- **LESSON 6**

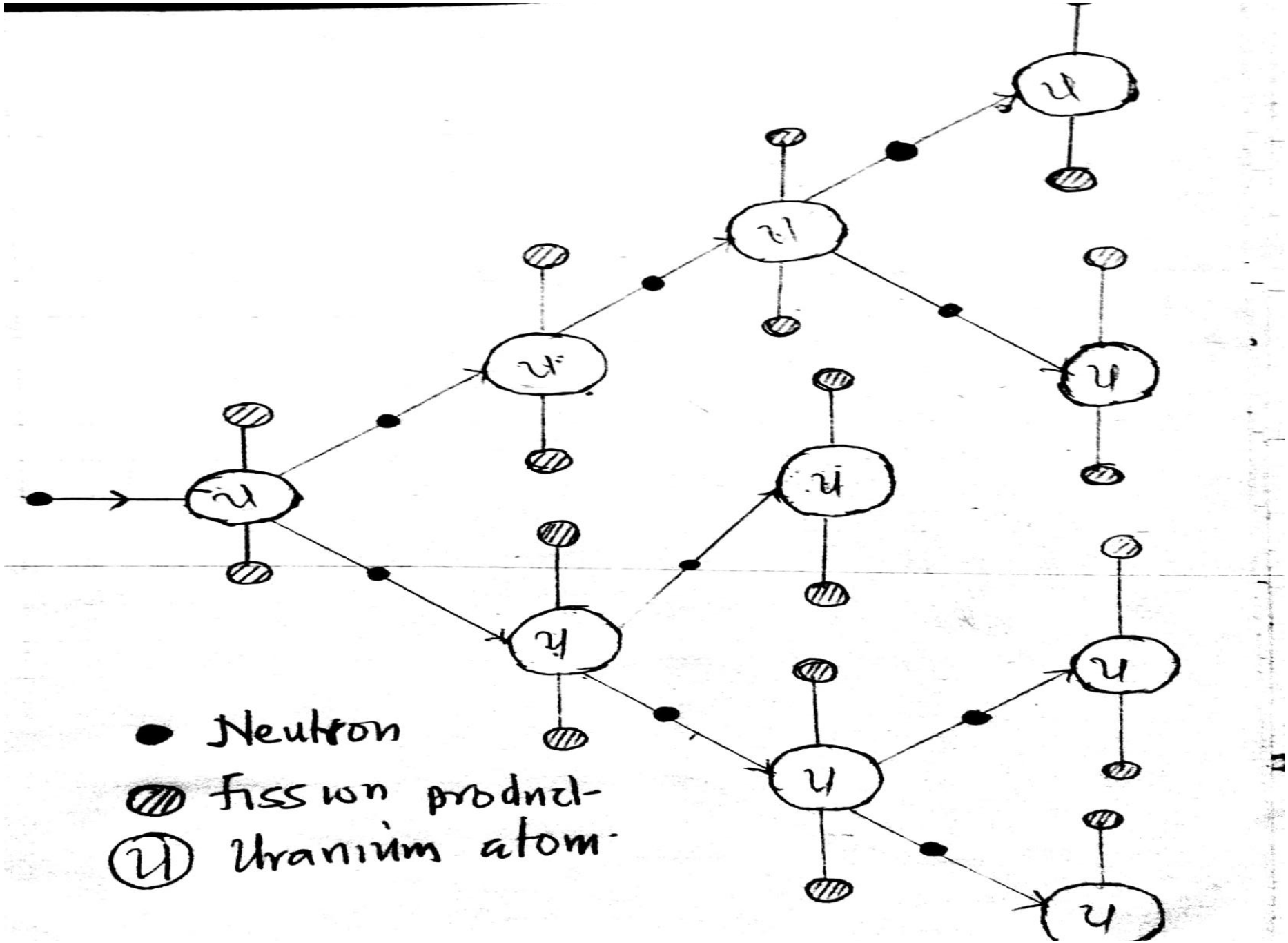
NUCLEAR FISSION REACTION

This is a nuclear reaction in which an **artificially produced heavier unstable nucleus** disintegrates or split into two smaller nuclei with the simultaneous release of great avalanche of energy and neutrons

NUCLEAR CHAIN REACTION - URANIUM FISSION

This is a nuclear reaction in which the initiating species is regenerated in the **reaction step** to continue the reaction.

$$^{235}_{92}U + {}^{1}_{0}n \rightarrow {}^{144}_{56}Ba + {}^{90}_{36}Kr + 2\,{}^{1}_{0}n + \text{Q}$$


U
U
U
U
U
U
U
U
U
U
U
Neutron
fission product
(U) Uranium atom

*Hence **NUCLEAR CHAIN REACTION** is a nuclear fission reaction in which the initiating species is regenerated in the reaction step to cause further fission process to proceed cumulatively.*

