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Paper # Radiation Protection.

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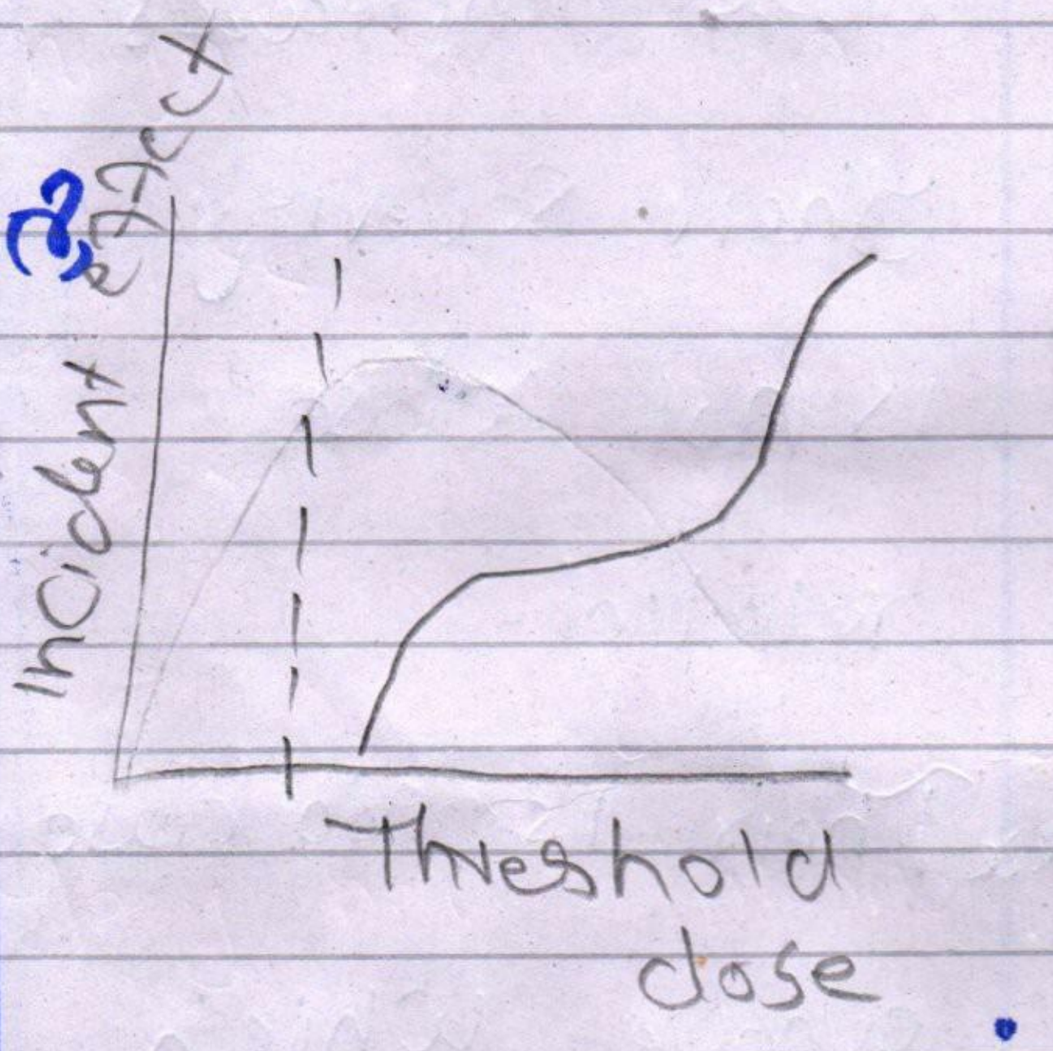
Q No (1)

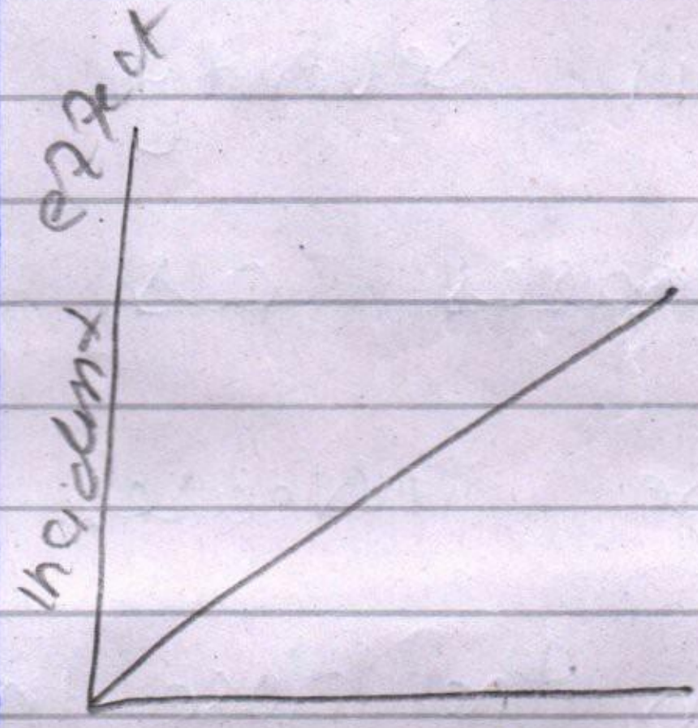
Differentiate between deterministic and stochastic effect of radiation:-

