

**STRESS**

**SCHEDULE**

**DELAY**



# **Fundamentals of Radiology**

**BY**

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## Course Learning Objectives

- The students are introduced to the history of radiology. Radiation protection and the role of radiology in the medical fields with introduction to the common modalities in diagnostic radiology, nuclear medicine, radio-therapy, Body Planes, Projections, Radiographic Recording Devices (RIS-PACs), And Radiological Examinations.

### Teaching and Learning Methods

1. Lectures:(Tools: board, data show)
2. Interactive learning ( Discussions )
3. Practical
4. Self-study ( Research )
5. Other methods: (Problem Based Learning)



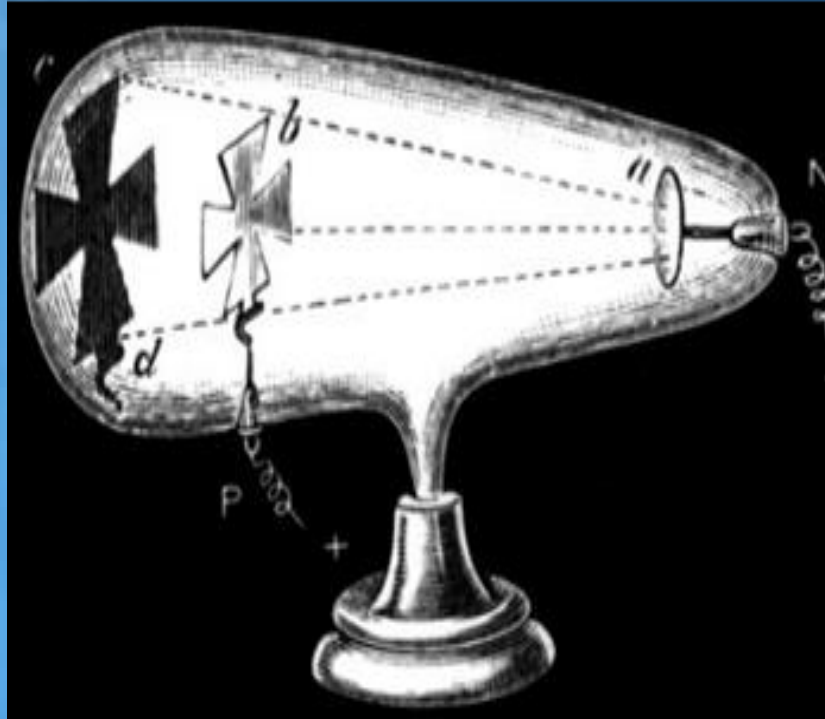
## Introduction to Radiology

- The foundations of the medical specialty of radiology were laid when German physics professor Wilhelm Roentgen presented his preliminary report, “On a New Kind of Rays,” to the secretary of the Wurzburg Physico-Medical Society in Germany on December 28, 1895, announcing the discovery of x-rays,



- Roentgen discovered quite by accident that its discharges produced shimmers of light on a nearby fluorescent screen (barium platinocyanide screen).
- Repeating the experiment multiple times, he proved to himself that the emissions were invisible to his own eyes, yet able to penetrate the walls of the cardboard box in which the tube was enclosed.
- Three days before Christmas he brought his wife into his laboratory, and they emerged with a photograph of the bones in her hand and of the ring on her finger.





Demonstration by Crookes that cathode rays travel in straight lines: a) cathode; b) aluminum cross and anode; d) dark shadow; c) fluorescent image



Roentgen's apparatus for studying the ionization of air by X rays, 1906.



German Museum, Munich

Forms of tube used by Roentgen in 1895–1896 for the production of X rays.

