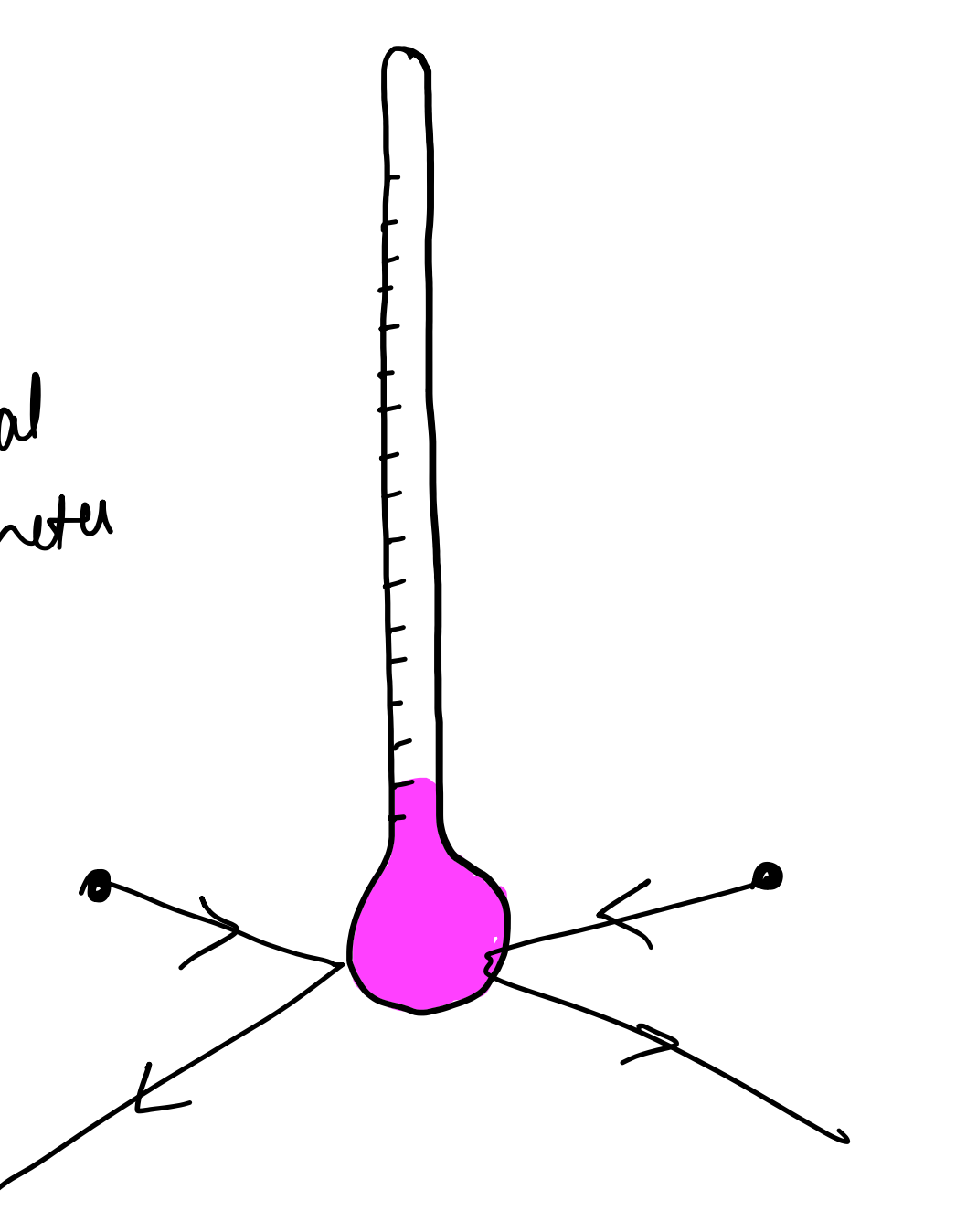
Measurement devices - 2

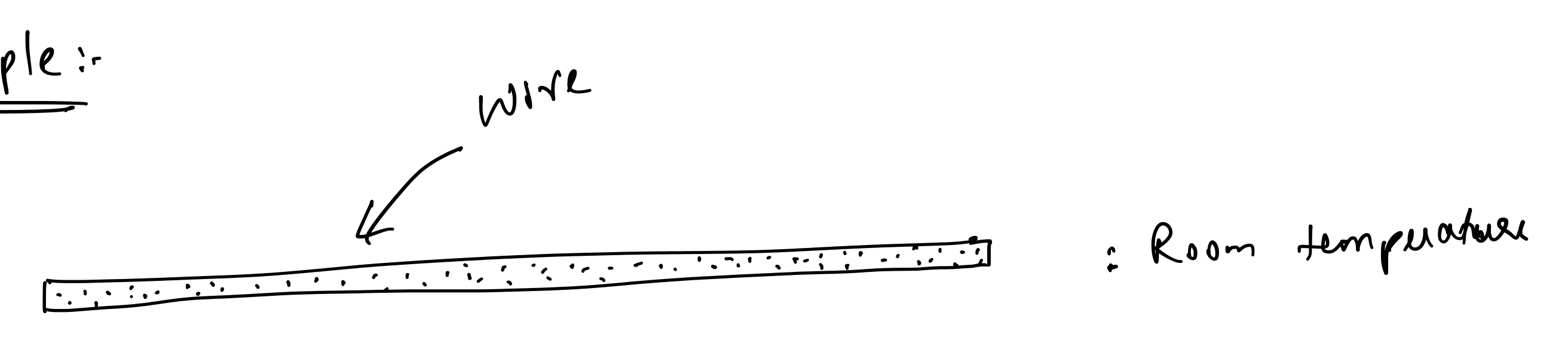
Friday, 11 February 2022 2:16 PM