	Deterministic effect	Stochastic effect :-
1)	Deterministic effect are produced by high vaciation close	Stochastic effect are produced by low close delivered over long Period of Time.
2)	They have Threshold close by increasing threshold close effect become worsen And below the threshold close No effect will be Seen	They have no threshold

3)	It is for Short Period of time	It is for long Period of time -
4)	Their Severity increases as close increases.	They increases in likehood as close increases Their Severity is not close related.
5)	When the close increase Deterministic effect increases.	Their is No close above which Stochastic effect are certain to occur.
6)	Deterministic effect include Acute Radiation ~~Sta~~ Sickness and chronic Radiation Sickness.	Stochastic effect include Radiation Carcinogensis and hereditary effect

2. in Deterministic effect skin, Gonads and Hematologic effect etc occur-	in Stochastic effect cancer, leukemia and Hereditary effect etc. may occur-





same every

Where -

Q no 2:- **Radiation:-** It is the emission or transmission of energy in the form of waves (electromagnetic) or particles (alpha, beta, gamma) through space or through a meterial medium.

This includes electromagnetic radiation eg (radio, waves, micro ~~We~~ waves, infrared, visible light, ultraviolet x-rays and gamma rays- (1)

it is classified on the basis of energy, frequency and wave length.

→ Ionizing and non ionizing radiation-

→ The higher energy radiation are ionizing in nature

→ Non ionizing are low in nlature

→ The ionizing radiation is important in radiography.

→ The radiation are also classified on the basis of source.

2) Radio activity:- it is refer To the particle which are emitted from nucles as a result of nuclear instability Because the nucleus experiences the intense conflict between the two strongest forces in nlature, it should not be surprising that their are

many Number of isotopes which are unstable and emit different kind of radiation.

→ There are three types of radio activity -

→ Alpha, ~~Beta~~ helium nuclie

→ Beta particle, An electron emiting from the nucleous of radioactive material (atom)

→ Gamma particle, Photon of high energy -

3) Non Ionizing radiation:-

It is refer to any type of electromagnetic radiation that does not carry per quantum to ionize atom or

Molecules-

→ The non ionizing radiation are unable to remove electron from an atom.

→ The non-ionizing radiation are only excite the electron that ~~are~~ is move from lower. ~~higher~~ shell to Higher shell.

So it does not ionize atom

→ it is safe and not harmful

4) ionizing radiation:-

The ionizing radiation is traveling as a particle or electromagnetic waves, that carry sufficient energy to detach electron from atom or molecule

Their by to ionize an atom or molecules.

→ Ionizing radiation is made of substance, particle, atom or electromagnetic waves.

→ it is traveled at the speed of light.

→ it is very important in radiography.

→ Ionizing radiation is very harmful and cause serious disorder

5) Harmful radiation:-

→ Radiation is transfer of energy.

→ The low levels of radiation

is present every where in surrounding

→ low energy radiation are not harm ful but medium energy radiation can cause sickness, headaches, etc - while high energy radiation damages the cell that make up to human body causing mutation. which is lead to malignancy -

→ exposure to radio over long period of time cause cancer

The higher energy radiation changes genetic move up by ionization.

Q3 Ans:- Two Basic radiation Protection are Time distance.

Time:-

→ The amount of radiation received by an individual is directly related to the length of the time.

→ It the time during which one is exposed to radiation is increases, the radiation will also increases.

→ Dose can be decreare when time is minimized.

→ It the time spent in a given radiation field is double the worker dose is double. There fore, to limit radiation dose,

the time spent in the field must be limited.

An example of reducing radiation close by reducing the time of exposure might be improving operator training to reduce the time they take to handle a radiation source —

Distance :— The radiation close received from a source is inversely proportional to the square of the distance of seperation - As a rule, to you double the distance, you reduce the exposure by a factor of four.

→ Greater the distance from Source will be less radiation received.

→ The exposure of an individual sitting 4 meter from a radiation Source will be 1/4 the exposure of an individual sitting 2 meter from the same Source.

Shielding:- The greater the Shielding around a radiation source the smaller the exposure.

→ Shielding simply means having some thing that ~~absorb~~ that will absorb radiation between you and the source of the radiation.

