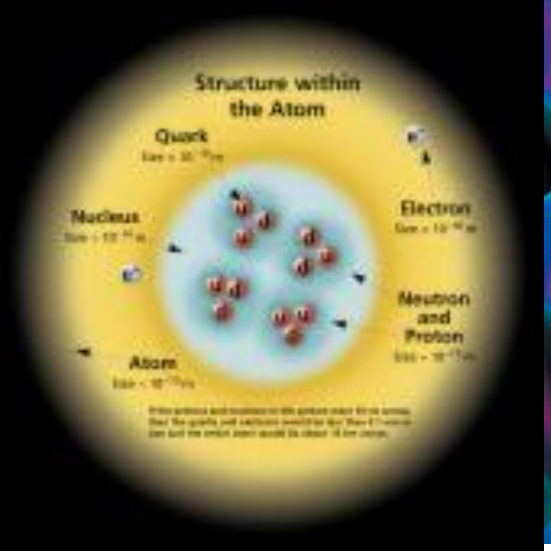
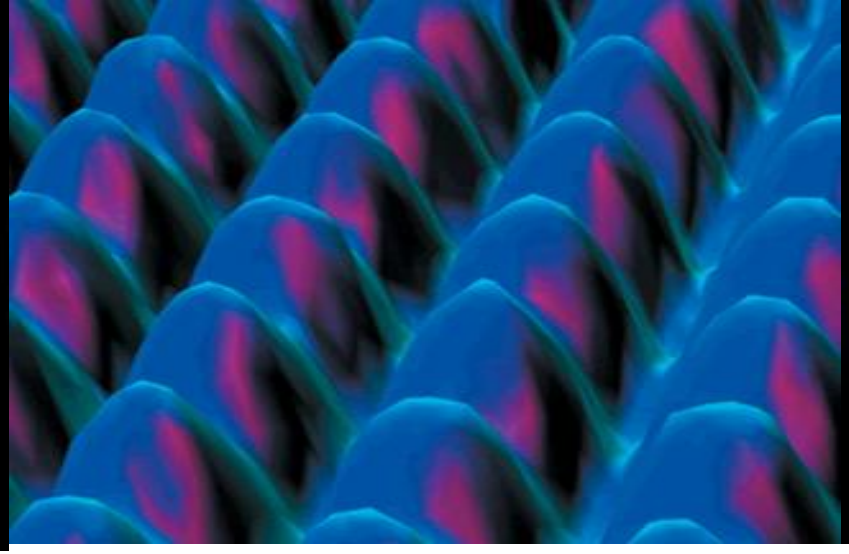
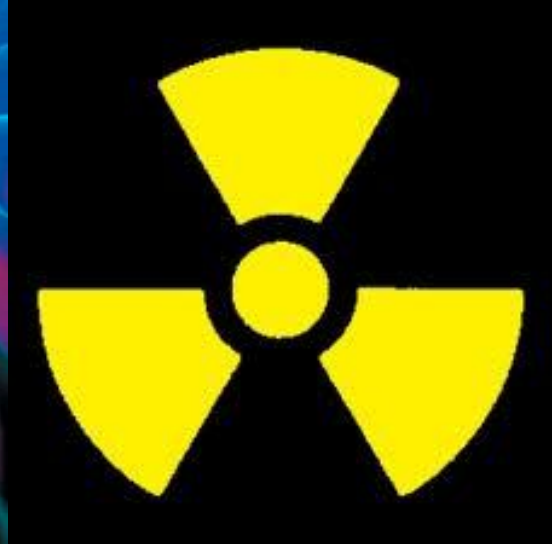