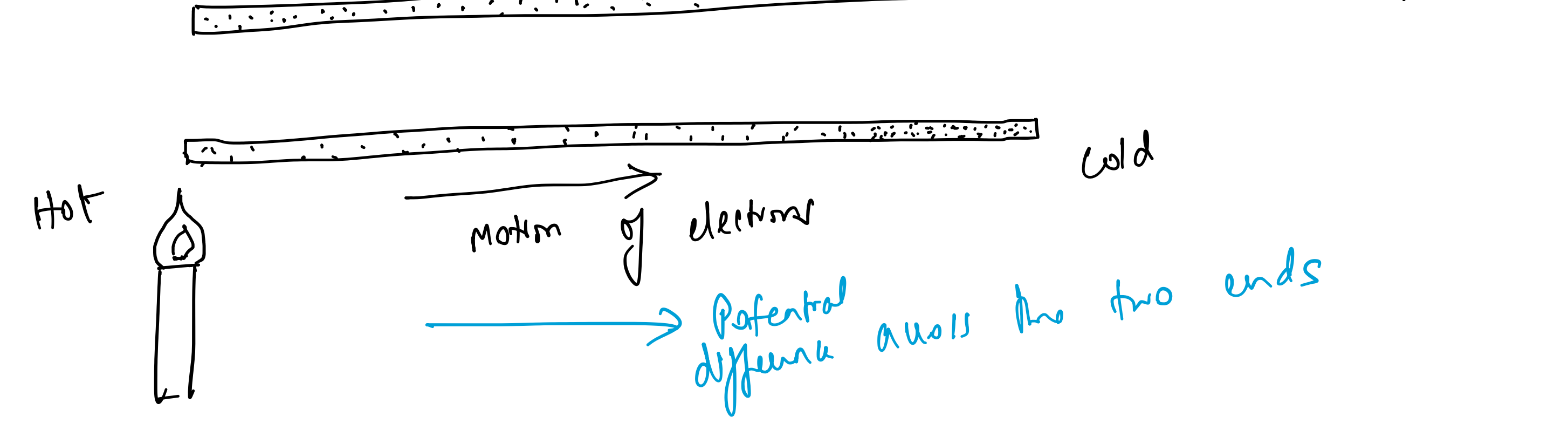
Temperature measurement

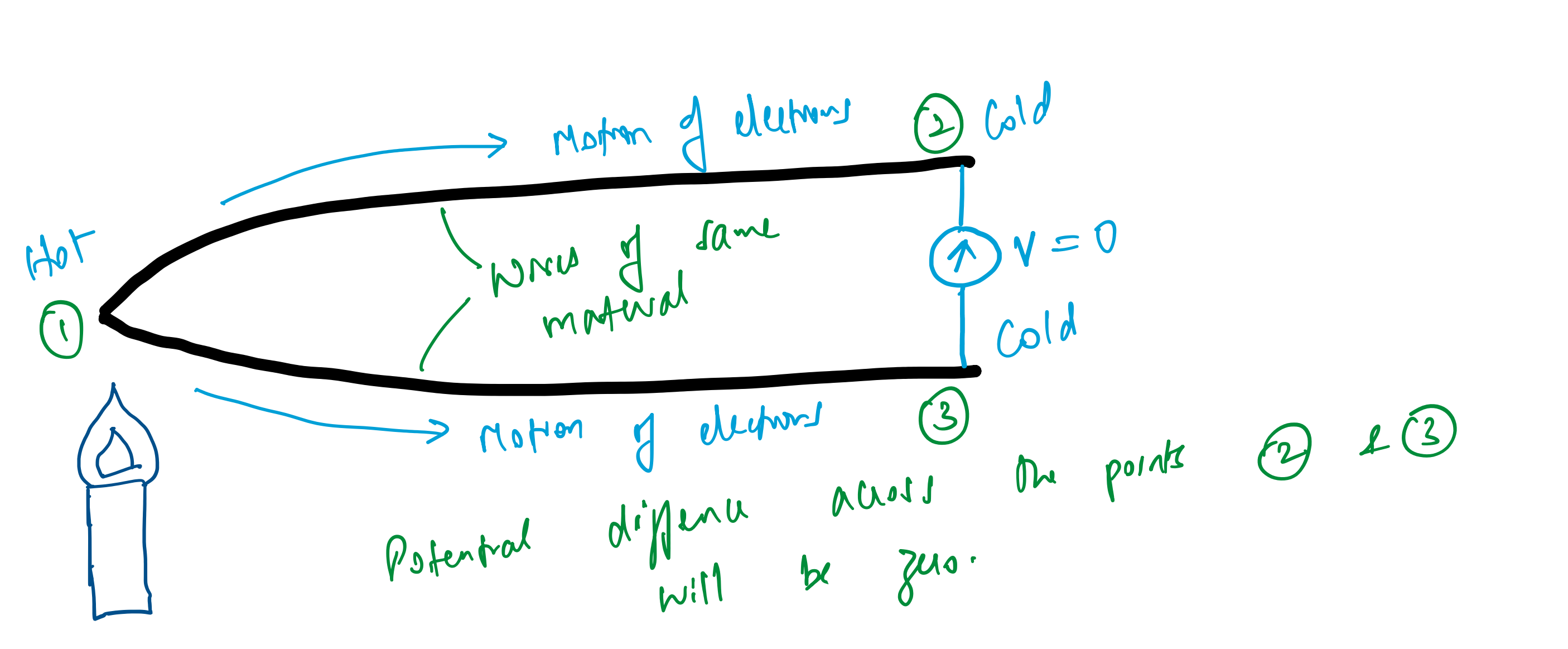
Classical Thermometer



