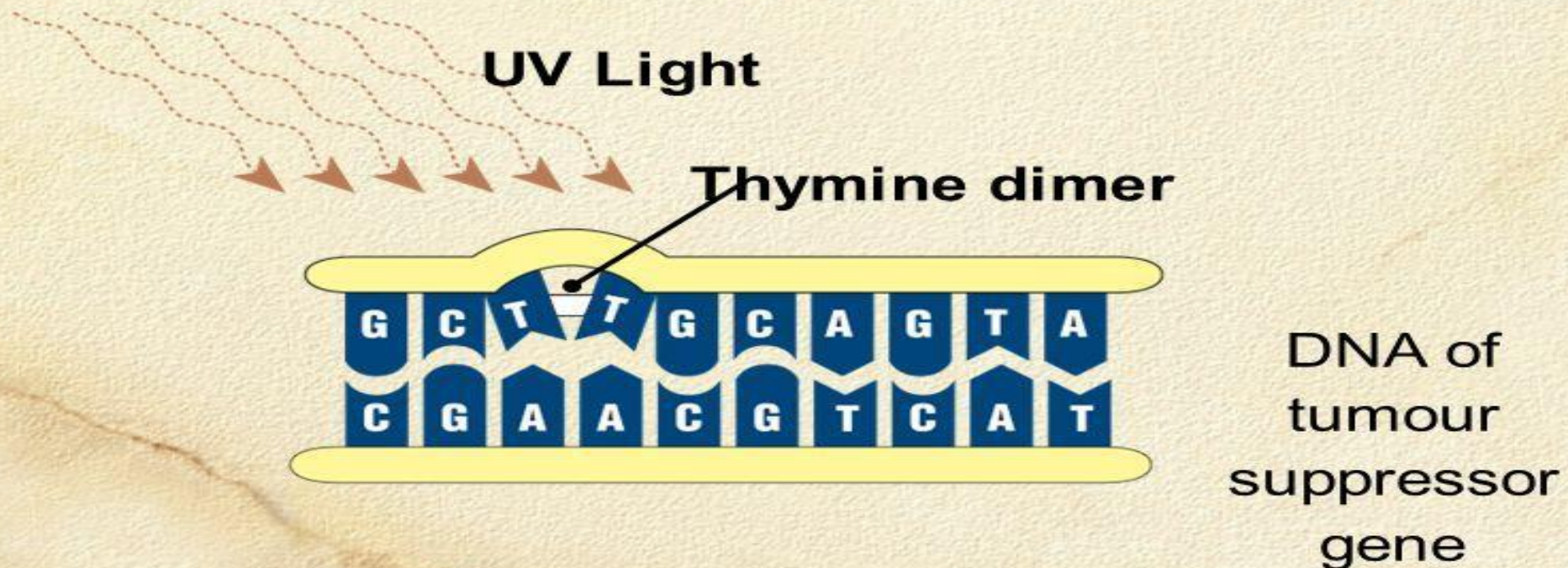
Effects of mutagens

- ❑ Mutagens cause changes to the DNA that can affect the transcription and replication of the DNA, which in severe cases can lead to cell death.
 - ❑ Powerful mutagens may result in chromosomal instability, causing chromosomal breakages and rearrangement of the chromosomes such as [translocation](#), [deletion](#), and [inversion](#). Such mutagens are called [clastogens](#).
 - ❑ Some mutagens can cause [aneuploidy](#) and change the number of chromosomes in the cell.
