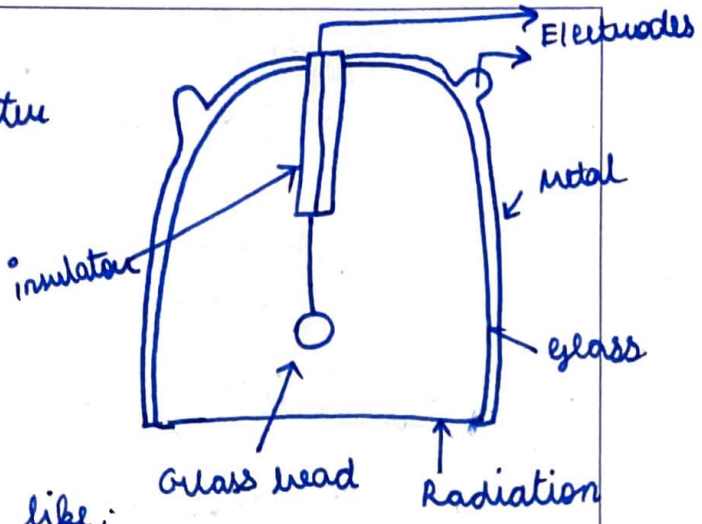
Q5

1) various types of thermocouples

Type	Positive Material	Negative Material	Sensibility at 20°C (μV/°C)	Range of temperature (°C)
B	Platinum 6% Rhodium	Platinum 30% rhodium	1.2	0 to 1820
C	Tungsten 5% Rhenium	Tungsten 26% Rhenium	19.7 (600°C)	0 to 2320
D	Tungsten 3% Rhenium	Tungsten 26% Rhenium	19.7 (600°C)	0 to 2320
E	Chromel (10% chromium)	Constantan (45% copper)	58.7	-270 to 1000
G1	Tungsten	Tungsten 26% Rhenium	19.7 (600°C)	0 to 2320
J	Iron	Constantan (45% copper)	50.4	-210 to 760
K	Chromel (10% chromium)	Alumel (10% Al & Silicon)	39.4	-270 to 1372
N(14)	Nicrosil	Nisil	39	-270 to 400
R	Platinum 13% rhodium	Platinum	5.8	-50 to 1768
S	Platinum 10% rhodium	Platinum	5.9	-50 to 1768
T	Copper	Constantan	38.7	-270 to 400

II) GEIGER COUNTER:-



★ Also called as Geiger Muller Counter

★ Mostly used Gas filled Counter

★ A ~~Geiger~~ Geiger Counter is an instrument used for detecting and measuring ionising radiation

★ It is widely used in applications like:

- Radiation dosimetry
- Radiological protection
- Experimental physics
- Nuclear industry

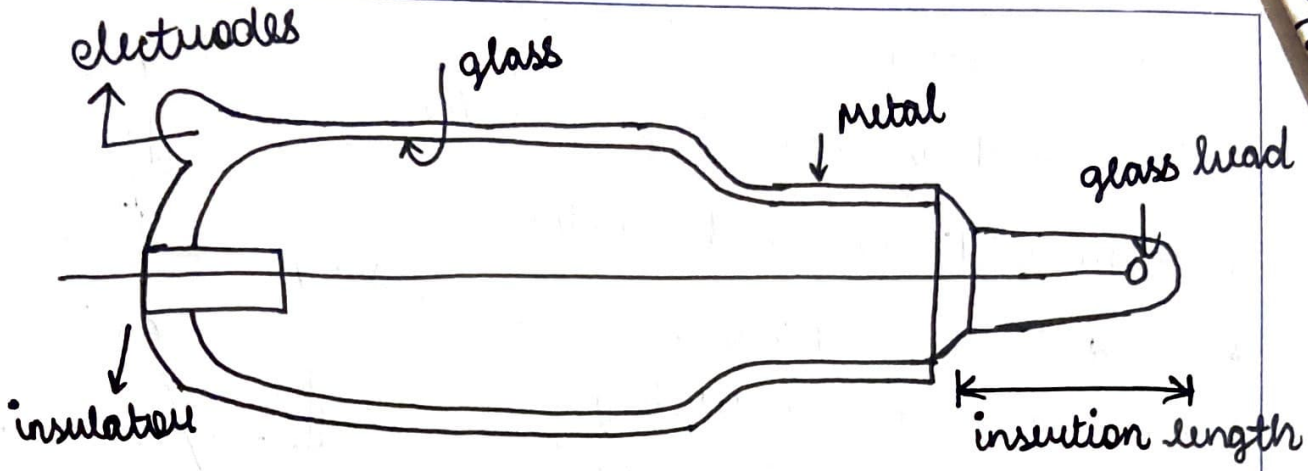
★ It detects ionising radiation such as α-particles, β-particles and γ-rays using the ionisation effect produced in a GM tube, which gives it name to the instrument.

