GLP-F020

اسم القسم: هندسة تقنيات الأجهزة الطبية / اسم المختبر: هندسة اجهزة الاشعاع/ المرحلة : الثالثة / رمز المختبر:BL 301

سجل التجارب للعام الدراسي 20 23 - 20 24

رقم التجربة :- Experiment No.1

اسم التجربة : Introduction of GM counter

الغرض من التجربة :- To learn about the GM counter and its importance in detecting radiation.

الاجهزة والمعدات :- power point

طريقة العمل :

A Geiger counter (GM) is an electronic instrument used for detecting and measuring ionizing radiation

It detects ionizing radiation such as **alpha particles**, **beta particles**, and **gamma rays** using the ionization effect produced in a Geiger–Müller tube.

It is considered one of the world's best-known radiation detection instruments.

History

The original detection principle was realized in 1908 at the University of Manchester,

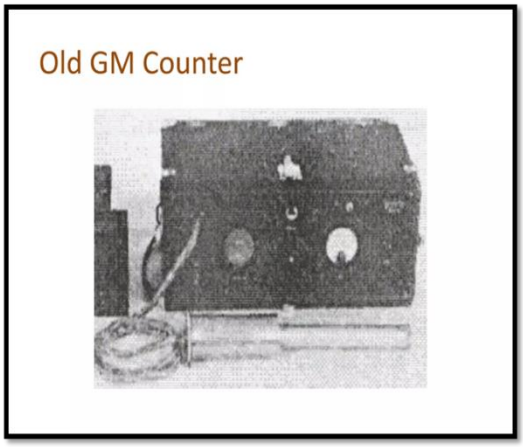
The development of the Geiger–Müller tube in 1928 that the Geiger counter could be produced as a practical instrument.

It has been very popular due to its robust sensing element and relatively low cost.

However, there are limitations in measuring high radiation rates and the energy of incident radiation.

In 1928 Geiger and Walther Müller (a PhD student of Geiger) developed the sealed Geiger–Müller tube which used basic ionization principles previously used experimentally. Small and rugged, not only could it detect alpha and beta radiation as prior models had done, but also gamma radiation.

Old models of GM counter



Component of GM Counter

1. A hollow metal case s typically made of a conductive material, often metal, and it acts as the cathode in the GM tube. The cathode is negatively charged. The hollow metal act as (cathode). The cathode is negatively charged.

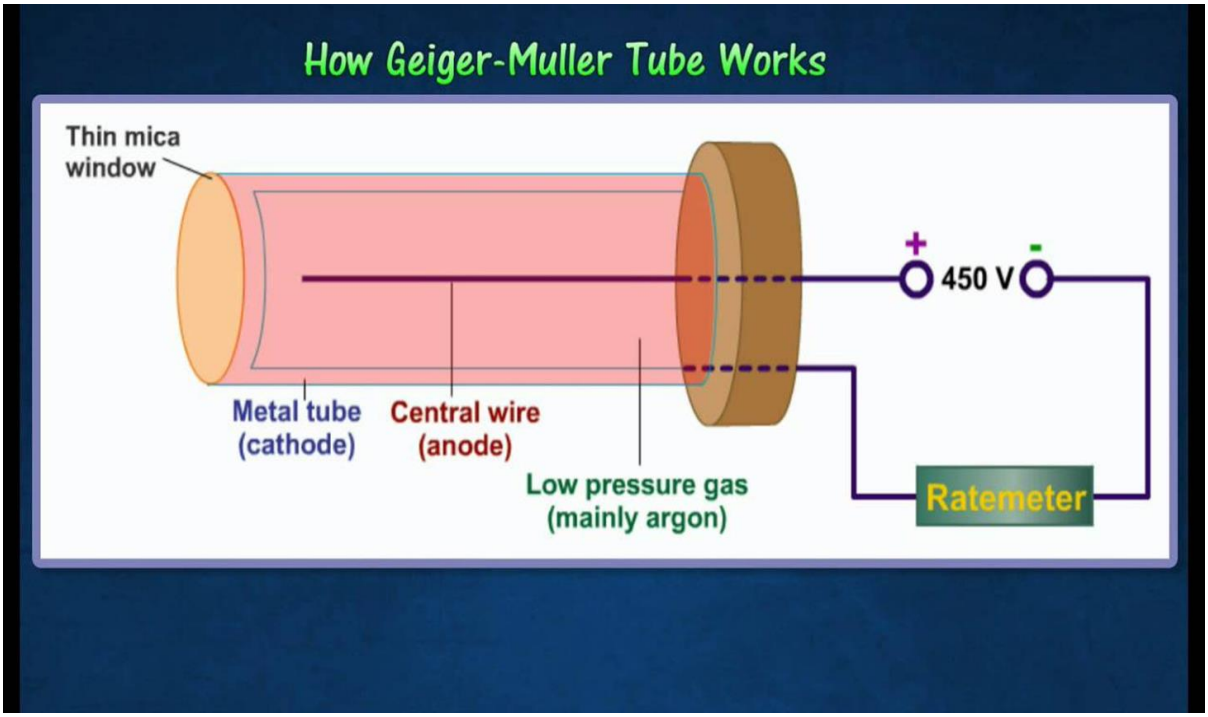
2. A fine tungsten wire is stretched along the axis of the tube and is insulated by ebonite plugs. This fine tungsten wire acts as (anode). The anode is positively charged. It is usually placed in the center of the tube.

