Radiation Effect on Human Body

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Abstract

Radiation is energy in the form of waves or streams of particles. There are many kinds of radiation all around us. When people hear the word radiation, they often think of atomic energy, nuclear power and radioactivity, but radiation has many other forms. We will explanation on this research definitions of radiation, and types of radiation and its effect on human body.

Keywords: Radiation, Energy, human body, radioactivity

Introduction

All life has evolved in an environment filled with radiation. The forces at work in radiation are revealed upon examining the structure of atoms. Atoms are a million times thinner than a single strand of human hair, and are composed of even smaller particles – some of which are electrically charged. Sections 2.1 atoms in more detail, along with basic radiation-related principles.

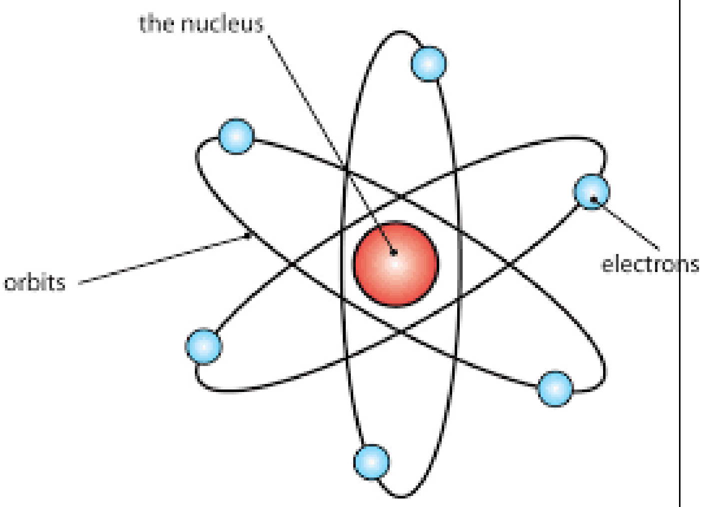
Atoms: Where all matter begins

Atoms form the basic building blocks of all matter. In other words, all matter in the world begins with atoms – they are elements like oxygen, hydrogen, and carbon.

An atom consists of a nucleus – made up of protons and neutrons that are kept together by nuclear forces – and electrons that are in orbit around the nucleus. The nucleus carries a positive charge; protons are positively charged, and neutrons do not carry a charge. The electrons, which carry a negative charge, move around the nucleus in clouds (or shells). The negative electrons are attracted to the positive nucleus because of the electrical force. This is how the atom stays together.

Figure:

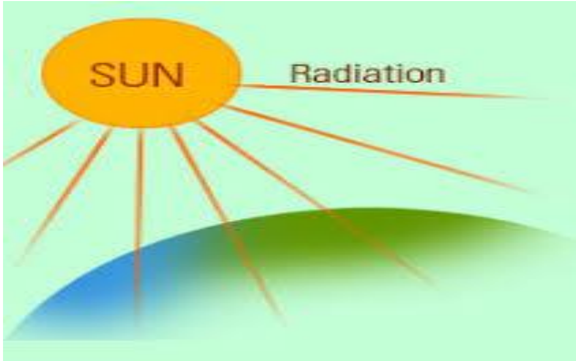
Model of an atom



Each element is distinguished by the number of protons in its nucleus. This number, which is unique to each element, is called the “atomic number”. For example, carbon has six protons; therefore, its atomic number is 6 on the periodic table .In an atom of neutral charge, the atomic number is also equal to the number of electrons. An atom’s chemical properties are determined by the number of electrons, which is normally equal to the atomic number