DETECTION AND MEASUREMENT OF RADIOACTIVITY

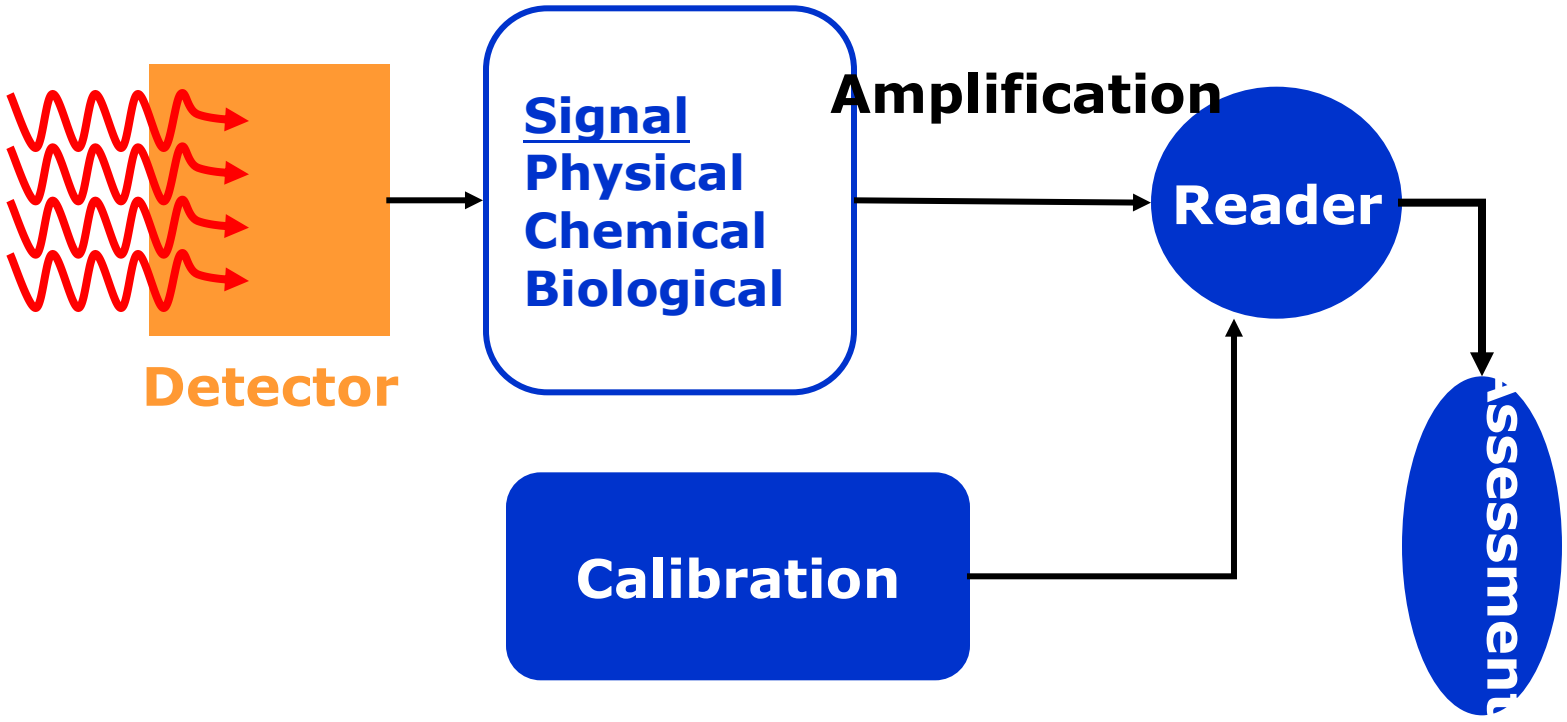
NANIK DWI NURHAYATI,S.SI,M.SI

RADIATION DETECTORS

- Instruments used in the practice of health physics serve a wide variety of purposes
- one finds instruments designed specifically for the measurement of a certain type of radiation, such as low-energy X-rays, high-energy gamma rays. fast neutrons, and so on