 - ❑ Accumulation of mutations may lead to cancer.
 - ❑ Many mutagens are not mutagenic by themselves, but can form mutagenic metabolites through cellular processes. Such mutagens are called promutagens.
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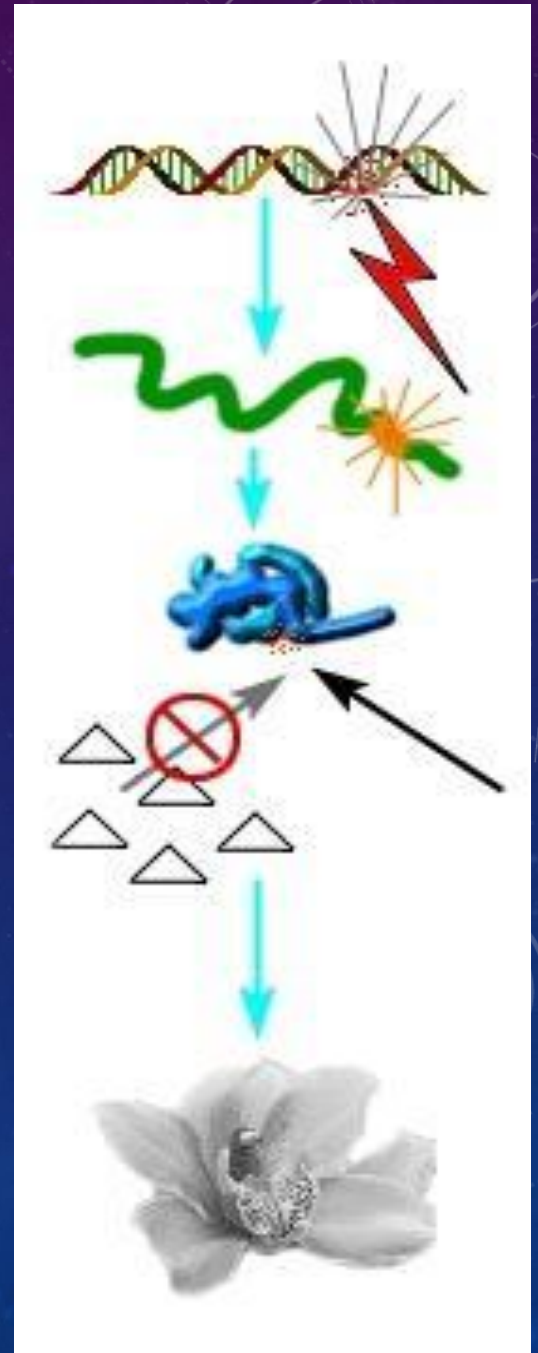
Effect of Mutagens on DNA

- After exposure to **UV light** adjacent thymine bases in DNA become cross-linked to form a 'thymine dimer'.
- This disrupts the normal base pairing and throws the controlling gene's instructions into chaos.