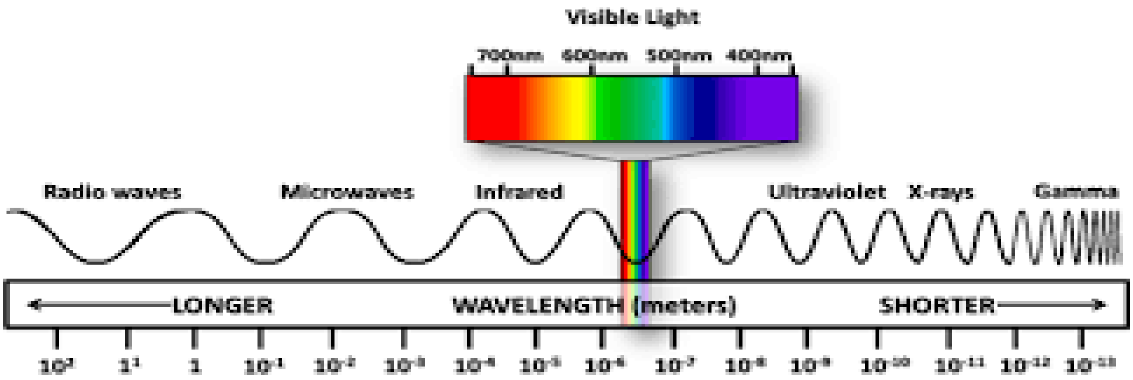
Definitions of Radiation

Radiation[1] is energy in the form of waves or streams of particles. There are many kinds of radiation all around us. When people hear the word radiation, they often think of atomic energy, nuclear power and radioactivity, but radiation has many other forms. Sound and visible light are familiar forms of radiation; other types include ultraviolet radiation (that produces a suntan), infrared radiation (a form of heat energy), and radio and television signals.



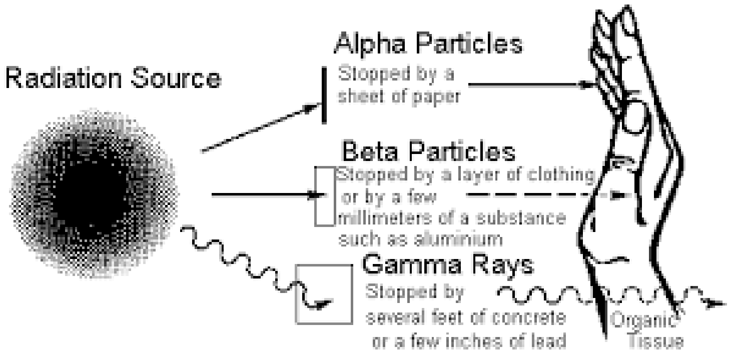
Radiation is the emission or transmission of energy in the form of waves or particles through space or through a material medium.

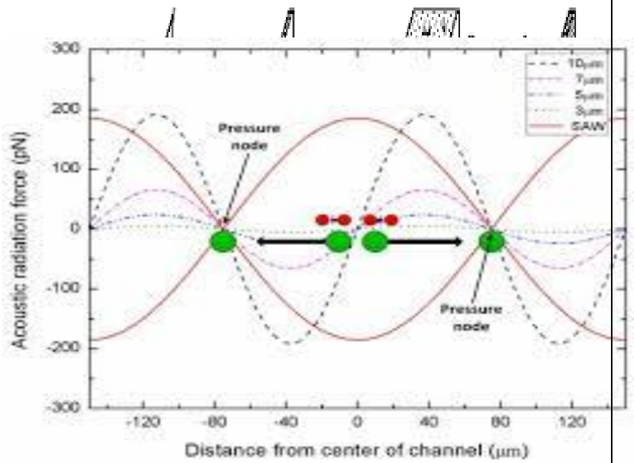
This includes: **Electromagnetic radiation,** such as radio, microwaves, infrared, visible light, ultraviolet, x-rays, and gamma radiation (γ)



Particle radiation, such as

Alpha radiation (α), beta radiation (β), and neutron radiation (particles of non-zero rest energy)



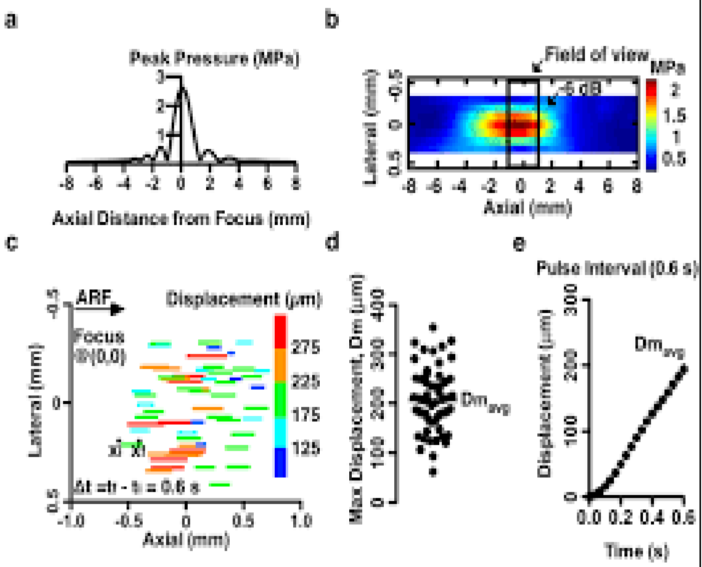


Acoustic radiation, such as

Ultrasound, sound, and seismic waves (dependent on a physical transmission medium)

Gravitational radiation, radiation that takes the form of gravitational waves, or ripples in the curvature of space-time.