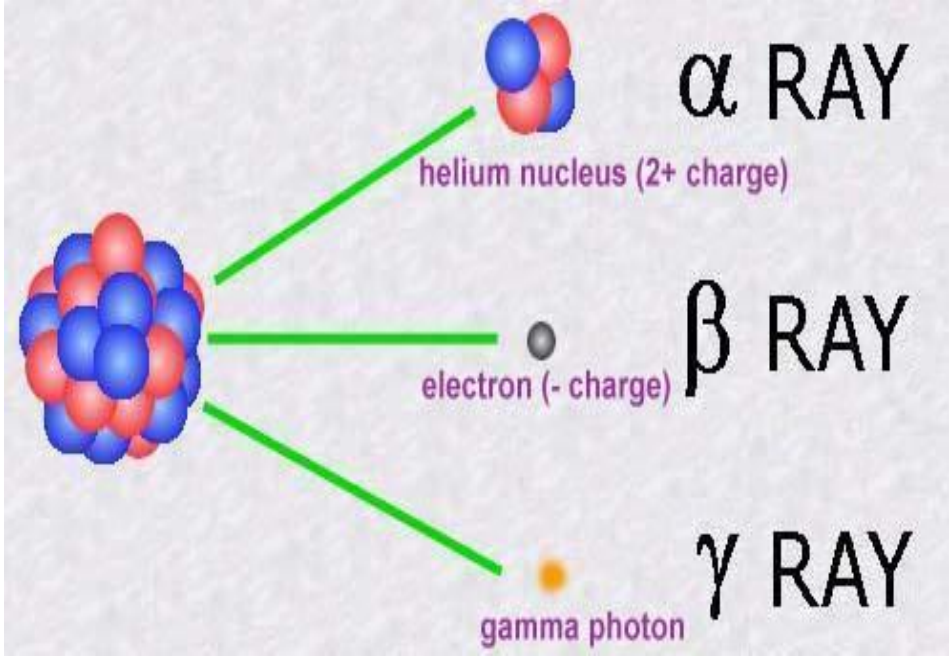
- The basic requirement of any such instrument is that its detector interact with the radiation in such a manner that the magnitude of the instrument's response is proportional to the radiation effect or radiation property being measured

Radiation Measurement Principles



Daya Tembus : $\alpha < \beta < \gamma$

Daya ionisasi : $\alpha > \beta > \gamma$



α ⇒ dpt ditahan oleh lapisan kulit
dpt ditahan selembar kertas

β ⇒ dpt ditahan papan kayu atau Al

γ ⇒ dpt menembus & merusak organ
dpt ditahan oleh beberapa cm Pb

Ideal Properties for Detection of Radioactivity

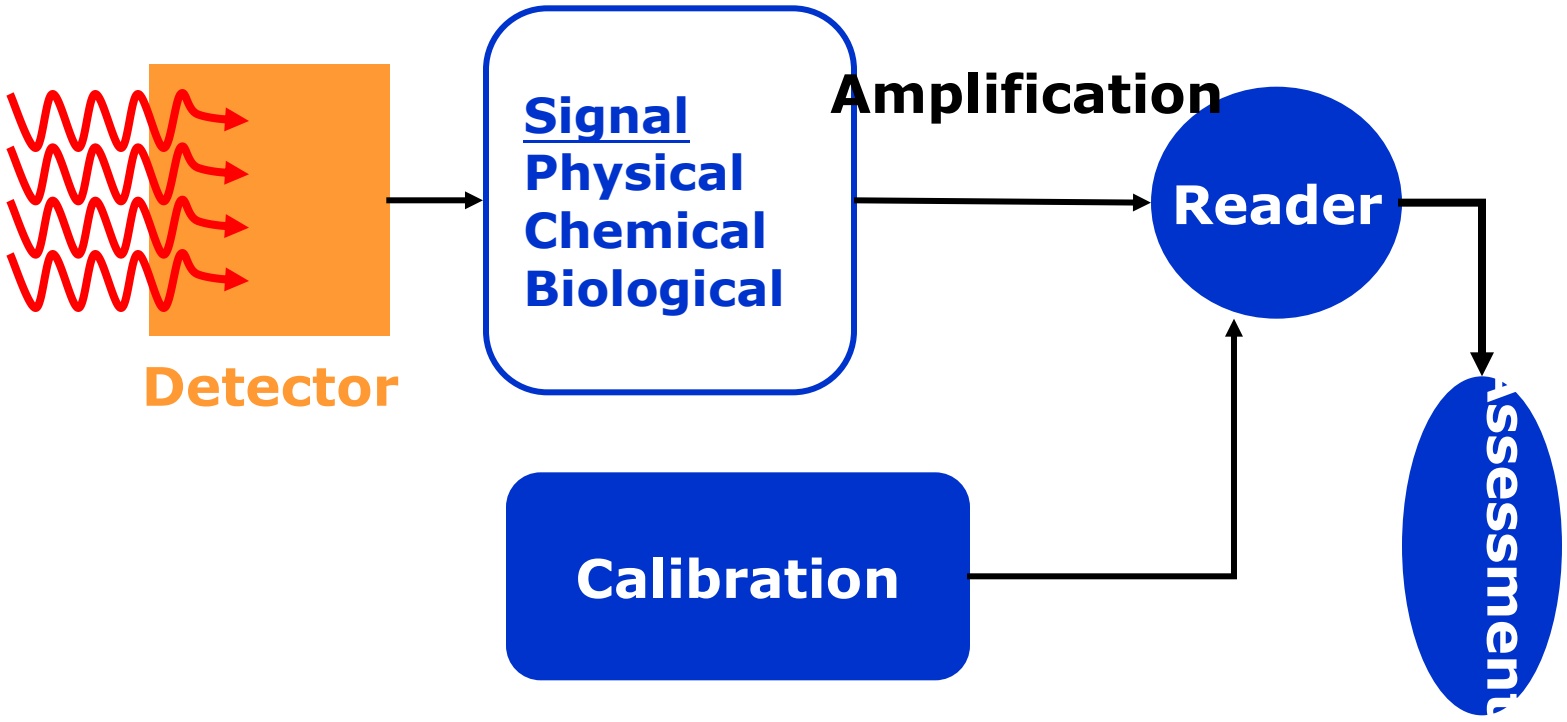
Radiation	Ideal Detector Properties
α	Very thin/no window or ability to put source inside detector
β	Same as above, can be low or high density, gas, liquid, or solid
γ	High density, high atomic number materials
neutrons	Low atomic number materials, preferably hydrogenous