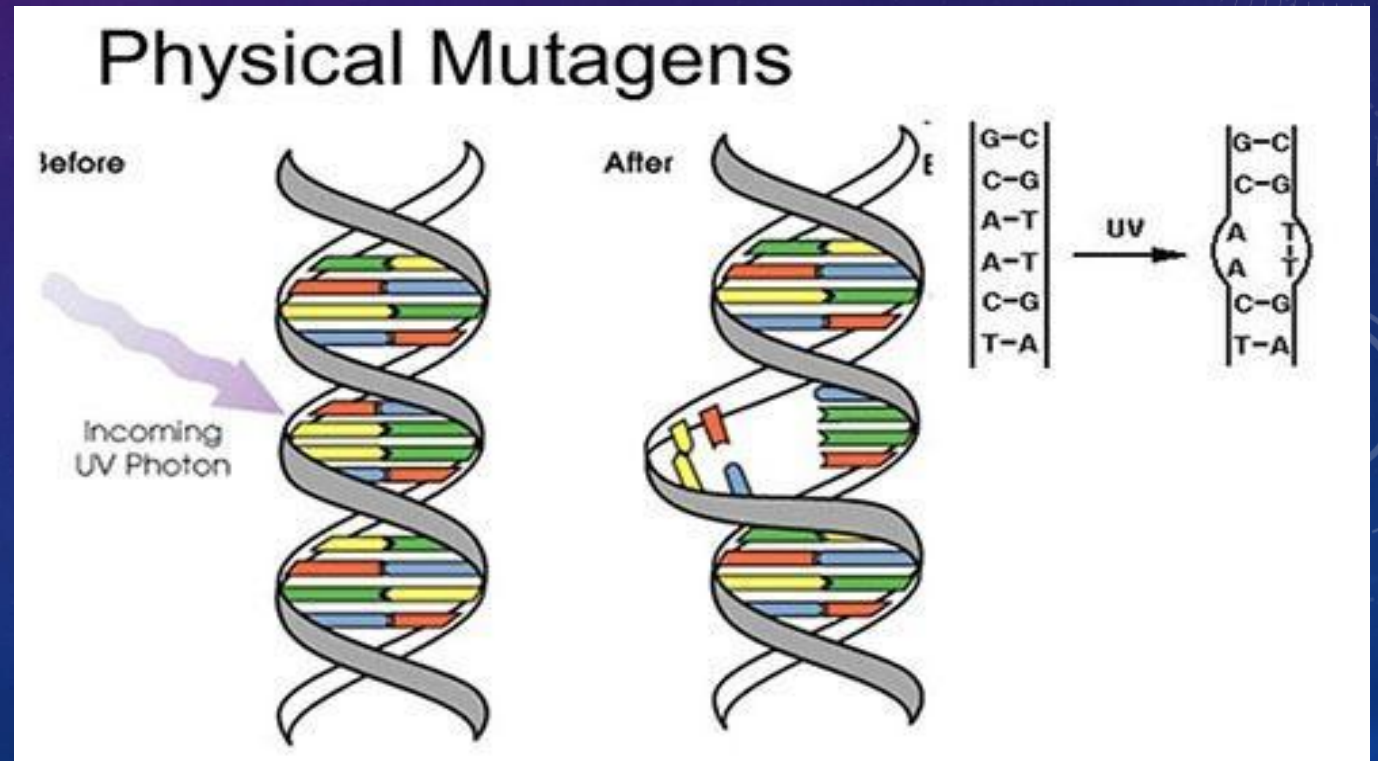
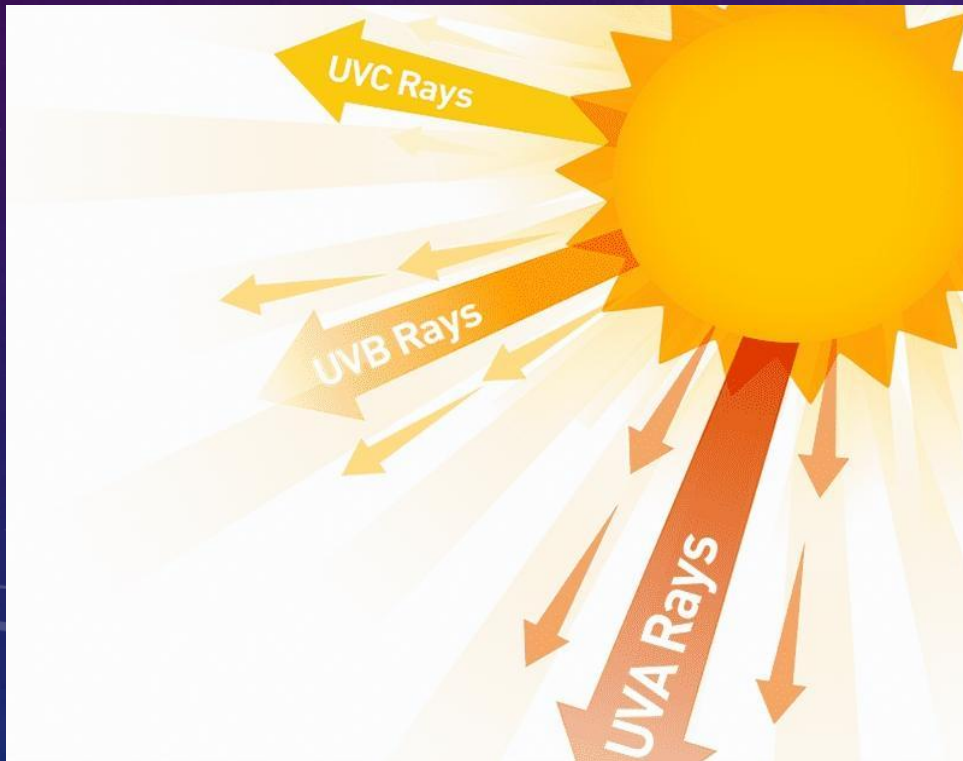
MUTAGENIC FACTORS:

1. Chemical mutagenic factors – Base analogs
2. Physical mutagenic factors – Heat & radiations
3. Biological mutagenic factors- viruses, bacteria, transposons.

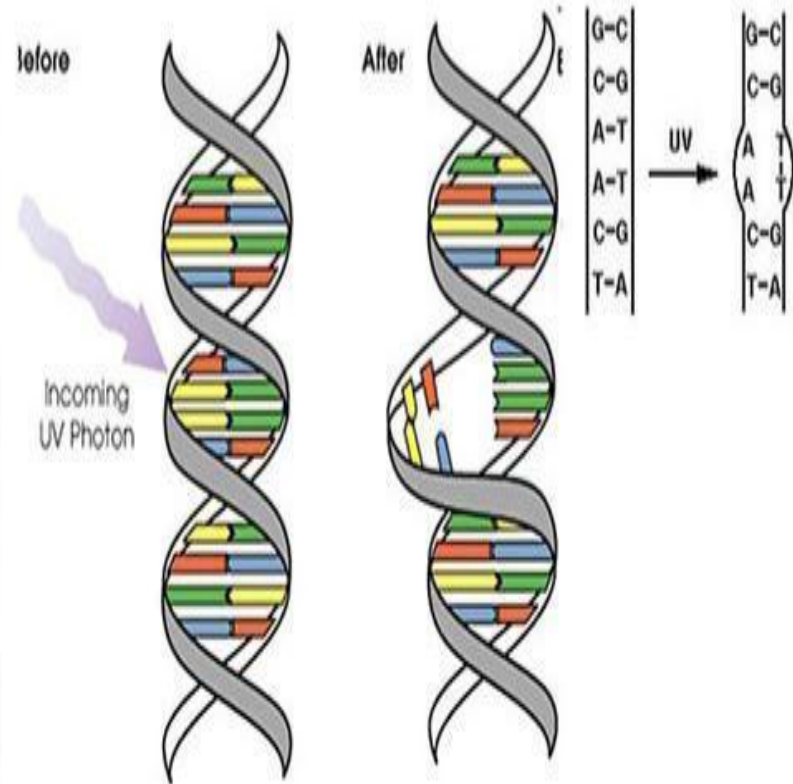


PHYSICAL MUTAGENS:

Physical mutagens include electromagnetic radiation, such as gamma rays, X rays, and UV light, and particle radiation, such as fast and thermal neutrons, beta and alpha particles.



Physical Mutagen



Ultra Violet (UV) Radiation
From UV Lamp

Electromagnetic Radiation

- X – rays from X-ray generator
- Gamma rays from
 - a. Cobalt 60 (half life – 5.27 yrs)
 - b. Cs 137 (half-life – 30 yrs.)

Corpuscular Radiation

- Thermal or Slow Neutrons from reactors
- Fast Neutrons from reactors
- Beta Particles
- Phosphorus 32 (half-life-14.3 days)
- Sulfur – 35 (half – life – 87 days)

- Ion Beam
- Electron Beam

Physical Mutagen

❑ I. Electromagnetic Radiations(Non ionizing):