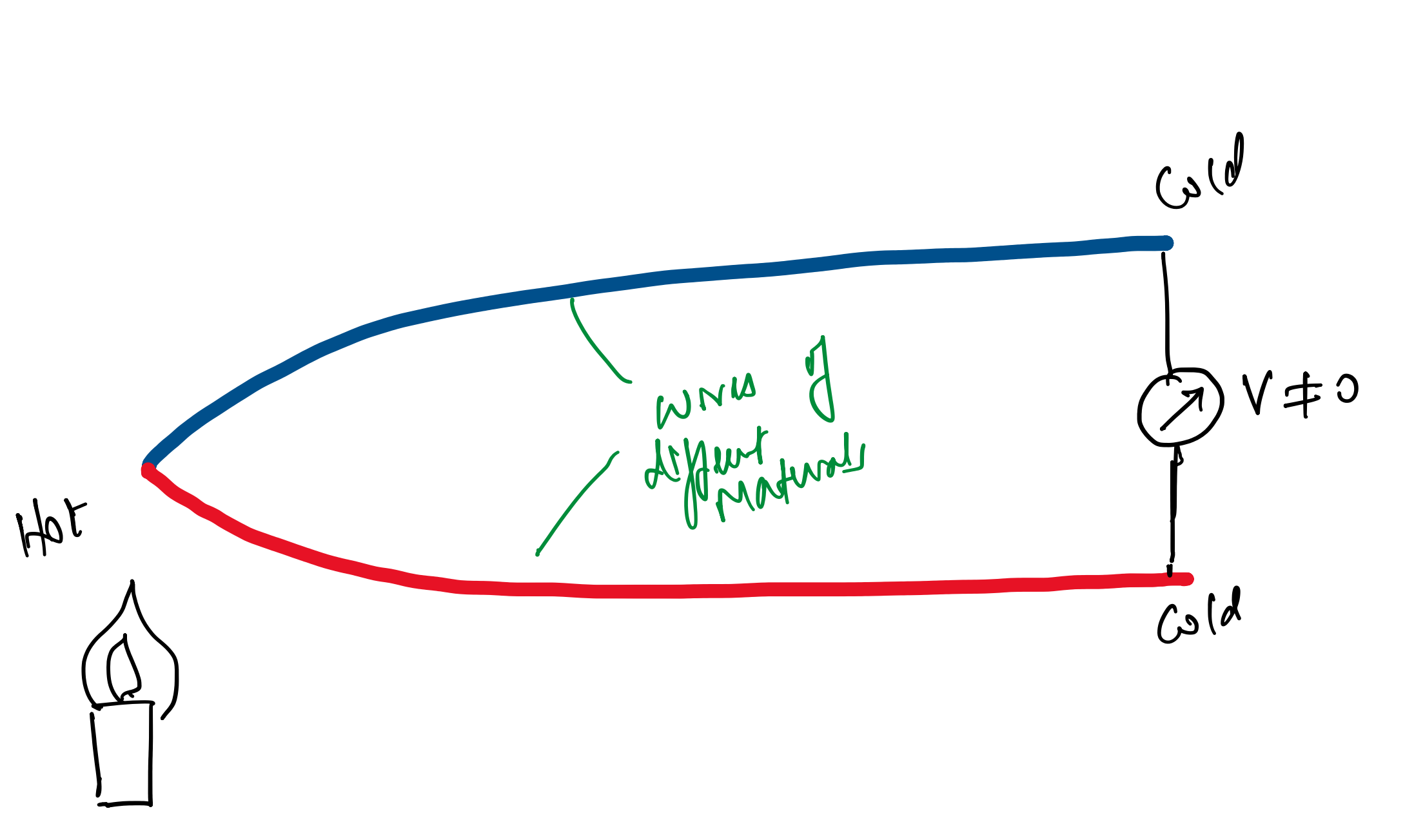
Thermocouple :-

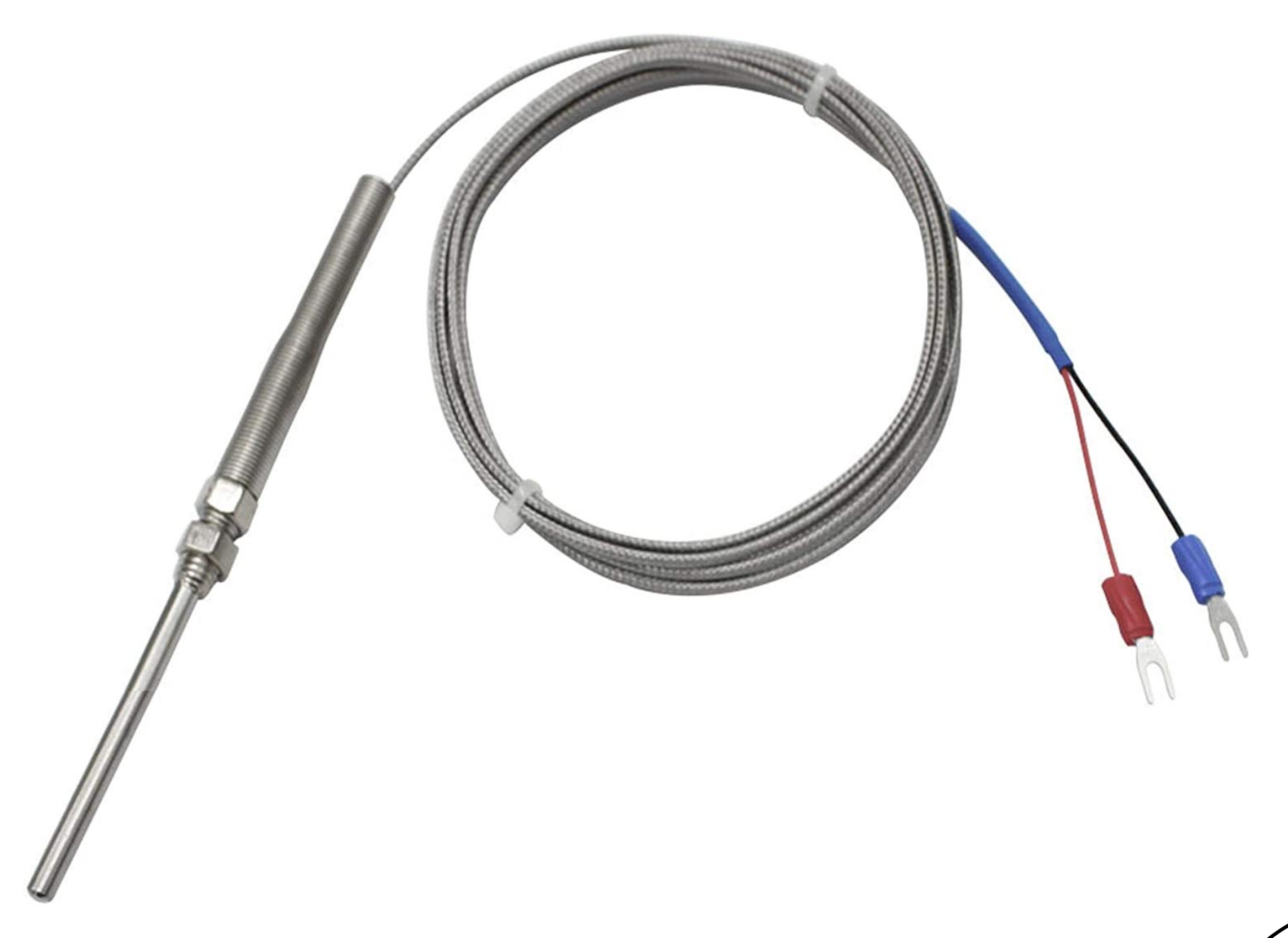


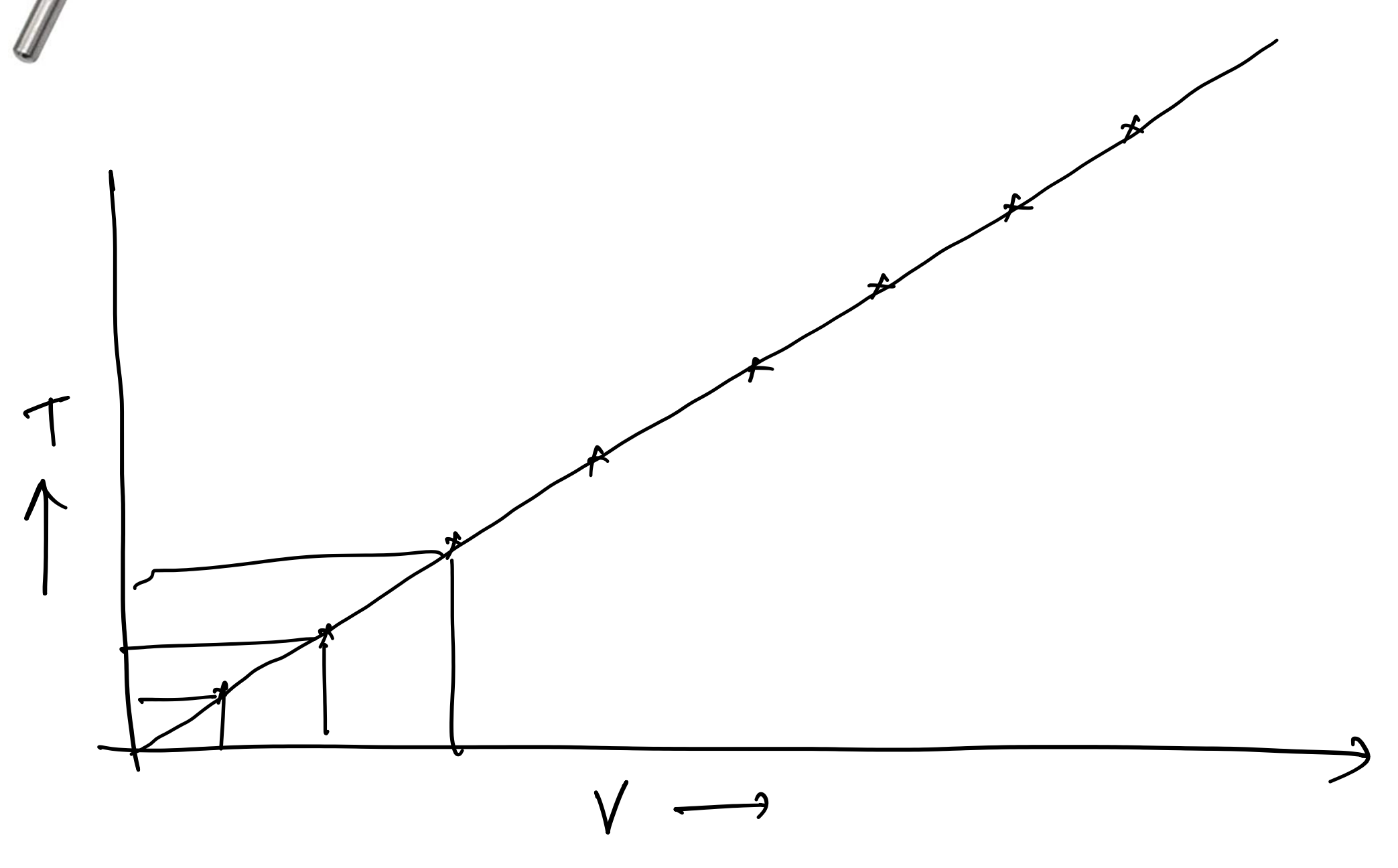