Ideal Detector for Detection of Radiation

Radiation	Ideal Detector
α	Thin Semiconductor Detectors Proportional Counters
β	Organic Scintillators Geiger Counters Proportional Counters
γ	Inorganic Scintillators Thick Semiconductor Detectors
neutrons	Plastic Scintillators Proportional Counters (He, BF_3) Lithium Glass Scintillators

Excellent table on Page 61 shows numerous different technologies used in safeguards

Radiation Measurement Principles



RADIATION DETECTORS

TABLE 9.1. Radiation Effects Used in the Detection and Measurement of Radiation

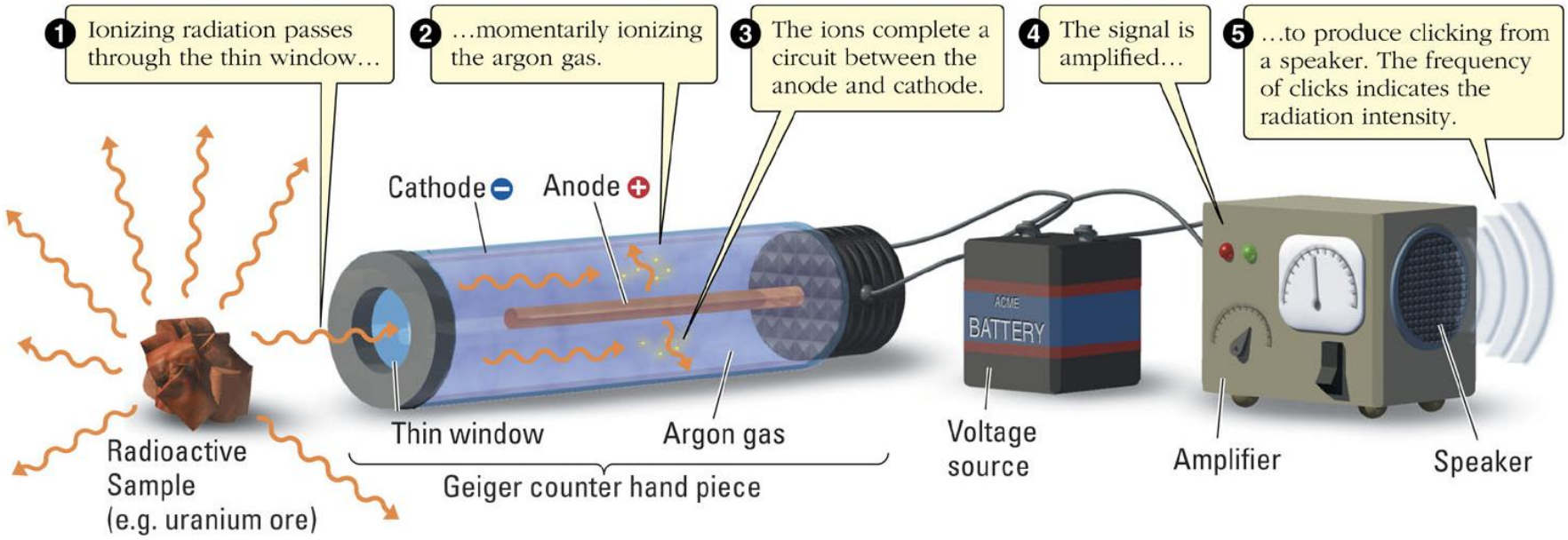
Effect	Type of Instrument	Detector
Electrical	1. Ionization chamber	1. Gas
	2. Proportional counter	2. Gas
	3. Geiger counter	3. Gas
	4. Solid state detector	4. Semiconductor
Chemical	1. Film	1. Photographic emulsion
	2. Chemical dosimeter	2. Solid or liquid
Light	1. Scintillation counter	1. Crystal or liquid
	2. Cerenkov counter	2. Crystal or liquid
Thermo-luminescence	Thermoluminescent dosimeter (TLD)	Crystal
Heat	Calorimeter	Solid or liquid