→ The amount of Shielding required to protect is dependent

on the different types of reduction and energy -

Q3(b) :- Names of Radiation protection device :-

1, Gas - filled Detectors

2, Scintillation Detector

3, Thermoluminesence Dosimetry

4) Optically Stimulated Luminescence Dosimetry.

Their are Some tool which Protect the body from radiation -

1) Radiation Protection Apron

2, Radiation Protection Apron Accessories.

3, Radiation Protection Gloves

4) Radiation protection Thyroid Shield

5, Radiation Protection Drape Shield,

Q4 Features of Radiation Protection design:-

The feature of radiation protection is to reduce patient radiation close during x-ray examination.

feature for radiation protection are:-

(1) Protective x-ray tube Housing:- Every x-ray tube must be hold with in a protective housing

→ Benifit of protective housing is that it reduce leakage radiation during use will leakage radiation which beless

than 1m GY/hr at a distance of 1m from Protective housing.

2) Control Panel:- The Control panel must be Show the Conclition of exposure.

→ Positively Show when the tube is energized And Some time also ~~visible~~ visible or cuclible.

Signal Show when the x-ray beam is energized

→ KVP And MA are indicator for their requirment.

→ x-ray beam will be clearly Show to Radiological technologists

3) Source to image receptor distance :-

The SID indicator must be accurate within 2% of the indicated SID.

→ Simple as tape measure attached to tube housing.

→ inclicator must be provided.

4) Collimation :- The x-ray beam and light beam must concicle to within 2% of SID.

→ Attenuation of useful beam of Collimator shutter must be equivalent to attenuation of Protective housing.

→ Light-Localized, Variable aperature, rectangular collimator

Should be provided.

5): Positive beam limitation:-

The Special x-ray beam imaging system make in United States Between 1974 and 1994.

→ It must be adjusted to any image receptor size in use and at all standard SID.

→ The PBL must be accurate to within 2% of the SID.

→ The collimator shutter automatically provide an x-ray beam equal to the image receptor.

→ it is no longer required but continue to be a part of

New Radiographic System -

Beam Alignment :-

For the Proper Alignment each Radiographic tube must be Provided with a Mechanism to ensure for the proper alignment of the x-ray and image Receptor -

filtration :-

All x-ray beam must have a total filteration.

→ At least 2.5mm Al when operated above 70 KVP.

→ Radiograpic tube operated between 50 and 70 KVP must have at least 1.5mm Al

→ Below 50KVP 0.5mm Al

filteration must be required.

→ x-ray tube designed for mammography have 30um Mo or 60 um Rh filteration.

Reproductibility:-

It consist output radiation intensity

→ it must not be exceed 5%. through same technique.

Linearity:-

The exposure time is adjusted for constant mAs- the output radiation intensity will be remain constant.

→ The maximum variation in linearity is 10%. from one mA station to an adjusted mA station.

Operator Shield:-

This must not be possible to exposure both in room outside of operature

→ Protable x-ray must have 2m theter for exposure.

Fluroscopic Protection:-

Primary Protective barrier

→ IR assembly should be 2mm Pb equivalent.

→ Primary Protective barrier filtration at least 2.5mm

→ Colimator linear intensity

SSD → Source to skin disease.

Q(5) Geiger muller:-

It is Named after its developers by Geiger and Muller.