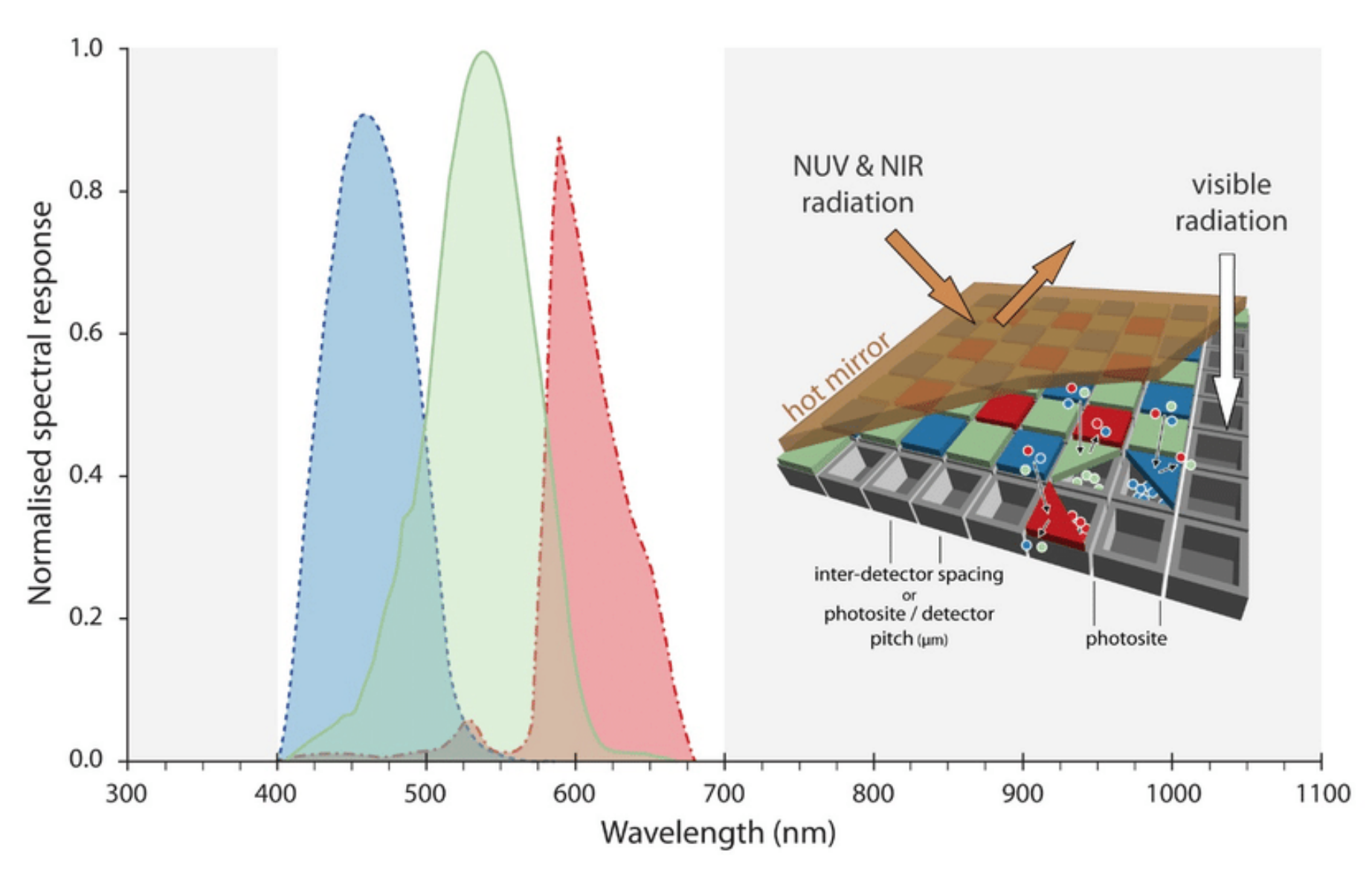


Potential difference across the points 2 & 3 will be zero.