★ It is perhaps one of the world's best known radiation detection instruments

★ It can be made to have longer operating life by particularly using halogen gas filling

★ The Commercially available varieties are:

1) End-Window type
2) Cylindrical type
3) Nanowire type



Needle type design of a GM counter

★ The GM tube is filled with a gas such as Neon, Argon or Helium at the pressure being the lowest

★ Unit used is CPM (Counts per Minute)

1) End Window

★ This style of tube would have a small window at one of it ends

★ This window would be helpful in ionizing particles that could travel easily

2) Cylindrical type:

★ Radiation is received by the side walls

3) Needle type → Insertion in a narrow channel is requi

Advantages

★ prevent nuclear accidents
Ensure safety in all operations
highly sensitive
Reading is accurate
useful in expanding the scope of Nuclear energy

Dis-advantages

★ do not measure energy.
★ less efficient
★ leads to deduction in lifetime

Construction and working of Semiconductor biased sensors for meas— temp.

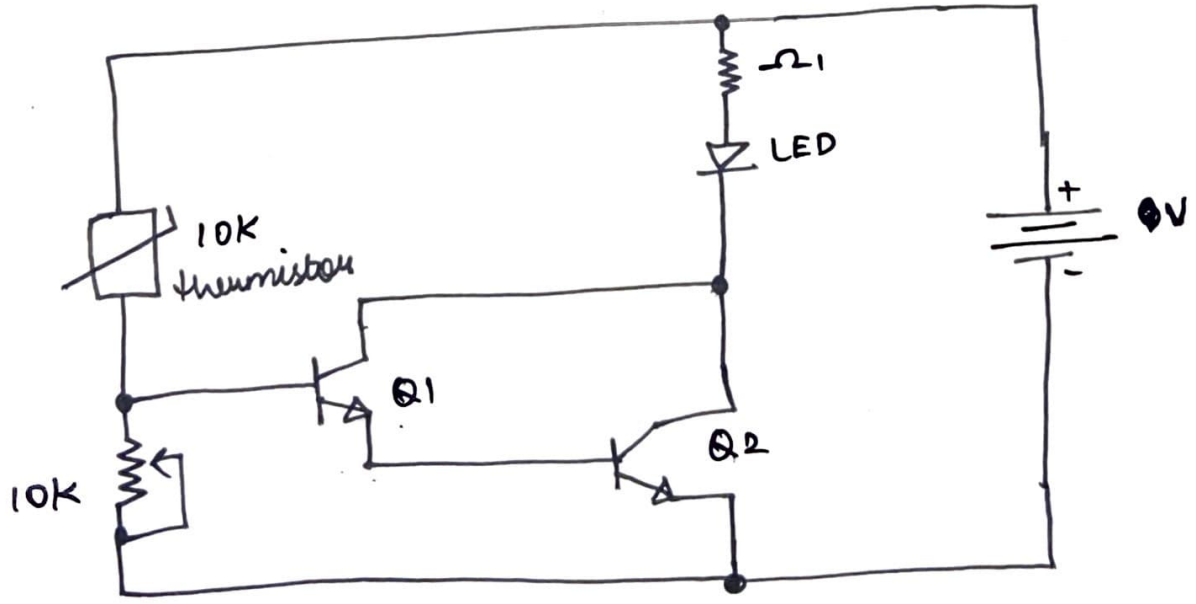
★ Thermal temperature sensors are thermocouples which are most extensively used in industries, over a wide range of temperatures

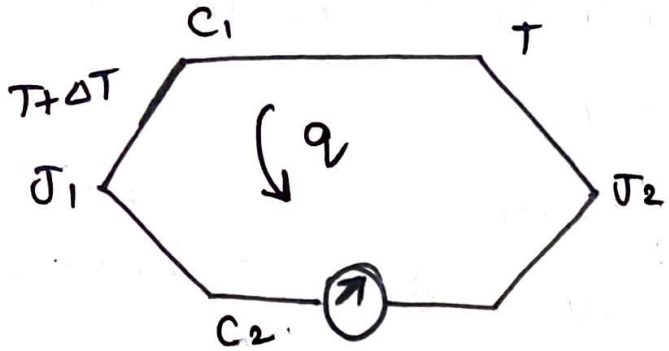
★ It was discovered by T. Seebeck

★ Seebeck effect is when electricity is created between a thermocouple when the ends are subjected to a temperature difference between them.

$$\Delta E = \alpha_1 \Delta T$$

- $\alpha_1 \rightarrow$ Seebeck coefficient
- $\Delta E \rightarrow$ open circuit emf
- $\Delta T \rightarrow$ difference of Temperature b/w two junctions





★ When two conductances C1 and C2 of different compositions are made up into a closed Electrical circuit. A small current flows through it if one of the junction T_1 has a different temperature than the other junction T_2.

★ The current is driven as an Emf which is generated b/w these two junctions because of temperature difference

★ The emf is called the thermoelectric potential or the Seebeck emf which is dependent on the compositions of C1 and C2

★ The diffusion of temp. ΔT with the polarity depending on the sign of ΔT.

$$\alpha_1 = \frac{\lambda k}{T} \ln(\rho_1 / \rho_0)$$

$\lambda \rightarrow$ constant approximation value

$\rho_0 \rightarrow 5 \times 10^{-6} \Omega m$