Radiation is often categorized as either ionizing or non-ionizing depending on the energy of the radiated particles. Ionizing radiation carries more than 10 eV, which is enough to ionize atoms and molecules, and break chemical bonds. This is an important distinction due to the large difference in harmfulness to living organisms. A common source of ionizing radiation is radioactive materials that emit α, β, or γ radiation, consisting of helium nuclei, electrons or positrons, and photons, respectively.



Purpose of the Study

The purpose of this study is to explanation definition of radiation and types of radiation, to contribute in protect people and the environment from the harmful effects of ionizing radiation.

Research Questions

- what is the effects of ionizing radiation on human health and on the environment
- what is the objectives and basic concepts in managing radiation risks
- what is Principles of radiation risk management, and their application

Types of Radiation

Radiation is energy in the form of waves of particles.
There are two forms of radiation[i] – non-ionizing and ionizing

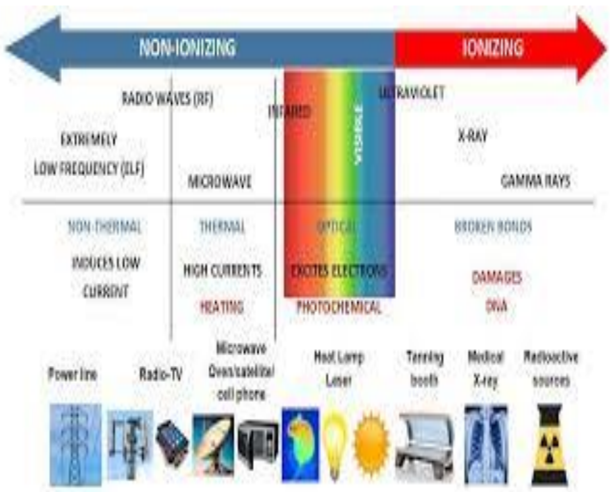
Non-ionizing radiation

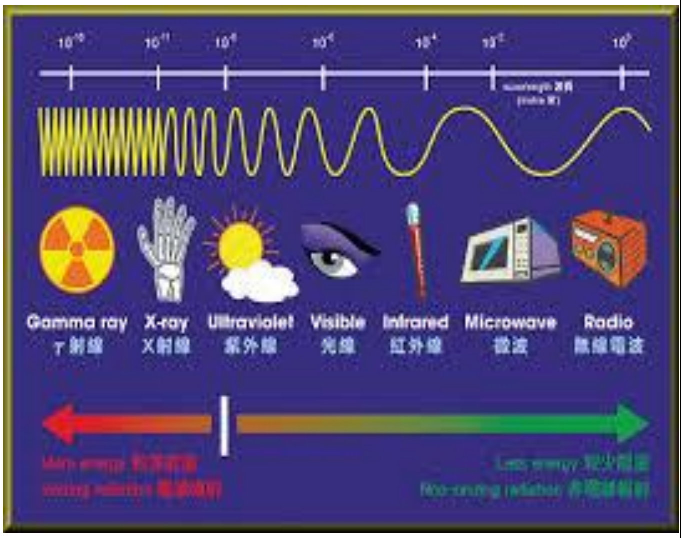
Non-ionizing radiation has less energy than ionizing radiation; it does not possess enough energy to produce ions. Examples of non-ionizing radiation are visible light, infrared, radio waves, microwaves, and sunlight.
Global positioning systems, cellular telephones, television stations, FM and AM radio, baby monitors, cordless phones, garage-door openers, and ham radios use non-ionizing radiation.

Other forms include the earth's magnetic field, as well as magnetic field exposure from proximity to transmission lines, household wiring and electric appliances. These are defined as extremely low-frequency (ELF) waves and are not considered to pose a health risk.

Non-ionizing radiation is

described as a series of energy waves composed of oscillating electric and magnetic fields traveling at the speed of light. Non-ionizing radiation includes the spectrum of ultraviolet (UV), visible light, infrared (IR), microwave (MW), radio frequency (RF), and extremely low frequency (ELF). Lasers commonly operate in the UV, visible, and IR frequencies. Non-ionizing radiation is found in a wide range of occupational settings and can pose a considerable health risk to potentially exposed workers if not properly controlled.