Thermocouple Conductor Combinations, Operating Range and Colour Coding

Thermocouple Type & Operating Range Continuous	Conductors +/–	International IEC584.3:1989 (BS EN 60584.3)	Color
K 0 to 1100ºC	Nickel-Chromium Vs. Nickel-Aluminium (Also known as chromel Vs Alumel and T_1 Vs. T_2)	+ –	(+)green /(-) white Jacket: green
KCB (Compensating for type K) Connect between 0ºC and 100ºC	Copper Vs. Copper-Nickel (also known as copper Vs. Constantan)	+ –	(+)green /(-) white Jacket: green
T -185 to 300ºC	Copper Vs. Copper-Nickel (also known as copper Vs. Constantan)	+ –	(+)brown /(-) white Jacket: brown
J 0 to 750ºC	Iron Vs. Copper-Nickel (also known as iron Vs. Constantan)	+ –	(+)black /(-) white Jacket: black
N 0 to 1200ºC	Nicrosil Vs. Nisil	+ –	(+)pink /(-) white Jacket: white
E 0 to 800ºC	Nickel-Chromium Vs. Copper-Nickel (also known as Chromel Vs. Constantan)	+ –	(+)purple /(-) white Jacket: purple
R 0 to 1600ºC	Platinum 13% Rhodium Vs. Platinum	+ –	(+)orange /(-) white Jacket: orange
S 0 to 1550ºC	Platinum 10% Rhodium Vs. Platinum	+ –	(+)orange /(-) white Jacket: orange
B 0 to 1600ºC	Platinum 30% Rhodium Vs. Platinum 6% Rhodium	+ –	(+)grey /(-) white Jacket: grey
RCA/SCA (Compensating For Type R/S) Connect between 0ºC and 100ºC	Copper Vs. Copper-Low Value Nickel	+ –	(+)orange /(-) white Jacket: orange