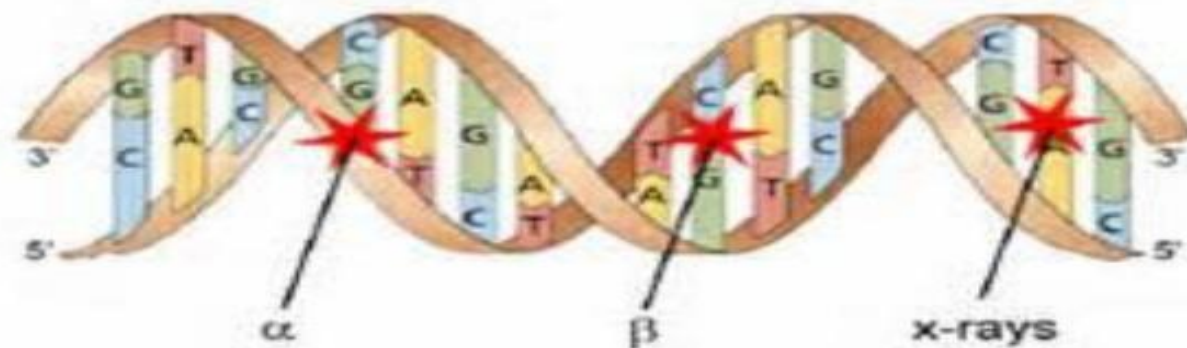
- ▶ Visible light and other forms of radiation are all types of electromagnetic radiation (consists of electric and magnetic waves).
- ▶ The portion of light which is biologically significant is UV and higher energy radiation.
- ▶ UV radiation is not ionizing but can react with DNA and other biological molecules
- ▶ UV radiation: Cyclobutane pyrimidine dimers, Thymidine dimers (T-T)



Physical Mutagen

❑ 2. Ionizing Radiations:

- ▶ X- and gamma-rays.
- ▶ Produce reactive ions (charged atoms or molecules) which react with biological molecules.
- ▶ Damage base and sugar residues.
- ▶ This term also includes corpuscular radiation-
 - streams of atomic and subatomic particles emitted by radioactive elements:
 - these are of two types, alpha- and beta-particles



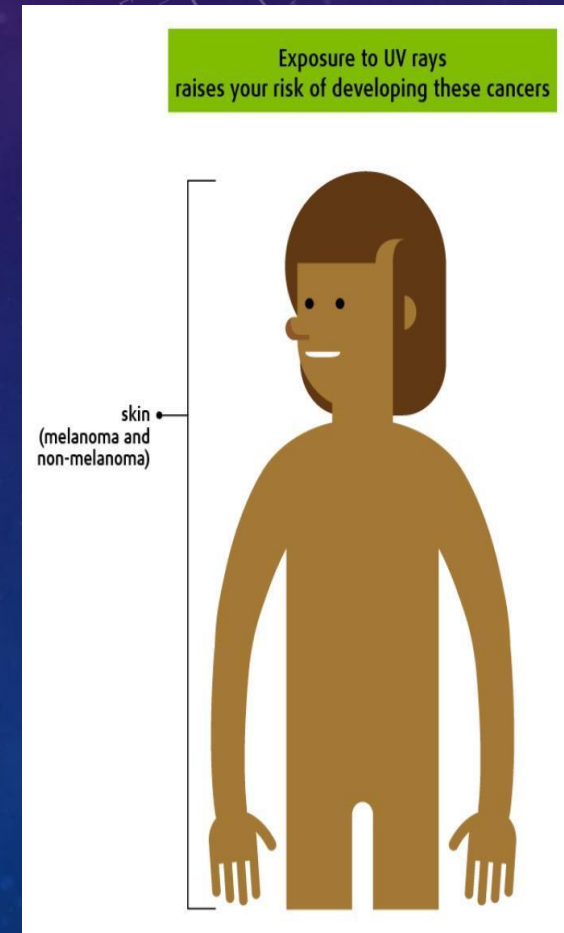
Physical Mutagen

- ▶ The rapidly dividing cell types (blood cell-forming areas of bone marrow, gastrointestinal tract lining) are the most affected by ionizing radiation.
- ▶ The severity of the effects depends upon the dose received.
- ▶ **Ionizing** radiation produces a range of effects on DNA both through free radical effects and direct action:
 - -breaks in one or both
 - -damage to/loss of bases (mutations)
 - -crosslinking of DNA to itself or proteins