If the reaction is not carefully controlled, it will rapidly accelerate into an explosion of

CATACLYSMIC PROPORTION

NOTE. This is what happens in the atomic bomb

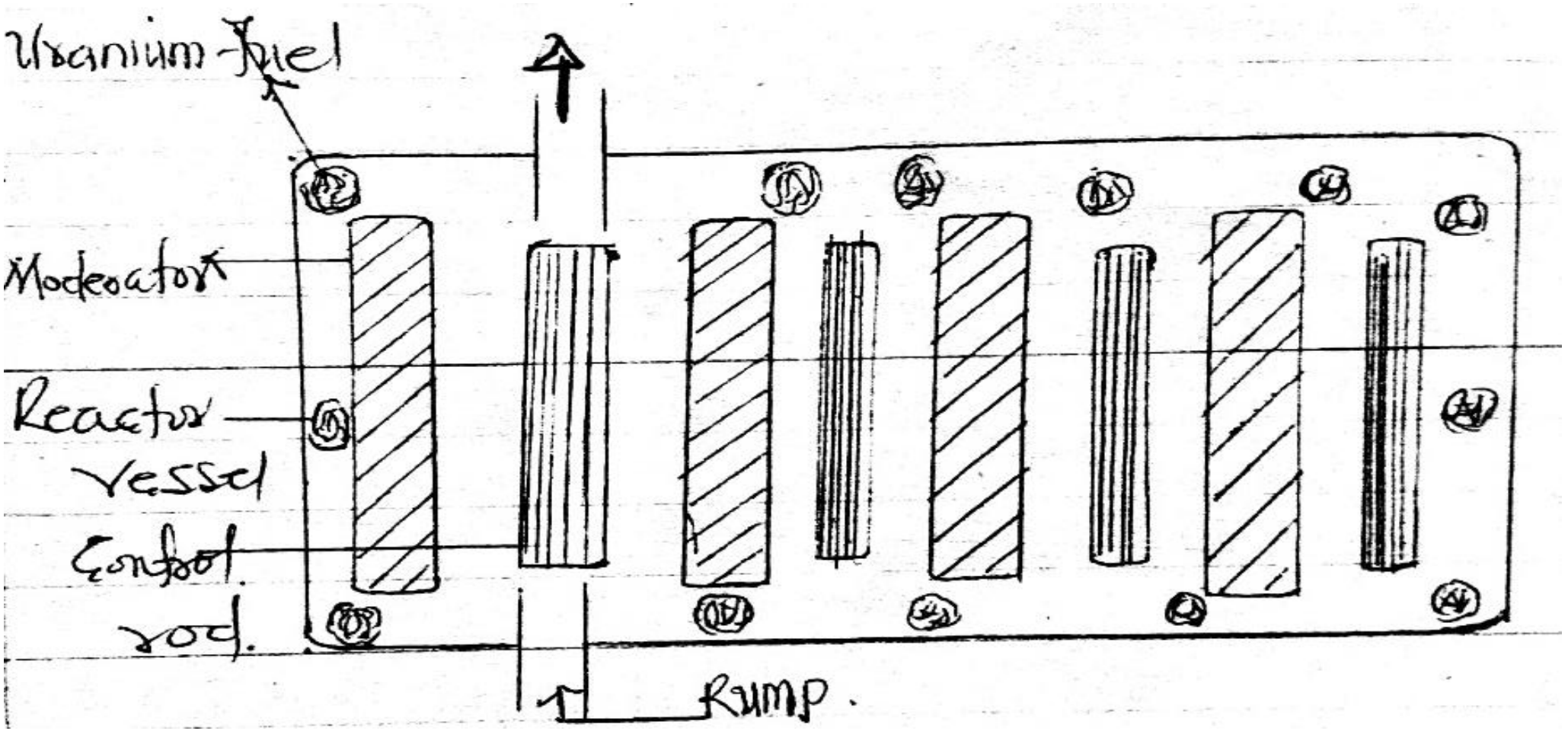
- **<u>CONDITION FOR CHAIN REACTION</u>**

- 1. The neutron production factor must be above unity

- 2. The initial mass size of the fissionable material must exceed a certain critical mass

A NUCLEAR REACTOR

A device in which the energy produced in a nuclear chain reaction is carefully controlled and peacefully used



COMPONENTS OF THE NUCLEAR REACTOR

1. MODERATORS
2. CONTROL RODS
3. COOLANTS
4. REFLECTORS
5. SHIELD
6. WASTE DISPOSAL SYSTEM

DIFFERENCE BETWEEN FUSION AND FISSION

FUSION	FISSION
Involves aggregation of lighter nuclides	Involves disintegration heavy nuclide
It is not a radioactivity process	It is an artificial radioactivity Process
Reaction is easily controlled	Reaction is very difficult to controlled by man