3. Ebonite Plugs: The ebonite plugs insulate the fine tungsten wire from the metal case. This separation is essential to maintain a potential difference between the cathode (case) and anode (tungsten wire).

4. Evacuation and Gas Filling: The tube is evacuated and then partially filled with a mixture of gases (such as helium, neon, or argon).

5. High Tension Battery: A high tension battery is connected to the fine tungsten wire through a resistance (R).

6. Thin Mica Window: A thin window made of mica is arranged at one end of the tube. This window allows ionizing radiation (such as alpha, beta, or gamma radiation) to enter the tube. When radiation enters the tube and interacts with the gas, it can ionize the gas atoms, producing charged particles.



Principle of operation

A GM counter detects ionizing radiation by creating electrical pulses through gas ionization. When radiation enters the tube filled with a gas mixture, it ionizes the gas, generating charged particles.

These free electrons collide with other gas atoms, creating more electron-ion pairs.

The resulting avalanche of charge produces measurable electrical pulses for radiation detection.

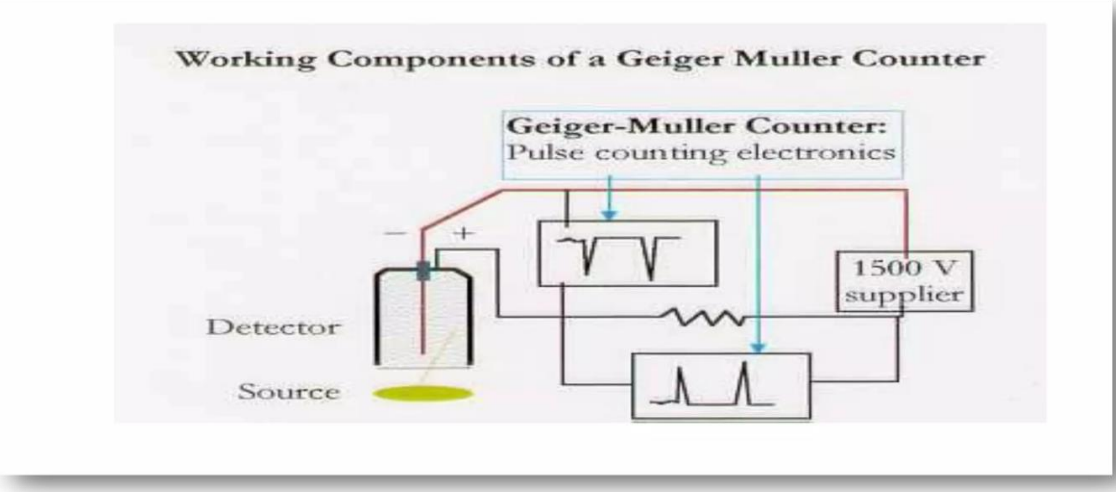
When ionizing radiation such as an alpha, beta or gamma particle enters the tube, it can ionize some of the gas molecules in the tube.

From these ionized atoms, an electron is knocked out of the atom, and the remaining atom is positively charged.

The high voltage in the tube produces an electric field inside the tube.

The electrons that were knocked out of the atom are attracted to the positive electrode, and the positively charged ions are attracted to the negative electrode.

This produces a pulse of current in the wires connecting the electrodes, and this pulse is counted.



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اليوم	التاريخ	الشعبة	العدد الكلي للطلبة	عدد الحضور	وقت المحاضرة	اسم و توقيع مدرس المادة