



Islamic University / Najaf  
College of Medical Technology  
Department of Radiology Techniques



Radiation Physics Lab/second stage

## Introduction to Radiation Physics

### Lecture 4

By

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## Introduction:

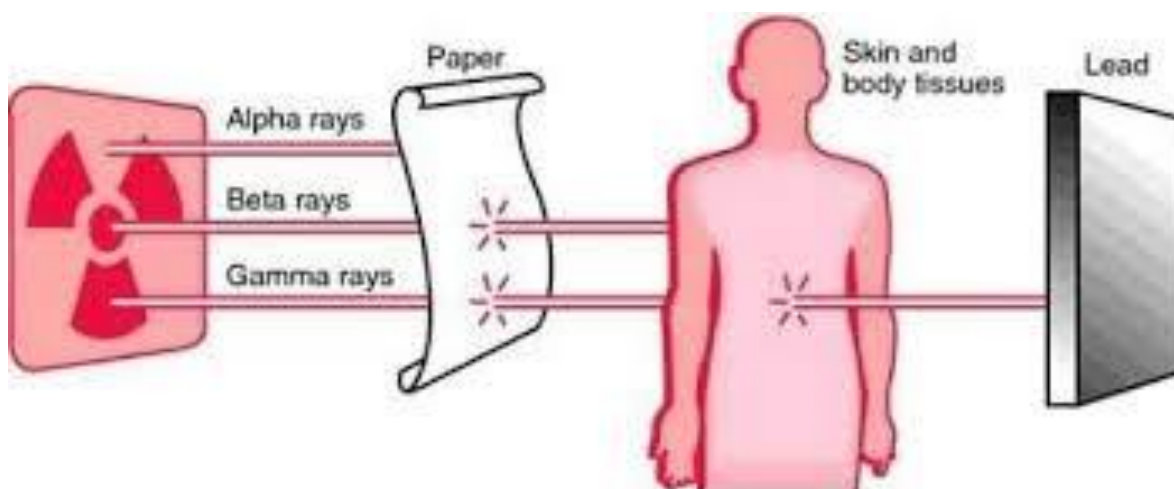
### types of radiation:

There are two main types of radiation: **Ionizing radiation** such as x-rays, gamma rays, cosmic rays, beta and alpha particles.

**Non-ionizing radiation** such as electromagnetic radiation, including radio waves Television, radar waves, heat waves of short wavelengths (microwaves) and sub waves red, ultraviolet and normal light.

**Ionizing Radiation:** There are three main types of ionizing radiation that may be found for radiation is alpha particles, beta particles, and gamma rays.

**The health effects of ionizing radiation:** The health harms of radiation depend on the level of radiation to which a person is exposed, and the radiation affects his body cells and increases the possibility of cancer and other genetic changes that may be transmitted to children When a person is exposed to a large amount of radiation, it may lead to death.



## **Radiation units:**

They are physical quantities that express the amount of energy deposited in a specific mass of matter or human tissue, or express about the dangers of different types of ionizing radiation on human tissues and organs, or on the entire body the human. these quantities, when derived, depend on the method of interaction of the particular type of ionizing radiation with matter The method of transfer of energy from these radiations to the material, and the degree to which the specific type of radiation is harmful, when equal values of energy deposited in one mass of different substances. From these units:

**1-Rad:** A unit of measure for the amount of radiation energy absorbed (absorption dose).

**2-Roentgen (R):** A unit of measure for outgoing radiation and is mainly used for X-rays.

**3- Curie (Ci):** It is a measure of the outgoing rays, and one curie =  $3.7 \times 10^{10}$  decays per second.

**4-REM:** A unit of measurement for the biological effect of absorbed radiation.

**5-Sievert (SIEVERT):** Sv is one of the most recent units for measuring the effect resulting from the absorption of radiation. (One Sievert = 100 REM).