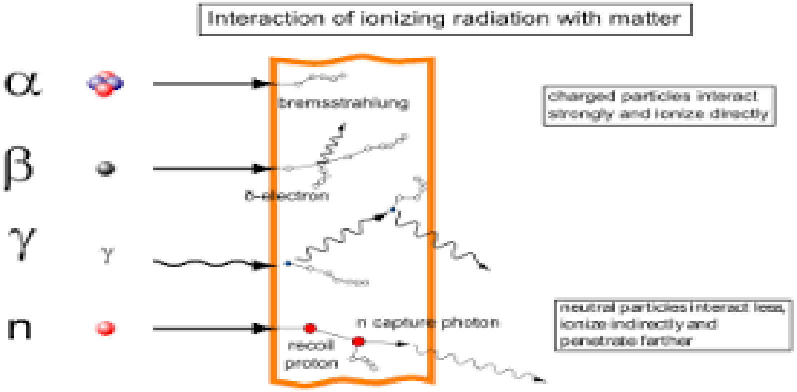




Ionizing radiation[ii]

Ionizing radiation is capable of knocking electrons out of their orbits around atoms, upsetting the electron/proton balance and giving the atom a positive charge. Electrically charged molecules and atoms are called ions. Ionizing radiation includes the radiation that comes from both natural and man-made radioactive materials.

There are several types of ionizing radiation:



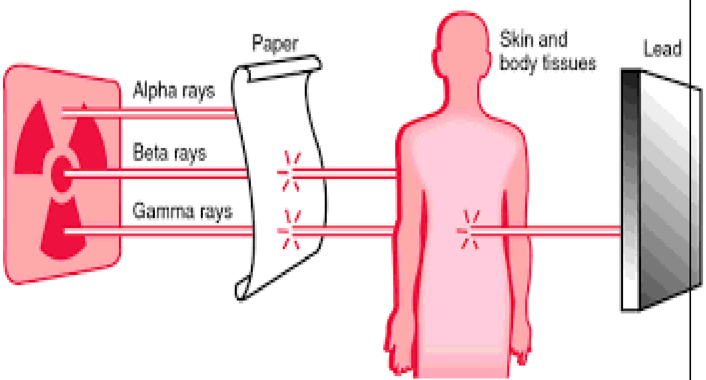
Alpha radiation (α)

Alpha radiation consists of alpha particles that are made up of two protons and two neutrons each and that carry a double positive charge. Due to their relatively large mass and charge, they have an extremely limited ability to penetrate matter.

Alpha radiation can be stopped by a piece of paper or the dead outer layer of the skin. Consequently, alpha radiation from nuclear substances outside the body does not present a radiation hazard. However, when alpha-radiation-emitting nuclear substances are taken into the body (for example, by breathing them in or by ingesting them), the energy of the alpha radiation is completely absorbed into bodily tissues. For this reason, alpha radiation is only an internal hazard. An example of a nuclear substance that undergoes alpha decay is radon-222, which decays to polonium-218.

Beta radiation (β)

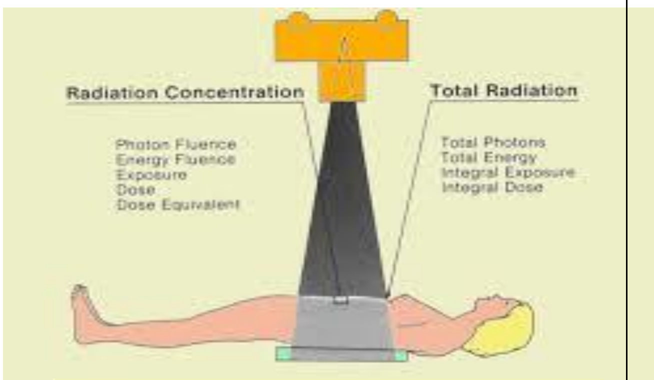
Beta radiation consists of charged particles that are ejected from an atom's nucleus and that are physically identical to electrons. Beta particles generally have a negative charge, are very small and can penetrate more deeply than alpha particles. However, most beta radiation can be stopped by small amounts of shielding, such as sheets of plastic, glass or metal.

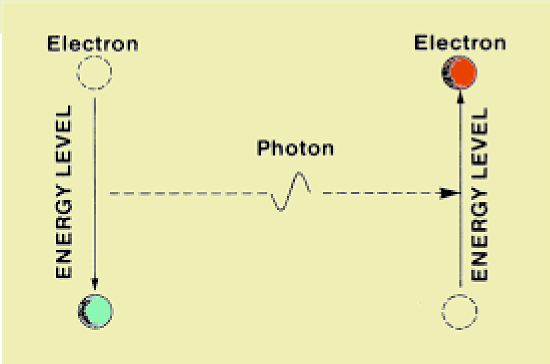


When the source of radiation is outside the body, beta radiation with sufficient energy can penetrate the body's dead outer layer of skin and deposit its energy within active skin cells. However, beta radiation is very limited in its ability to penetrate to deeper tissues and organs in the body. Beta-radiation-emitting nuclear substances can also be hazardous if taken into the body. An example of a nuclear substance that undergoes beta emission is tritium (hydrogen-3), which decays to helium-3.

