

*AL-Mustaqbal University College  
Department of Medical Physics  
The Second Stage  
Medical Imaging*



كلية المستقبل الجامعة  
قسم الفيزياء الطبية  
المرحلة الثانية  
التصوير الطبي

التصوير الطبي

*Medical Imaging*

**LECTURE ONE**

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## **LECTURE ONE**

### **Introduction to Radiation**

- **Radiation** is the emission of energy as electromagnetic waves or as moving particles, especially high-energy, which comes from a source and travels through space and may be able to penetrate various materials.

Therefore, we can classify radiation according to the effects it produces on matter, into two groups;

- 1) **Particulate radiation** such as alpha and beta particles.
- 2) **Electromagnetic radiation** such as x-rays or gamma rays.

- Some types of radiation are known as ionizing radiation and non-ionizing radiation.

#### 1) **Non-ionizing radiation**

Non-ionizing radiation has less energy than ionizing radiation; it does not carry enough energy to produce ions. Examples of non-ionizing radiation are visible light, radio waves, microwaves, and sunlight.

#### 2) **Ionizing radiation:**

Ionizing radiation is capable of knocking electrons out of their orbits around atoms. This case leads to giving the atom or molecules 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.

Let us consider (suppose) two energy levels ( $E_1$  and  $E_2$ ) of electrons.  $E_1$  is the ground state or lower energy state of electrons and  $E_2$  is the excited state or higher energy state of electrons. The electrons in the ground state are called lower energy electrons or ground state electrons whereas the electrons in the excited state are called higher energy electrons or excited electrons. One; The electrons in the lower energy level need some extra energy to jump from lower energy level to the higher energy level. This extra energy can be supplied from various types of energy sources such as heat, electric field