PHYSICAL MUTAGENIC EFFECT: Radiations:



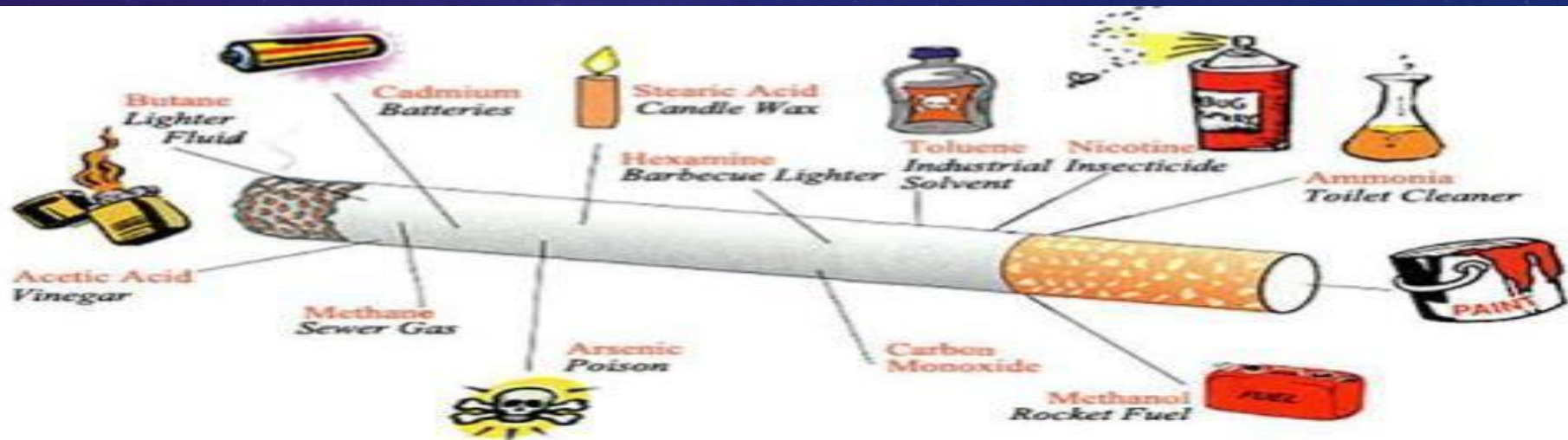
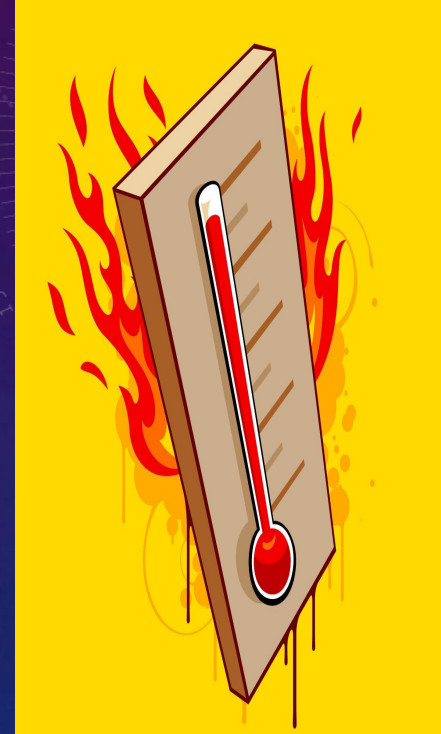
1. Radiations are the Primary mutagenic agent reported in 1920 .UV rays, x-rays ,alpha rays,neutrons,and other ionizing and non ionizing radiations are mutagenic.
2. Radiation directly damages the dna or nucleotide structure,which could be either lethal or sub lethal.
3. EM wave is additionally one in every of the known mutagens that cause harmful or sub lethal mutation.
4. Not even the dna but also proteins & lipids Present in an exceeding Cell.
5. Rapidly dividing cells are a Chief target for ioinzing radiations like X-rays



- Heat:

