

Biological Effects of Radiation

- All types radiation (alpha, beta, gamma and EMR) have hazardous effects on biological tissue
 - When X-rays are requires, patients are shielded with lead vests
 - Radiation was the devastating aftermath of such events including the Chernobyl meltdown and the WWII atomic bombing of Japanese cities
- The level of danger of exposure to radiation depends on several variables:
 1. The amount of energy of the radiation
 - * ▪ The more energy the radiation has, the more hazardous it is
 - High energy particles or photons can cause genetic damage by altering DNA and lead to development of cancers and harmful mutations
 2. Amount of exposure to radiation
 - More exposure to or large doses of harmful radiation increases the amount of energy being absorbed by biological tissue, therefore making it more hazardous
 - **Activity**: the amount of radiation produced in a given period of time. Activity depends on the stability and amount of the radioactive substance.
 - * ▪ Small amounts of harmful radiation vs. large amounts of low risk radiation
 3. Ability to ionize biological tissue
 - **ionization** occurs when an atom losses an electron/(s)
 - Cells can be damaged or killed when exposed to ionizing radiation, resulting in radiation sickness
- Safety can be improved when working with radioactive material or high energy EMR by
 1. Decreasing exposure time
 2. Increasing distance between people and the radioactive material
 3. Increasing the shielding used

RADIATION HAZARDS

Type of Radiation	Nature of Radiation	Penetrating Ability	Ionization Ability	Hazard
alpha	Helium nucleus	- Paper - Cannot penetrate skin	high	low, unless ingested
beta	High speed electron/positron	- cardboard - penetrates about 1 cm into the body	moderate to low	moderate
gamma	High energy photon	- metal - penetrates right through the body	low	high

EXAMPLE: Ultraviolet radiation is a type of ionizing radiation. Is it also a type of nuclear radiation? Explain.

No. Ultraviolet light is not one of the three types of nuclear radiation and is therefore not produced through a nuclear process. Ultraviolet light is produced when electrons within an atom make a transition to a lower energy level.

Now try pg. 310 #1-6