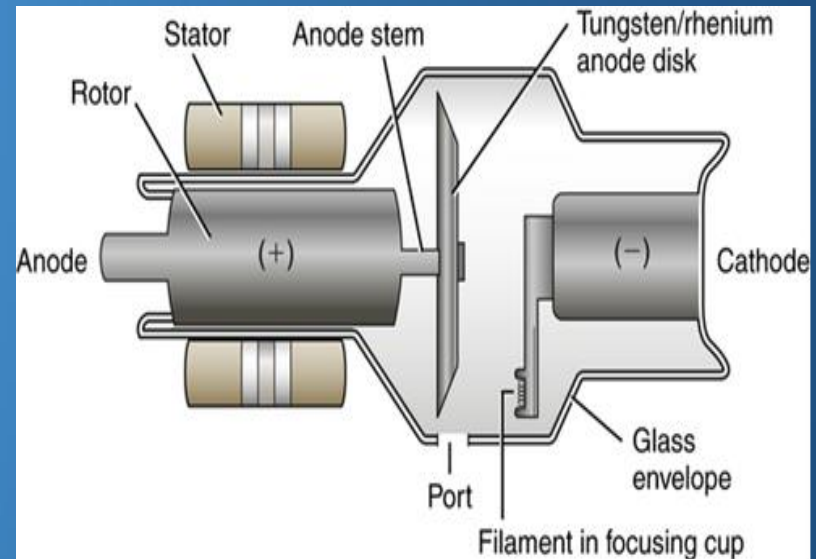
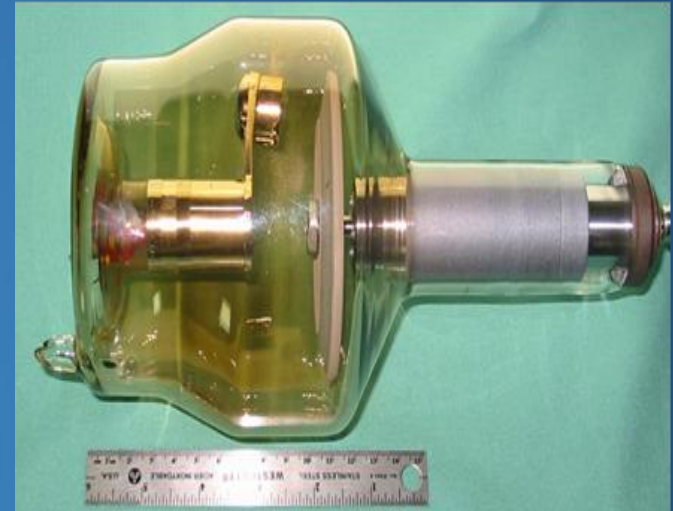


First X ray made in public. Hand of the famed anatomist, Albert von Kölliker, made during Roentgen's initial lecture before the Würzburg Physical Medical Society on January 23, 1896.

# X-ray tube components

**The x-ray tube is divided into four major components.**

- 1) Cathode Assembly
- 2) Anode Assembly
- 3) Glass Envelope
- 4) Protective Housing





## 1) Cathode Assembly

- The cathode is the negative side of the tube.
- The function of the cathode is to produce a thermionic cloud, conduct the high voltage to the gap between cathode and anode and focus the electron stream to the anode target.

### **It contains two primary parts:**

- a) The filaments
- b) The focusing cup

## 2) The Filaments

- Most tube has two filaments (dual focus) which provide a choice of quick exposures or high resolution.
- The filaments are made of thoriated tungsten.
- Tungsten is used in x-ray tube because of its high melting point of  $3370^{\circ}\text{C}$

### **Focusing Cup**

- The filaments are mounted within a focusing cup.
- Generally made of nickel, stainless steel, or molybdenum.
- Focuses the electrons on a smaller spot of the anode.
- The focusing cup has a negative charge so that it can condense the electron beam to a small area of the anode.



## **Medical Radiological Sciences**

- They are the sciences that concerns with different radiological investigations, modalities and techniques that are applied to improve the diseases management by producing an appropriate diagnosis and treatment of these diseases.

### **It is divided into:**

1. Radiodiagnosis
2. Radiotherapy
3. Nuclear Medicine



## **Radiodiagnosis**

- **It's the field that deals with using different equipments to reach to an appropriate diagnosis of different diseases such as**
  1. Traumatic Diseases (Fractures, Tissue ruptures... etc.)
  2. Neoplastic Diseases (Tumors)
  3. Inflammatory Diseases (Osteomyelitis in bones, sinusitis in sinuses...etc)
  4. Congenital Diseases (Dwarfism...etc)

**The equipments used in radiodiagnosis are divided into:-**

1. Equipments use x-rays
2. Equipments don't use x-rays



## **1. The equipments use x-rays includes:-**

### **1- Conventional x-ray Modalities which includes**

1. Mobile x-ray unit
2. Fluoroscopy unit and C-arm unit
3. Mammography unit
4. Panorama and oclosal film units
5. DEXA

### **2- Computed Tomography (CT)**



## 1. The conventional x-ray Modalities which includes

- The conventional x-ray modalities uses x-rays to get a 2D image of the part examined.
- The main functional part of them is the x-ray tube which consists of filament that emits electrons which strikes to target and emits x-rays these rays penetrates the body and interact with the different densities of the body systems producing the conventional x-ray image on a radiographic film.