Heat is another Mutagen that provokes mutations in our dna. After we heat the dna , over a specific degree ($>95^{\circ}\text{C}$),

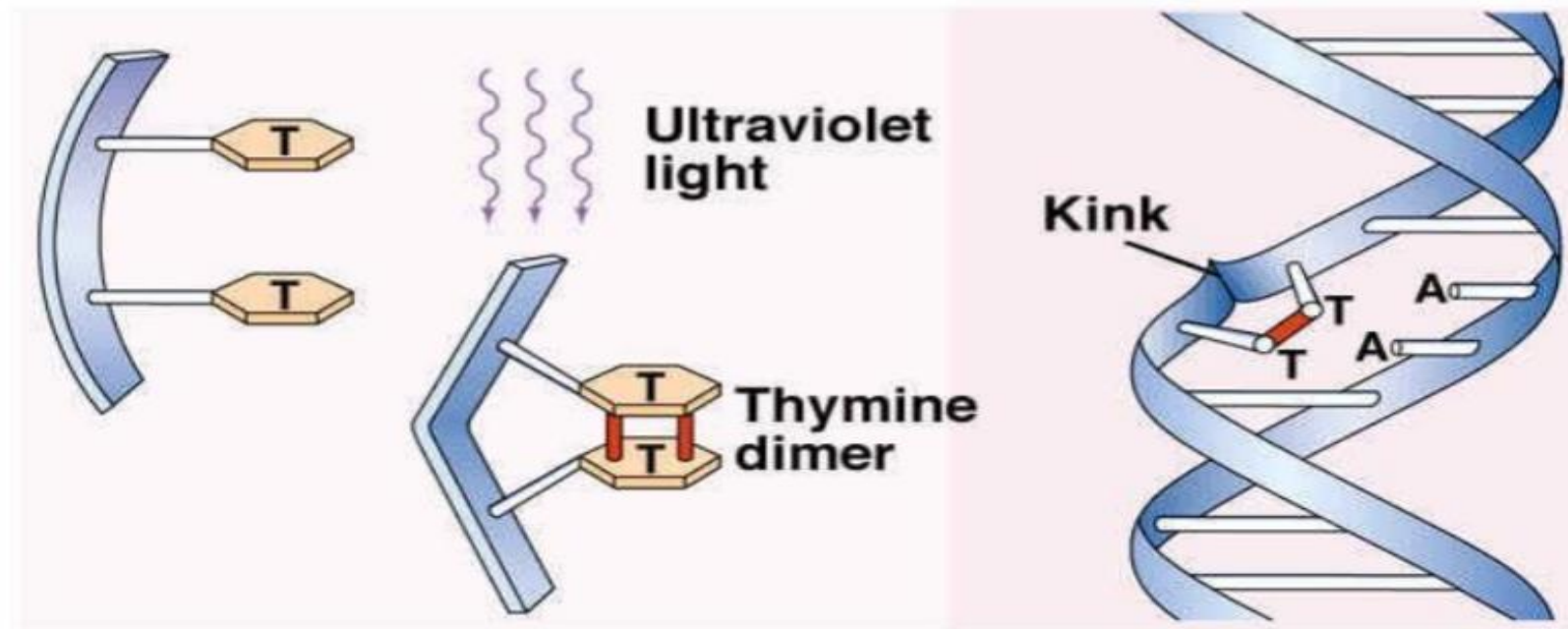
The dna become denatured two single stranded dna generated from the dsDna .Also, extreme heat damages dna and breaks the phosphodiester bonds Too.



Physical Mutagen

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Pyrimidine Dimer



QUESTIONS:

- Q1: what you understand by the term corpuscular radiation?
- Q2: on which level EM radiation effect human body?
- Q3: what's the major concern of adverse effects of exposure to non-ionizing EMR?
- Q4: what's are the effects produced by ionizing radiation on DNA?
- Q5: what is the another Mutagen (Other than ionising & non-ionising radiation) & how it effect DNA?



**THANK
YOU
FOR WATCHING
OUR
PRESENTATION**