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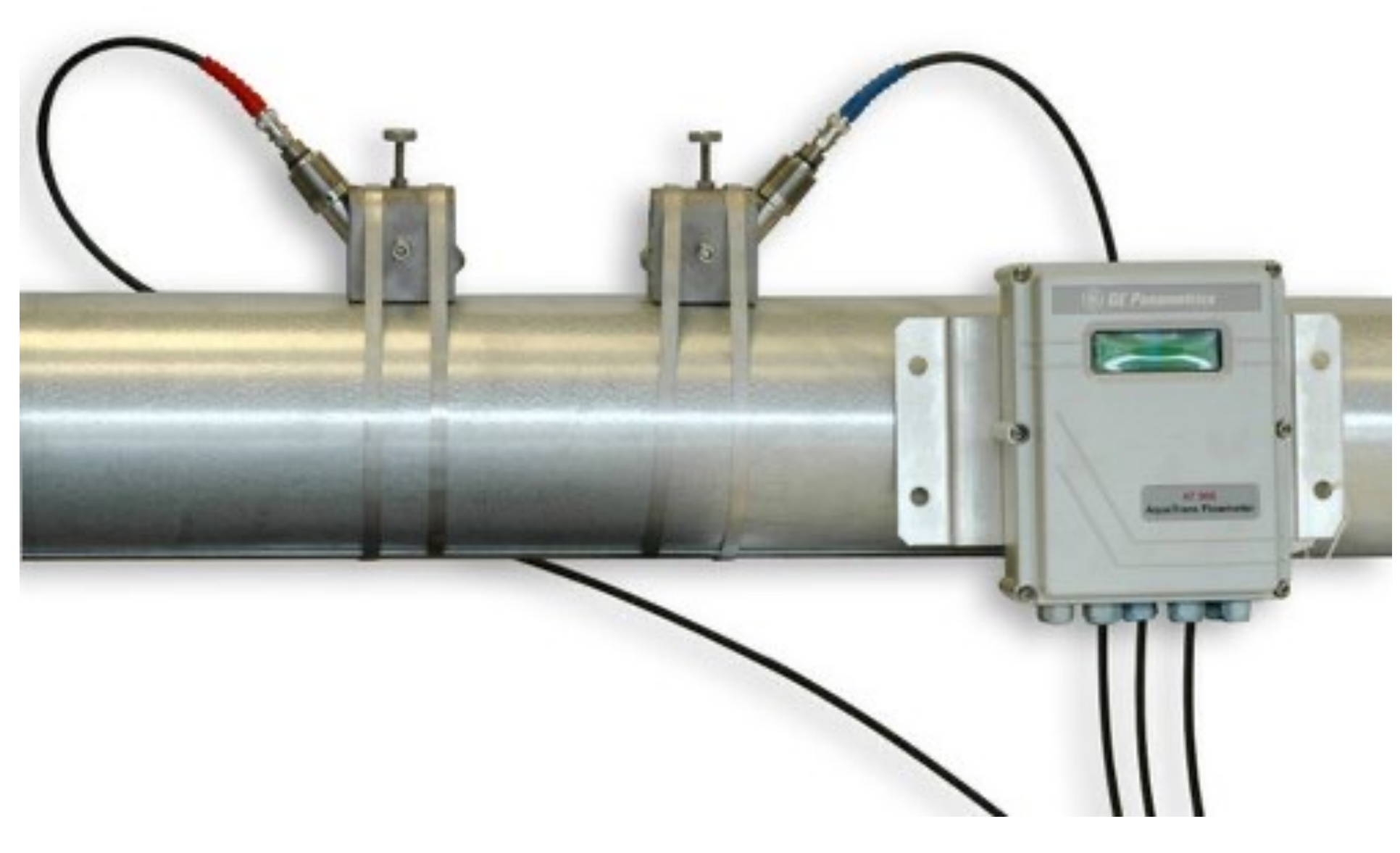
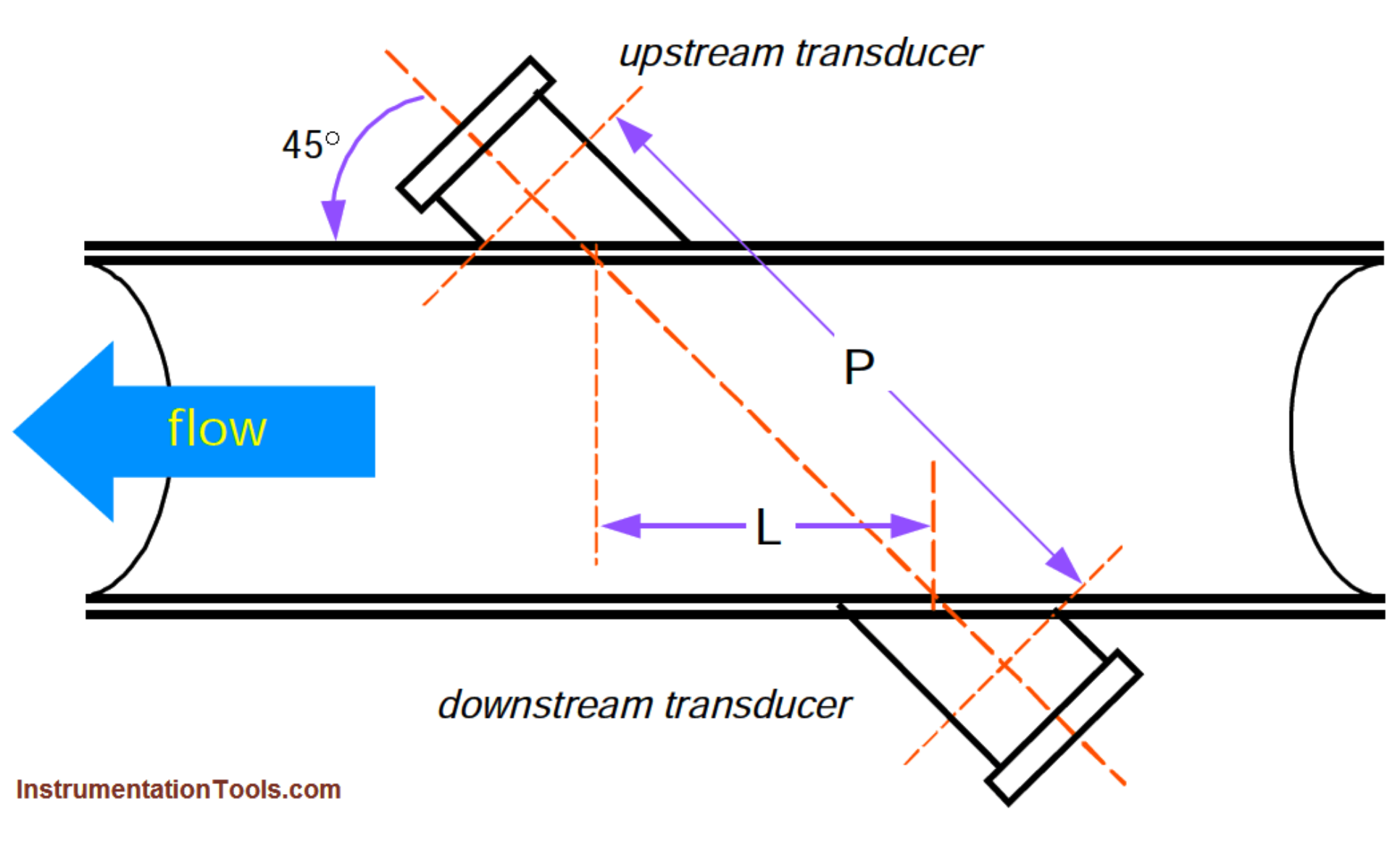
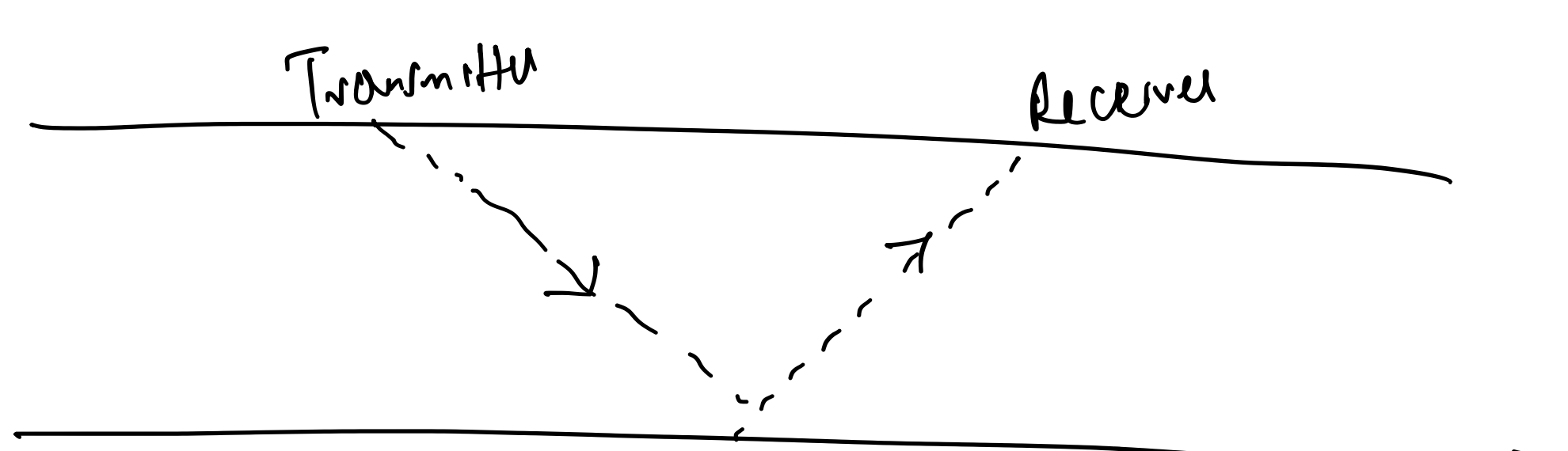
Flow measurement:-

