Medical physics Department

diagnostic radiology physics lab.

Third stage

By

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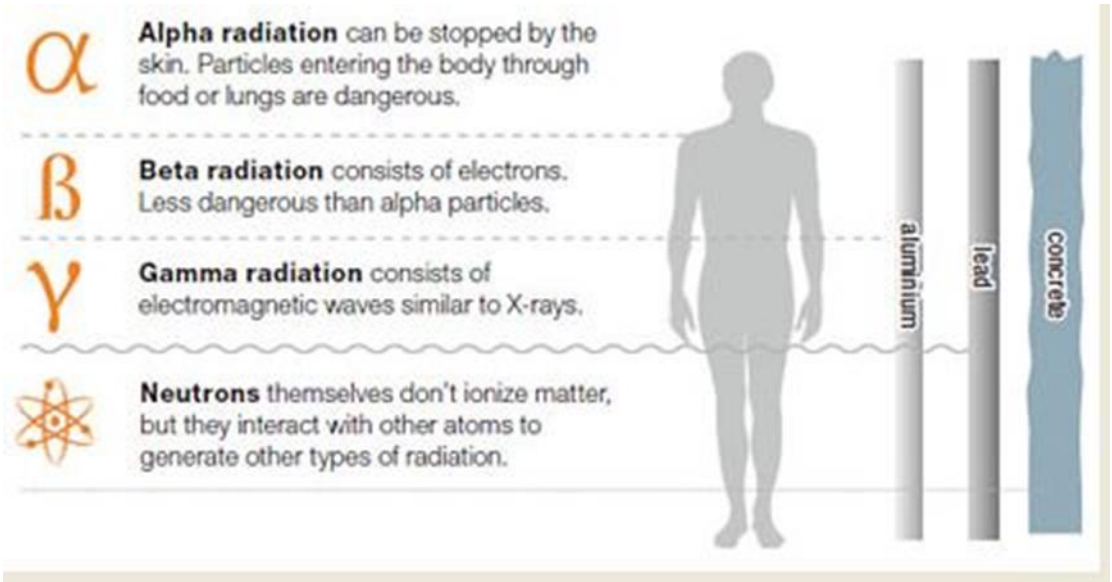


Experiment (3)

Inverse square law

Theory:

In science, an inverse-square law is any scientific law stating that a specified physical quantity is inversely proportional to the square of the distance from the source of that physical quantity. The fundamental cause for this can be understood as geometric dilution corresponding to point-source radiation into three-dimensional space.

In figure 1 (S) represents the light source, while r represents the measured points. The lines represent the flux emanating from the sources and fluxes. The total number of flux lines depends on the strength of the light source and is constant with increasing distance, where a greater density of flux lines (lines per unit area) means a stronger energy field. The density of flux lines is inversely proportional to the square of the distance from the source because the surface area of a sphere increases with the square of the radius. Thus the field intensity is inversely proportional to the square of the distance from the source.

The inverse square law also includes the relationship between the energy of ionizing radiation and the distance from the radiation source, whether it is nuclear or atomic radiation, which explains that one of the safety and security steps in using radiation is for the distance to be as large as possible to avoid the harm of ionizing radiation.

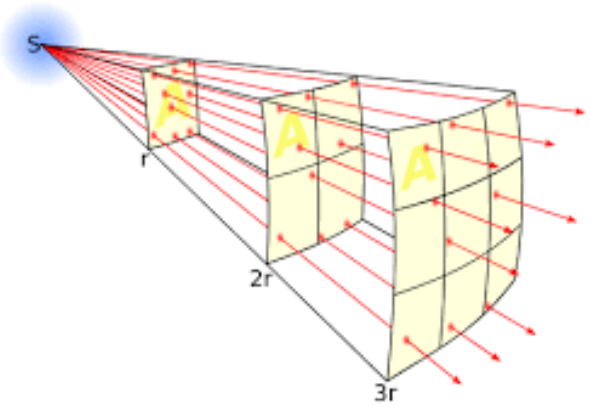


Figure (1) Inverse square law

The aim:

1- Measurement of the variation of light intensity according to variation indistance by using photoelectric cell.
2- To study the relationship between light intensity and distance.

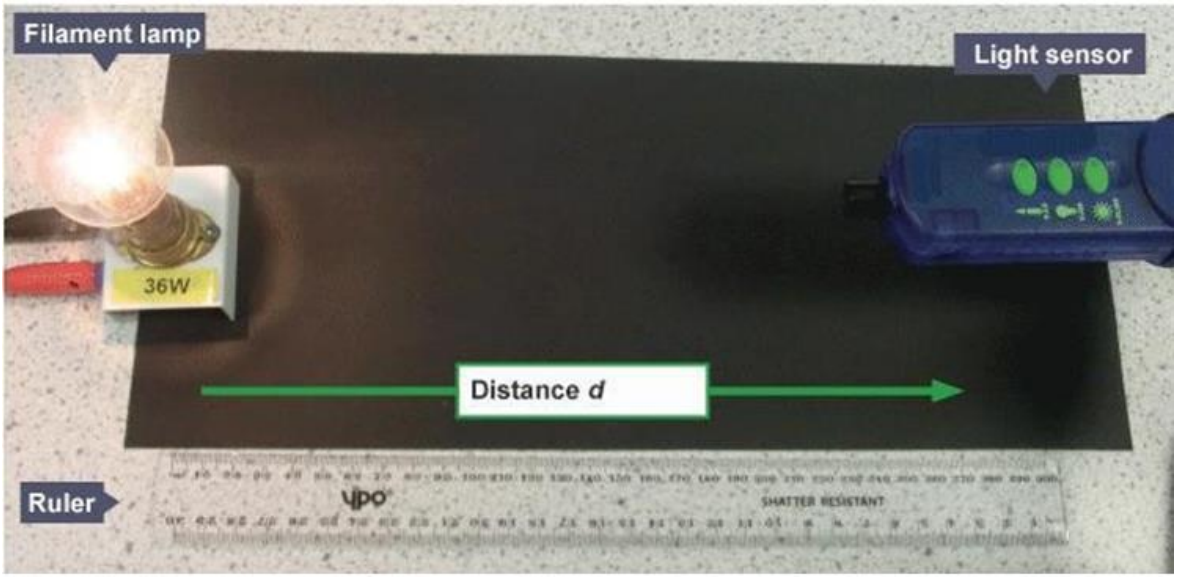
Methods:

1- Set up a clear lamp with a small filament as the point source over a black surface in a darkened room with a light sensor and ruler as shown in Figure below.

2- Using the ruler as a reference, vary the distance, of the light sensor from the centerof the lamp.

3- As the area of the light sensor is constant the light sensor reading can be taken asthe irradiance.

4. Return the step one and open the lamp to find the radiation intensity of the lamp.



5. Write the results of light intensity and distance in the following table

Distance d (cm)	Radiation intensity (lumens)	Distance d^2 (cm^2)	$1/d^2$ ($1/cm^2$)
5	450		
10	425		
15	400		
20	375		
25	350		
30	325		

6. Plot irradiance (intensity) via the $1/d^2$ as shown in the following figure.

Discussion:

1- Define the light intensity, Photoelectric cell?

2- Mention some medical applications about light intensity?

3- Discuss the curve in the experiment?