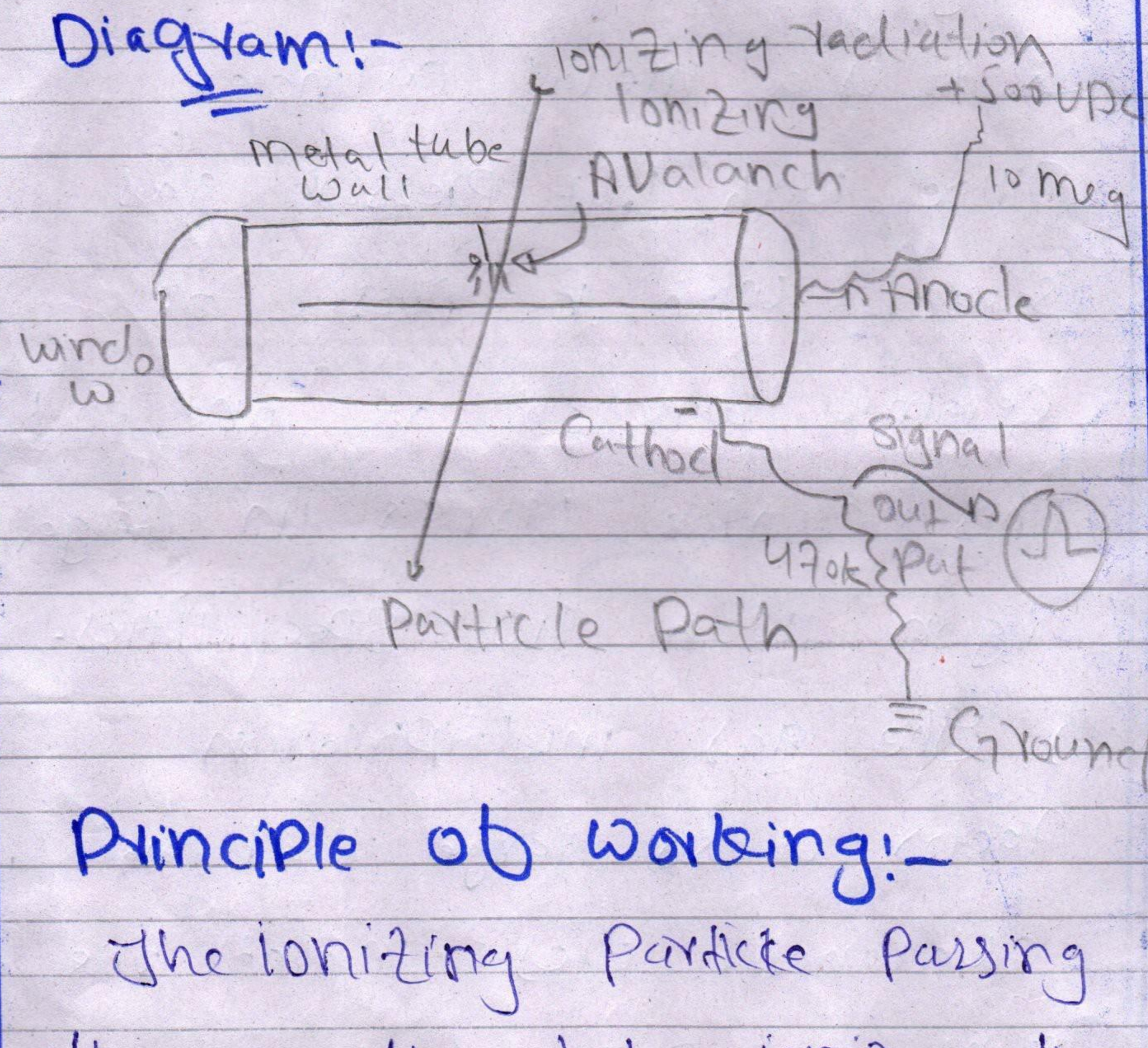
→ it is a metal cylinder filled with low pressure gas sealed with a plastic or ceramic window at one end This counter works in Geiger region with two specialities.

(1) The gas multiplication factor is so large that an avalanche dies in at one point but spreads all over the entire length of the central wire.

Large output pulse is

independent both of the energy and nature of the particle detected.

Diagram:-



Principle of working:-

The ionizing particle passing through the tube ionizes the gas and electron so produced move towards Anode. The velocity is quite high

and they later produce secondary electrons after repeated collisions with the particle of a gas.

→ Due to large multiplication action, a large ionizing current is produce.

Construction:-

Gm Counter Consist of following Components:

(1) metalic Cylincler
(2) Gaseous medium
(3) Cathocle
(4) Anocle
(5) Counter
(6) Voltage
(7) insulator plaque
(8) Amplifier

★ High Voltage is Applied to the tube

★ Mostly Argon is used as Gaseous Medium and only 10% ethyl Alchol is used.

→ it is used only for Quenching.

Working Mechanism:-

The working mechanism of Gm Counter is very simple

When some external particles like Alpha Particle, Beta and Gamma Particle/Radiation enter the medium

→ Basically leads to Ionization

→ Central electrode is connected to positive terminal of the battery

→ And the wall is connected to Negative terminal of the battery

→ Central wire is acting as Anod

→ And wall as Cathode.

The ionizing Particle passing through the ~~tube~~ tube and ionize the Gas and electron So Particle move towards anode.

→ The velocity is quite High.
→ This velocity is Given by High voltage
→ So these ionize move . Gas es Atom and Produce more ions Called Secondary ionization.
→ The Postive ion move towards ↓ Cathod And Negative ion move towards Anode.

→ After Repeated Collision With Particle of Gas
→ Due to Large multiplication A Larg ionizing current is Produce.

Advantage:-

The main Advantage of GM Counter is to Detect Charge Partical like ALPHA, Beta And Gamma.

Dis Advantage:-

- it is a slow Process
- It only Detect Charge Particle So it does not detect Neutron.

Detection of Radiation:-

A GM tube is ~~filled~~ a gas filled device that when a high voltage is applied creates an electrical pulse when radiation interacts with the wall or gas in the tube these pulses are converted to a reading on the instrument meter.

→ it is very sensitive

→ it readout @ radiation close and cout it.

→ it display in a unit of sievert.

→ it is used for protection for technologists to count us close.