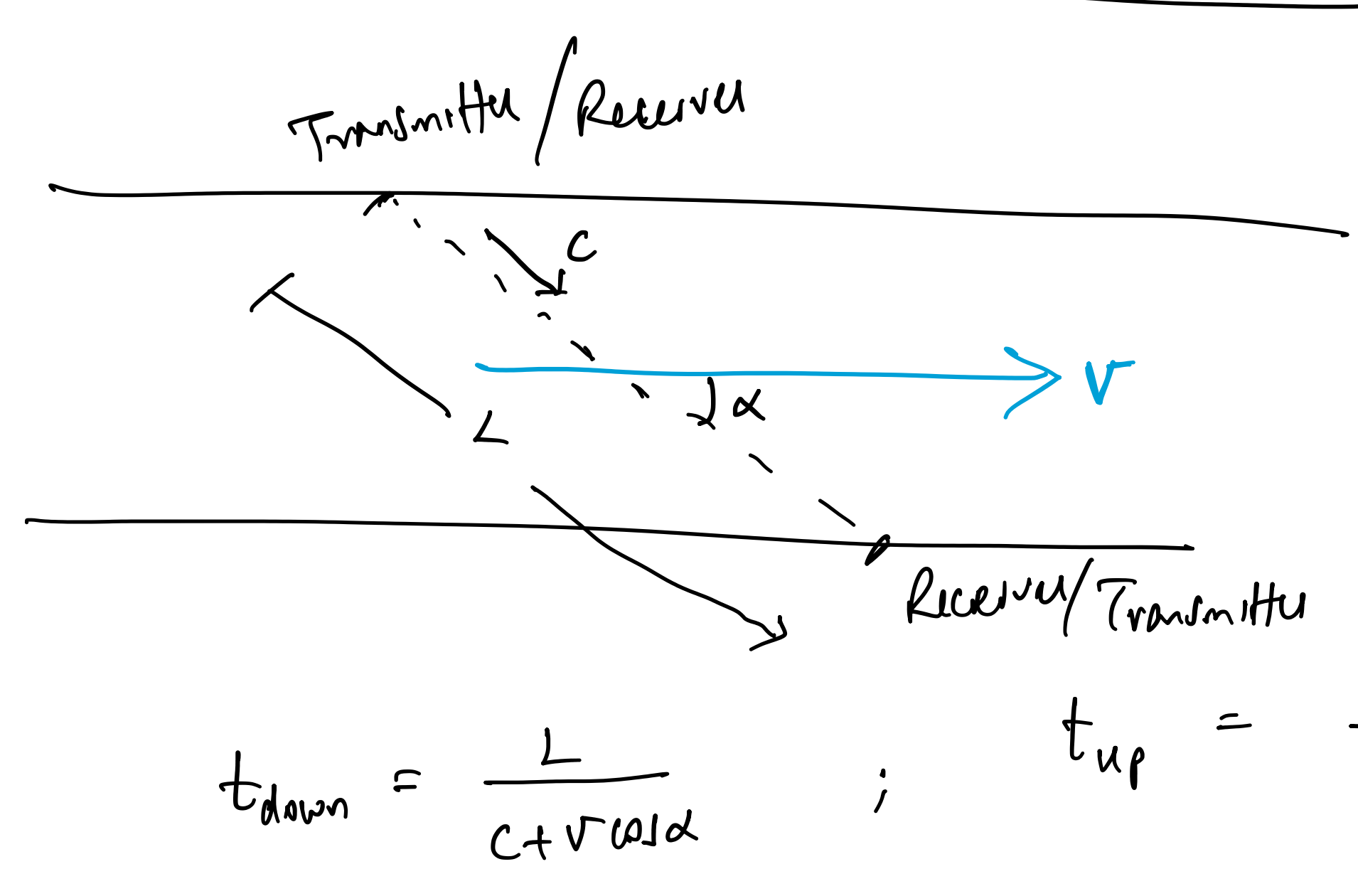
1. A sensor which does not interfere with the flow