Radiation Detector

- **Elektroskup (*Electroscope*)**
- **Kamar Ionisasi (*Ionization Chamber*)**
- **Proporsional Counter**
- **Geiger-Muller Counter**
- **Cloud Chamber**
- **Diffusion Chamber**
- **Bubble Chamber**
- **Nuclear Emulsion**
- **Scintillation Counter**
- **Solid State Detector**
- **The Spark Chamber**
- **Cerenkov Detecto**

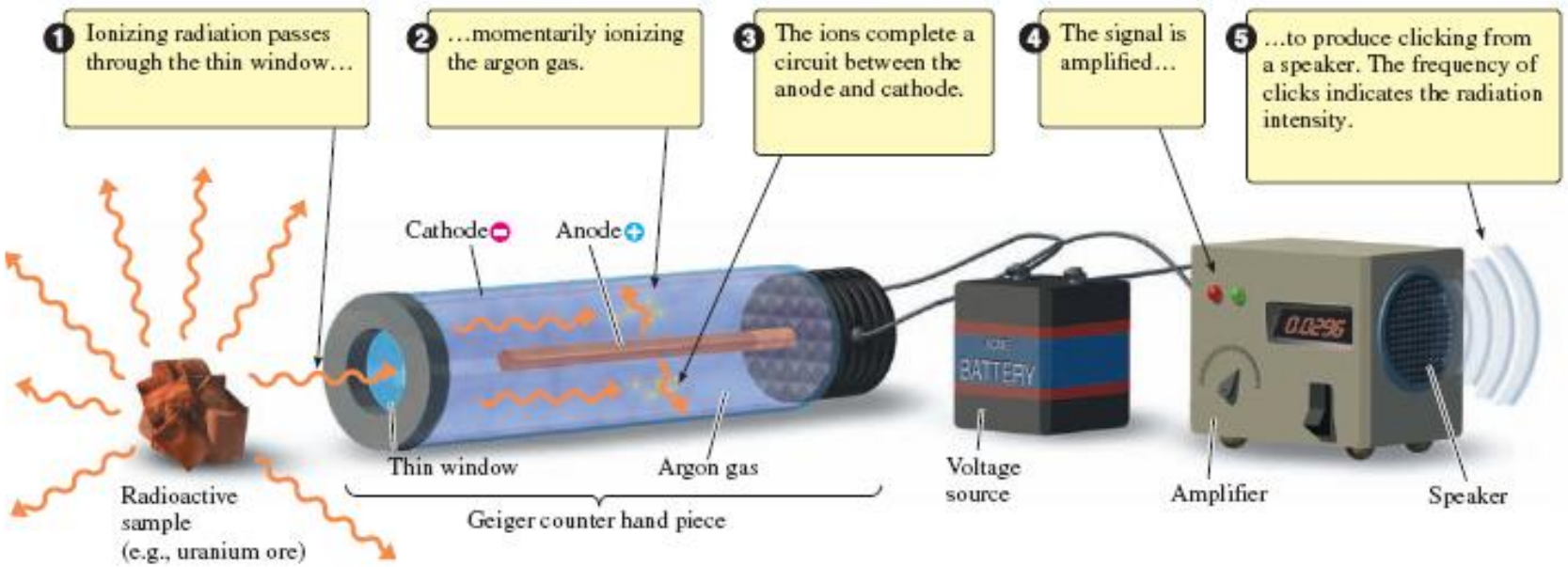
Detection of Radioactivity

- film badge
- scintillation counter
- Geiger counter => ionizes gas



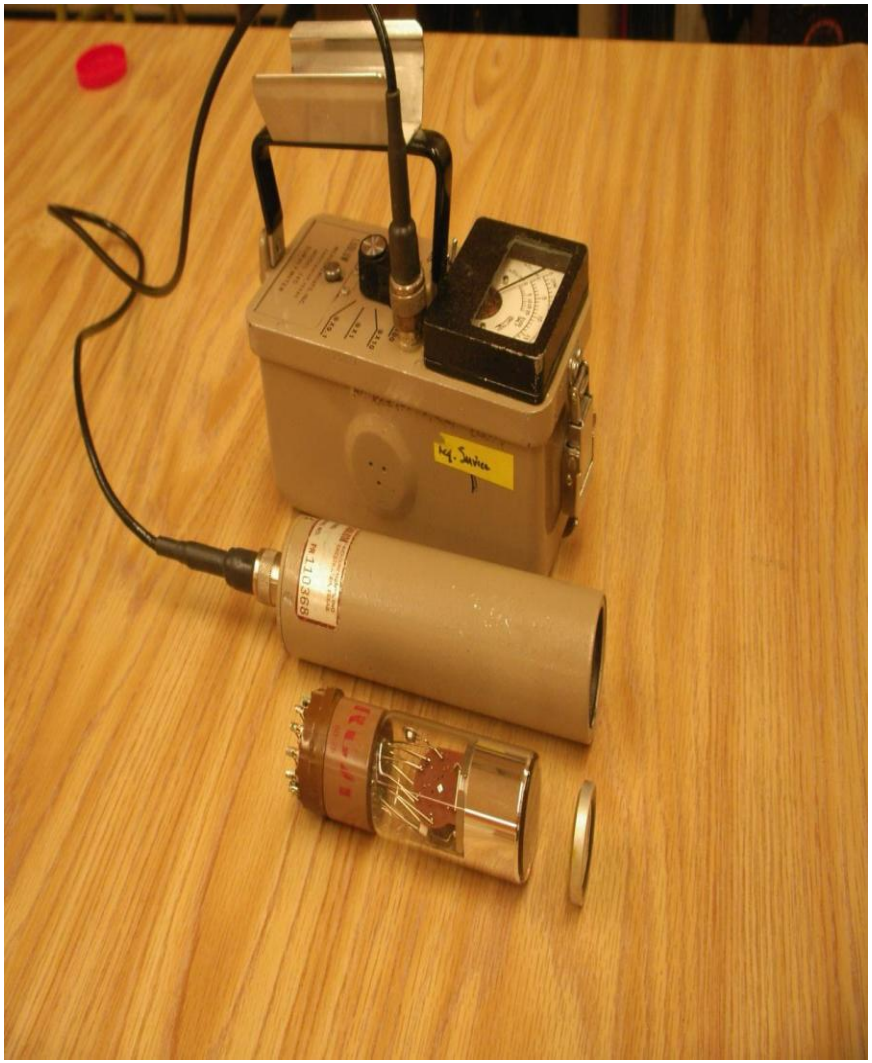
Detection of Radiation

- Schematic of Geiger Counter

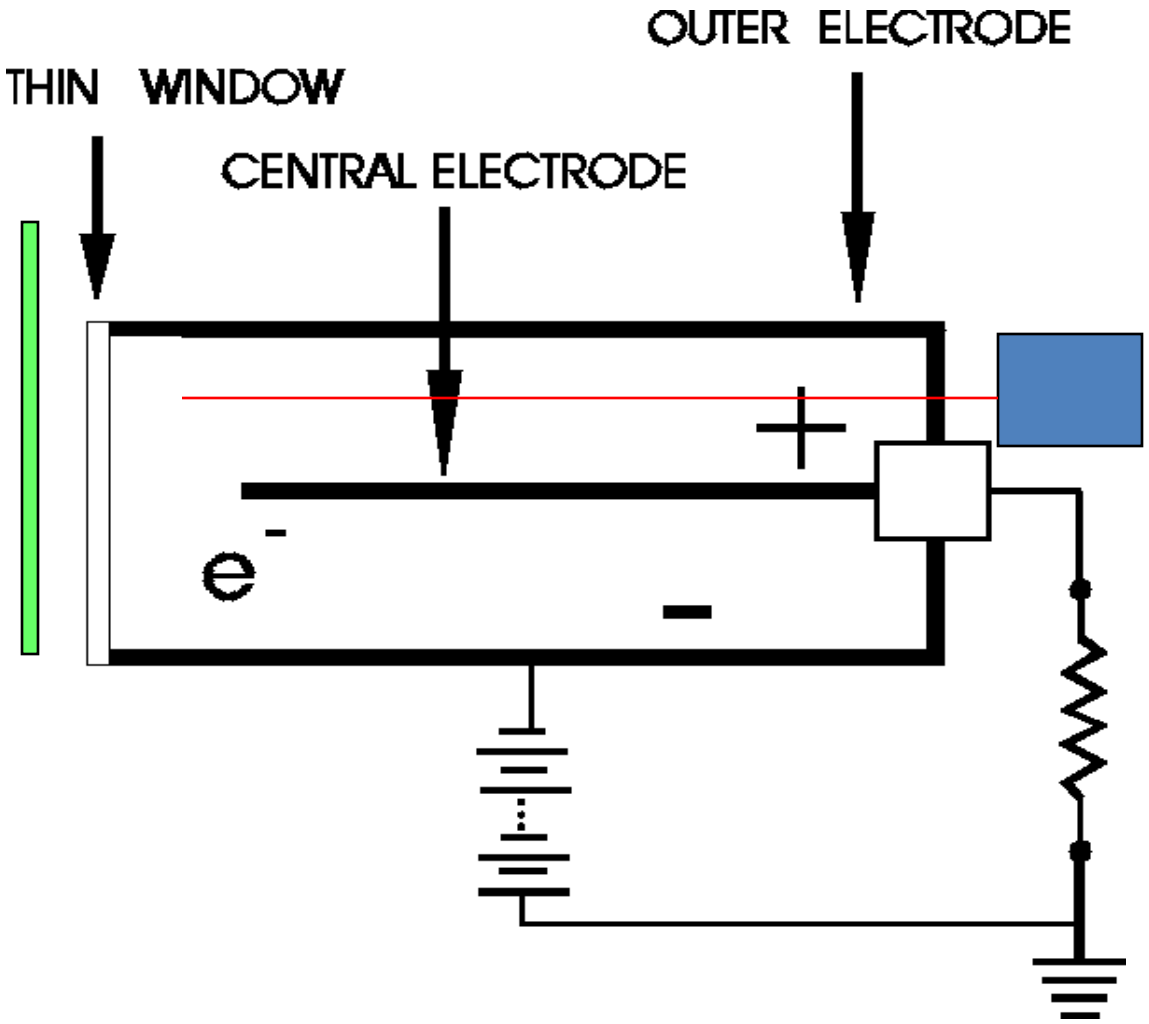


Detection of Radiation

- Picture of a Geiger Counter



Geiger-Meuller Tube



Gamma Counter

Jangan jadikan tugas belajarmu sebagai kewajiban, tetapi jadikan tugas belajarmu sebagai kesempatan untuk menikmati betapa indahnya ilmu pengetahuan. Suatu kebahagiaan pribadi jika apa yang kau peroleh bermanfaat bagi orang disekitarmu.