ADVANTAGE FUSION OVER FISSION

1. supply very clean energy
2. Abundant raw materials are available for fusion

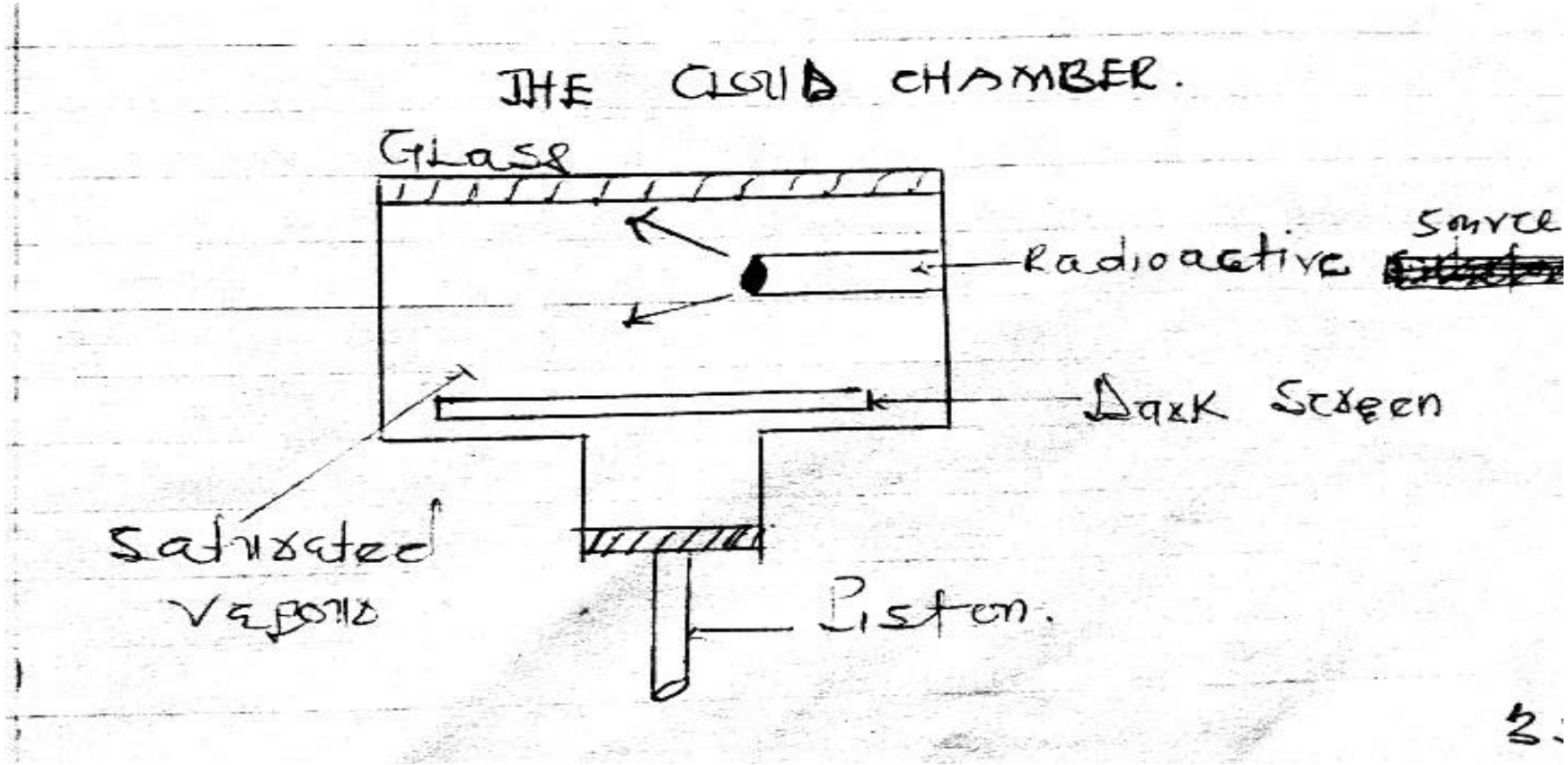
DETECTION OF RADIATION

The following instruments are used to detect radiation from radioactivity:

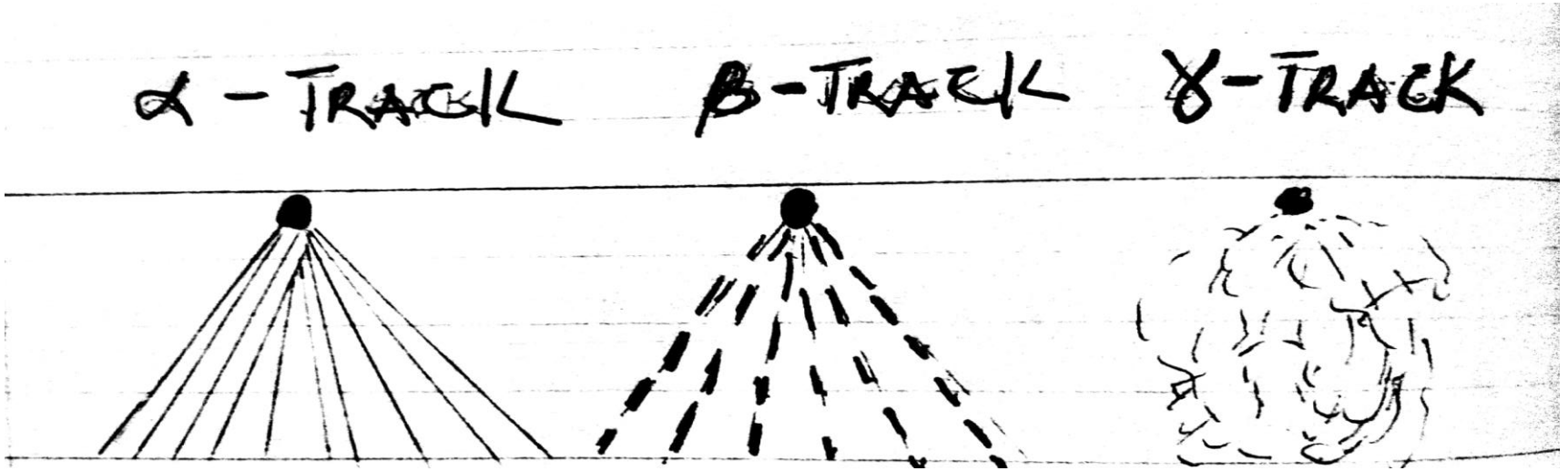
1. THE ELECTROSCOPE
2. **THE CLOUD CHAMBER**
3. THE SPINTHARISCOPE
4. THE SPARK COUNTER
5. **GEIGER MULLER TUBE / COUNTER**

THE CLOUD CHAMBER

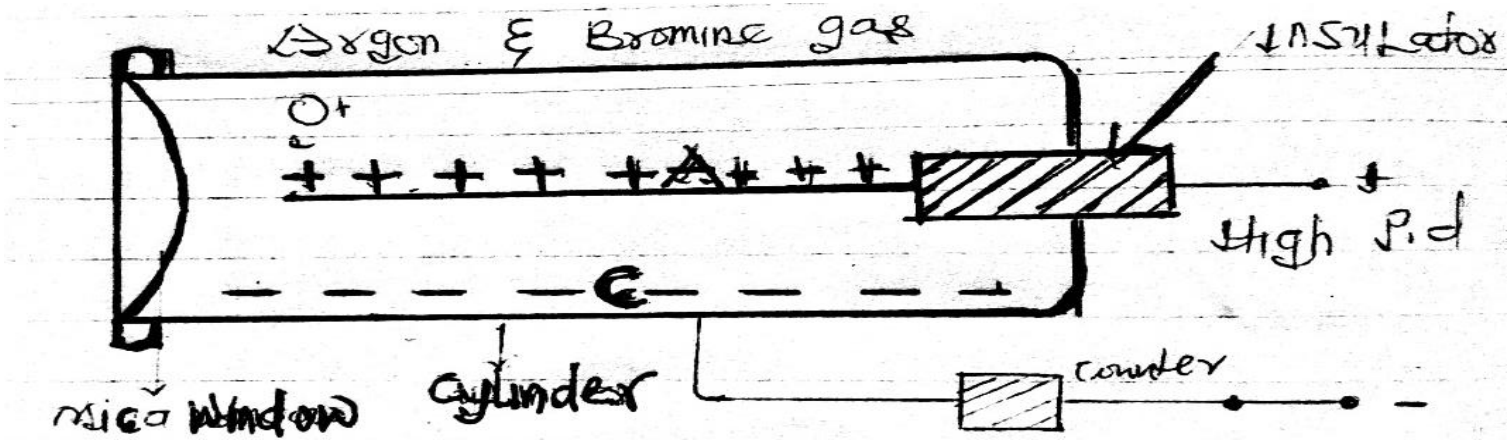
The dust- free chamber contains saturated alcohol vapour in dynamic equilibrium with excess alcohol



CLOUD CHAMBER TRACKS



GEIGER MULLER TUBE



MODE OF OPERATION

In its operation, Geiger Muller is pointed towards the radioactive source and incoming radiation ionises the, thus causing a pulse of charge to flow between the electrodes.

The current pulse from the tube creates a pulse potential difference across the tube which is amplified and detected by the counter in the circuit. By this means the counter registers or detects the passage of ionizing particle or radiation through the tube.

END OF LESSON 6