Ultrasonic flow sensor:-







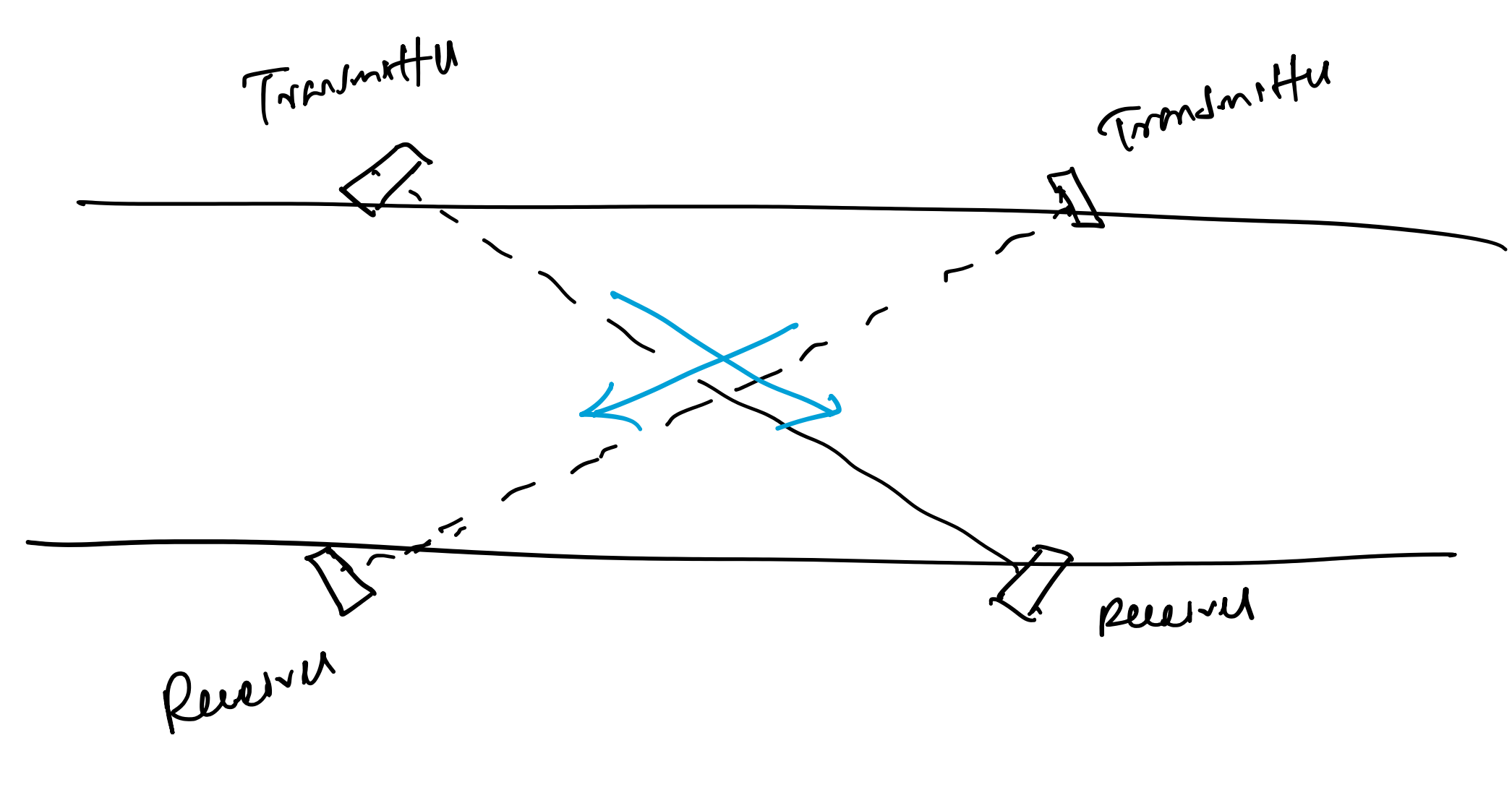


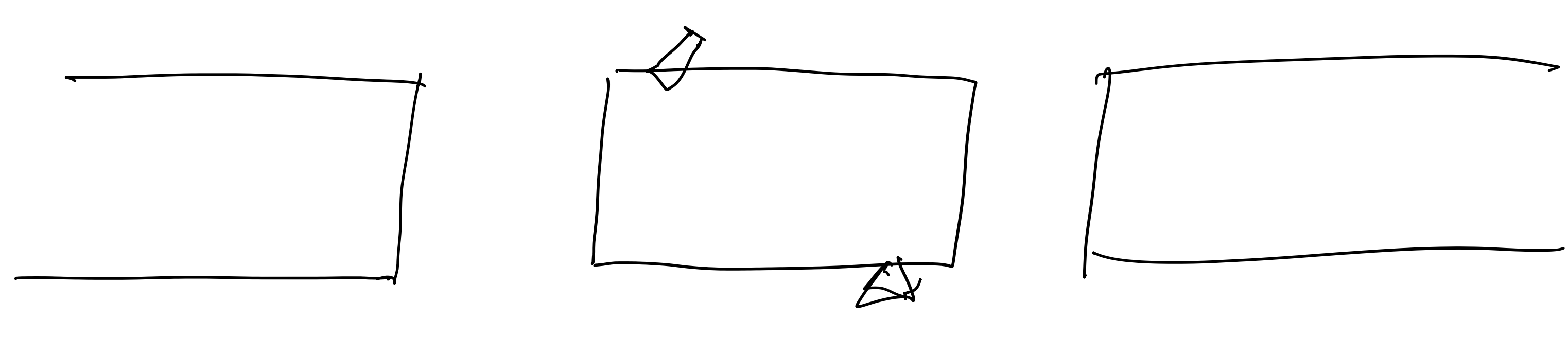
$t_{down} = \frac{L}{c + v\cos\alpha}$; $t_{up} = \frac{L}{c - v\cos\alpha}$

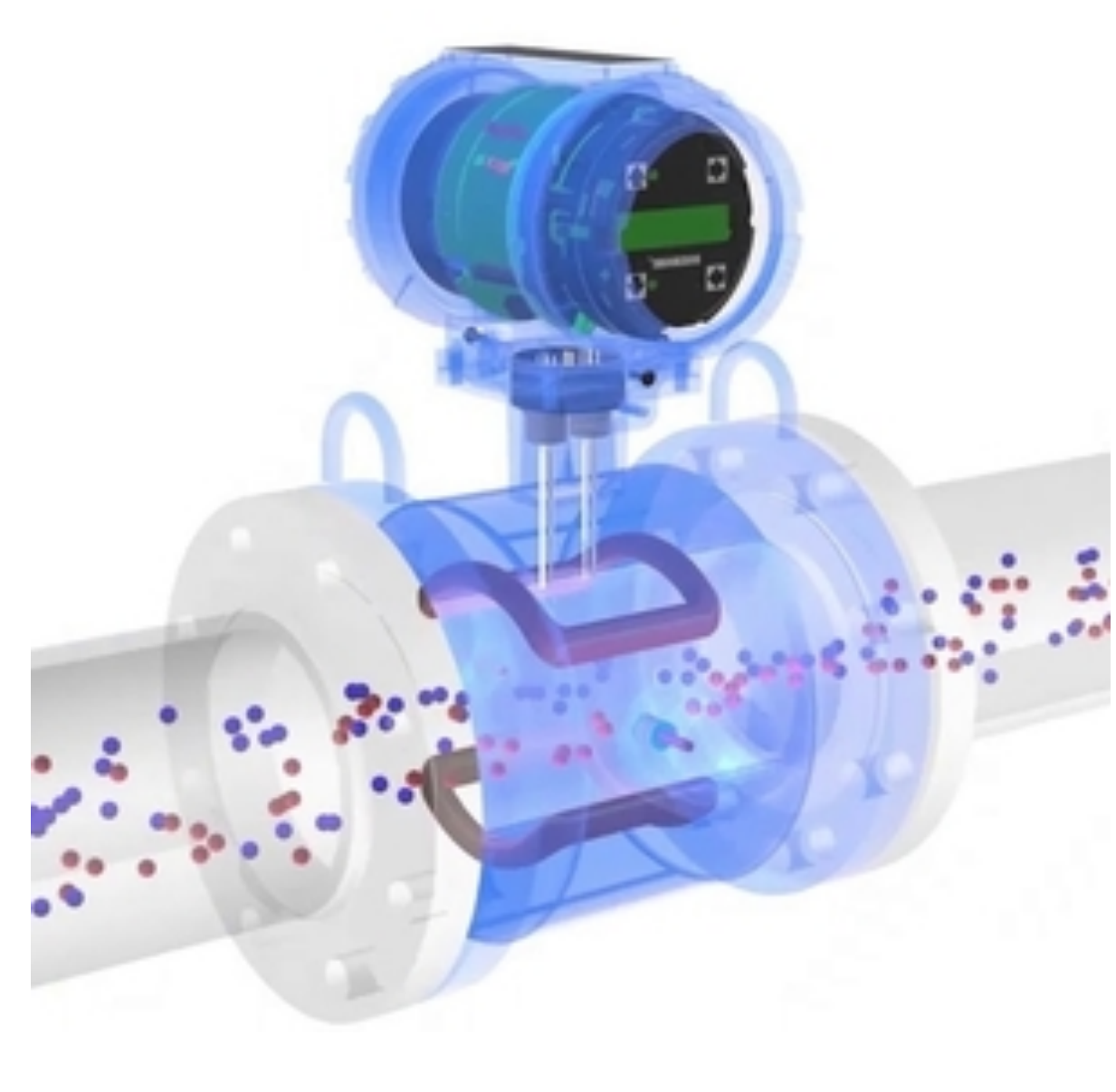
c, v are unknown

Knowing t_{up} & t_{down}, we can determine both c, v

$v = \frac{L}{2\cos\alpha} \times \frac{t_{up} - t_{down}}{t_{up} \times t_{down}}$







Magnetic flow meter

Turbine type flow meter