## Other physical units:

Name	Symbol	Quantity	Expressed in terms of other SI units	Expressed in terms of SI base units
radian	rad	angle	1	m/m
steradian	sr	solid angle	1	m <sup>2</sup> /m <sup>2</sup>
hertz	Hz	frequency	s <sup>-1</sup>	
newton	N	force, weight	kg·m·s <sup>-2</sup>	
pascal	Pa	pressure, stress	N/m <sup>2</sup>	kg·m <sup>-1</sup> ·s <sup>-2</sup>
joule	J	energy, work, heat	N·m	kg·m <sup>2</sup> ·s <sup>-2</sup>
watt	W	power, radiant flux	J/s	kg·m <sup>2</sup> ·s <sup>-3</sup>
coulomb	C	electric charge or quantity of electricity	s·A	
volt	V	voltage (electrical potential difference), electromotive force	W/A	kg·m <sup>2</sup> ·s <sup>-3</sup> ·A <sup>-1</sup>
farad	F	electric capacitance	C/V	kg <sup>-1</sup> ·m <sup>-2</sup> ·s <sup>4</sup> ·A <sup>2</sup>
ohm	Ω	electric resistance, impedance, reactance	V/A	kg·m <sup>2</sup> ·s <sup>-3</sup> ·A <sup>-2</sup>
siemens	S	electrical conductance	A/V	kg <sup>-1</sup> ·m <sup>-2</sup> ·s <sup>3</sup> ·A <sup>2</sup>
weber	Wb	magnetic flux	V·s	kg·m <sup>2</sup> ·s <sup>-2</sup> ·A <sup>-1</sup>
tesla	T	magnetic field strength	Wb/m <sup>2</sup>	kg·s <sup>-2</sup> ·A <sup>-1</sup>
henry	H	inductance	Wb/A	kg·m <sup>2</sup> ·s <sup>-2</sup> ·A <sup>-2</sup>

<b>degree Celsius</b>	<b>°C</b>	<b>temperature relative to 273.15 K</b>	<b>K</b>	
<b>lumen</b>	<b>lm</b>	<b>luminous flux</b>	<b>cd·sr</b>	<b>cd</b>
<b>lux</b>	<b>lx</b>	<b>illuminance</b>	<b>lm/m<sup>2</sup></b>	<b>m<sup>-2</sup>·cd</b>
<b>becquerel</b>	<b>Bq</b>	<b>radioactivity (decays per unit time)</b>	<b>s<sup>-1</sup></b>	
<b>gray</b>	<b>Gy</b>	<b>absorbed dose (of ionizing radiation)</b>	<b>J/kg</b>	<b>m<sup>2</sup>·s<sup>-2</sup></b>
<b>sievert</b>	<b>Sv</b>	<b>equivalent dose (of ionizing radiation)</b>	<b>J/kg</b>	<b>m<sup>2</sup>·s<sup>-2</sup></b>
<b>katal</b>	<b>kat</b>	<b>catalytic activity</b>		

## **How the graph works:**

This is done by drawing a horizontal line representing the x-axis, and a vertical line representing the y-axis so that it intersects with the middle of the horizontal line and results in its intersection as the point of origin, and the numbers to the right of the y-axis are positive numbers, and to the left of the y-axis the numbers are negative. Also, the numbers above the x-axis are positive numbers, and below the x-axis are negative numbers, and if the numbers to be represented on the graph are positive only, then only the right part of the x-axis and the upper part of the y-axis are drawn.

**1-Naming the axes:** The x and y axes are named to enable data to be studied and compared.

**2-Write the title of the graph.**

**3-Determine the range of values to be studied**

**4-Determine the number of units between each two consecutive values:**

by dividing the numbers on the two axes so that the difference between them is constant; As if it is one unit, or two units, or ten units, or a hundred units, or otherwise, and this depends on how big or small the numbers are to be studied, and the relationships between them.

**5-Connecting the points to each other:** When all the points are represented, they are connected to each other. If the relationship is linear between the variables being studied, a straight line will be formed.

### تمرين على الرسم البياني

س/ ارسمي على ورق الرسم البياني العلاقة بين المتغيرين S,P الموضح قيمهما في الجدول التالي ؟

S unit	26	40	60	80	150	188
P unit	800	1200	1600	2800	4280	5200