Photon radiation (gamma [γ] and X-ray)

Photon radiation is electromagnetic radiation. There are two types of photon radiation of interest for the purpose of this document: gamma (γ) and X-ray.





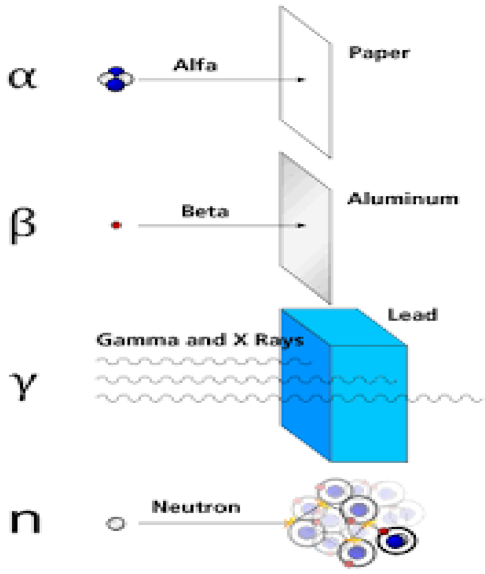
Gamma radiation consists of photons that originate from within the nucleus, and X-ray radiation consists of photons that originate from outside the nucleus, and are typically lower in energy than gamma radiation.

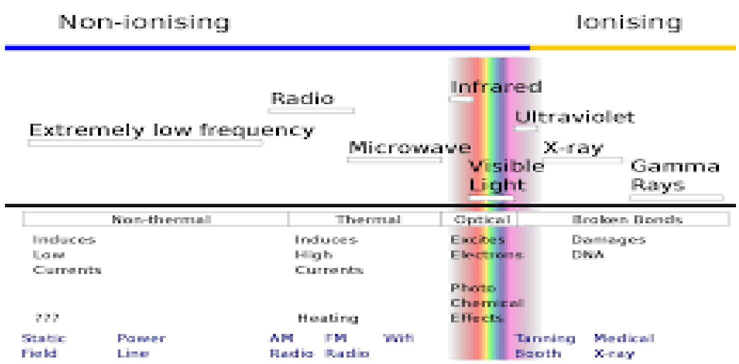
Photon radiation can penetrate very deeply and sometimes can only be reduced in intensity by materials that are quite dense, such as lead or steel. In general, photon radiation can travel much greater distances than alpha or beta radiation, and it can penetrate bodily tissues and organs when the radiation source is outside the body. Photon radiation can also be hazardous if photon-emitting nuclear substances are taken into the body. An example of a nuclear substance that undergoes photon emission is cobalt-60, which decays to nickel-60.

Neutron radiation (n)

Apart from cosmic radiation, spontaneous fission is the only natural source of neutrons (n). A common source of neutrons is the nuclear reactor, in which the splitting of a uranium or plutonium nucleus is accompanied by the emission of neutrons. The neutrons emitted from one fission event can strike the nucleus of an adjacent atom and cause another fission event, inducing a chain reaction. The production of nuclear power is based upon this principle. All other sources of neutrons depend on reactions where a nucleus is bombarded with a certain type of radiation (such as photon radiation or alpha radiation), and where the resulting effect on the nucleus is the emission of a neutron.

Neutrons are able to penetrate tissues and organs of the human body when the radiation source is outside the body. Neutrons can also be hazardous if neutron-emitting nuclear substances are deposited inside the body. Neutron radiation is best shielded or absorbed by materials that contain hydrogen atoms, such as paraffin wax and plastics. This is because neutrons and hydrogen atoms have similar atomic weights and readily undergo collisions between each other





Natural sources of ionizing radiation

Radiation has always been present and is all around us in many forms .Life has evolved in a world with significant levels of ionizing radiation, and our bodies have adapted to it.
Many radioisotopes are naturally occurring, and originated during the formation of the solar system and through the interaction of cosmic rays with molecules in the atmosphere. Tritium is an example of a radioisotope formed by cosmic rays' interaction with atmospheric molecules.

Some radioisotopes (such as uranium and thorium) that were formed when our solar system was created have half-lives of billions of years, and are still present in our environment. Background radiation is the ionizing radiation constantly present in the natural environment.

Conclusion

Finally, it should be noted that radiation has a significant impact on human health, and it is therefore necessary to conduct several studies that assess the quantitative and qualitative effects of radiation on public health and the ensuing social and economic impacts.

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