LAB REPORT FOR EXPERIMENT 6

Name:----⊥--- ~~~~~~~~~~ (9.5)   **Partner's Name:**

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Physics Section:------⊥-   **Instructor's Name:**-----------

PHYSICS LAB EXPERIMENT 6: THE POTENTIOMETER

1. PURPOSE:

we will use the potentiometer to measures an known electromotive force (emf) or an known potential difference.

II. DATA AND DATA ANALYSIS :

A. Calibration of the Potentiometer

1- Record your measurements of the reading V_x of the voltmeter at any point on the wire and the corresponding distance L_x in Table (6.1)below:

Table (6.1)

Reading	V_x (V)	L_x (cm)
1	0.2	15
2	0.8	30
3	1.2	45
4	1.6	60
5	2	75
6	2.5	90

78

Plot a graph of V_x versus L_x. State your conclusion.

It is direct linear relationship

3- If the wire is uniform derive a simple relation between the voltmeter reading V_x at any point on the wire and the corresponding distance L_x.

$$R = \left(\frac{\rho}{A}\right) L_x \qquad , \quad R \propto L_x$$

$$V_x = \left[\frac{I \cdot \rho}{A}\right] L_x$$

$$V_x = slope \cdot L_x$$

B. Measurement of an Unknown EMF

1- Calculate and record $\overline{L_x}$, the average value of L_x.

Trial	L_x(cm)
1	58
2	
3	
$\overline{L_x}=$	cm

2- Use your graph of **part A** to find the value of E_x corresponding to $\overline{L_x}$.

$$E_x = \frac{0.6}{22.5}(58) = 1.546 \quad volt$$

3- What is the current flowing through E_x when pointer touches the potentiometer wire at the balance point?

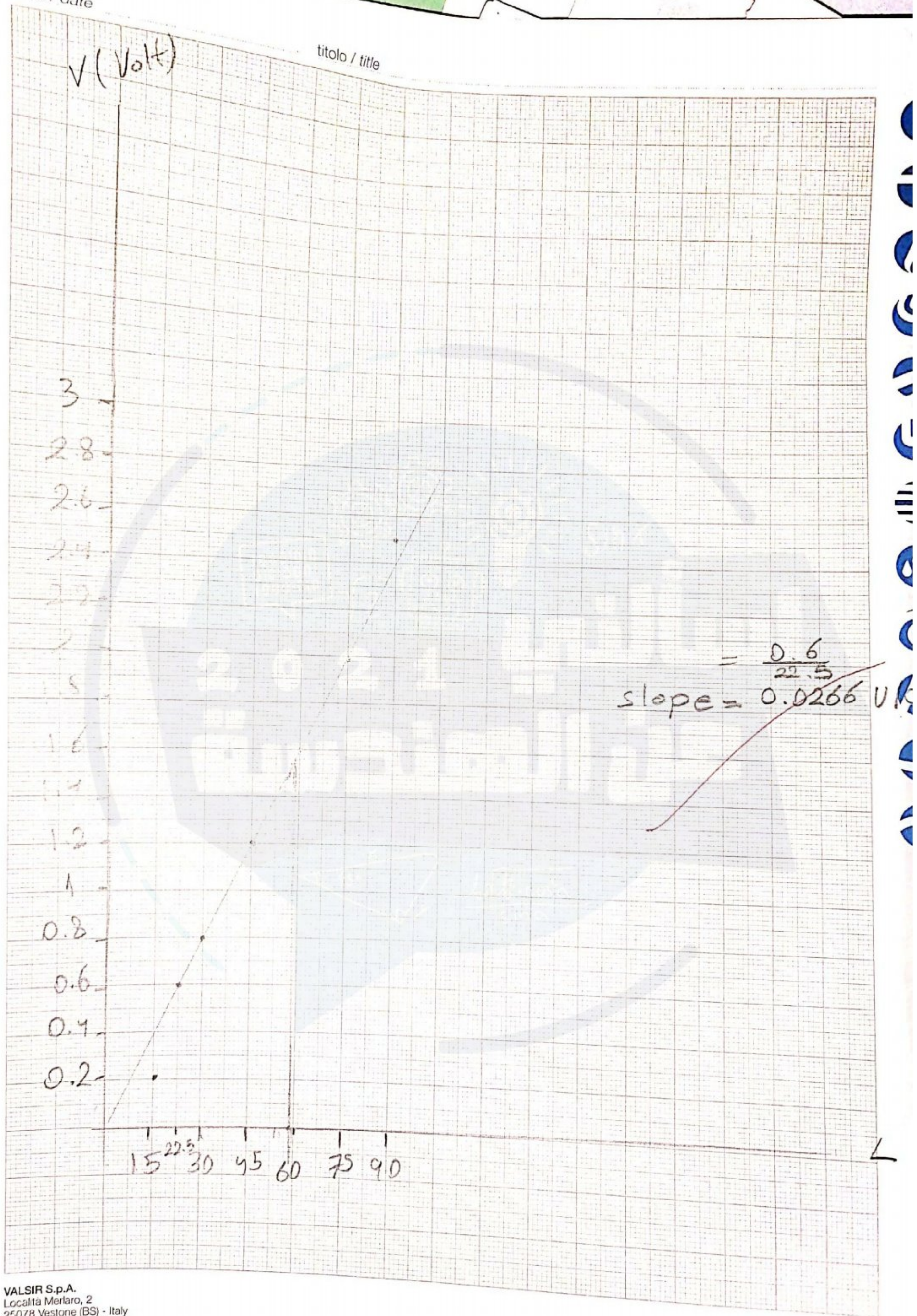$I = 0$, because $U = 0 \rightarrow$ (balance point)

4- What happens to the balance point when a small resistor is connected in series between E_x and the **galvanometer**? Explain the result you observe.

Nothing happen because $I = 0$

so L_x is the source

V (Volt)

3 —
2.8 —
2.6 —
2.4 —
2.2 —
2 —
1.8 —
1.6 —
1.4 —
1.2 —
1 —
0.8 —
0.6 —
0.4 —
0.2 —

15 22.5 30 45 60 75 90

$$= \frac{0.6}{22.5}$$

slope = 0.0266 V/

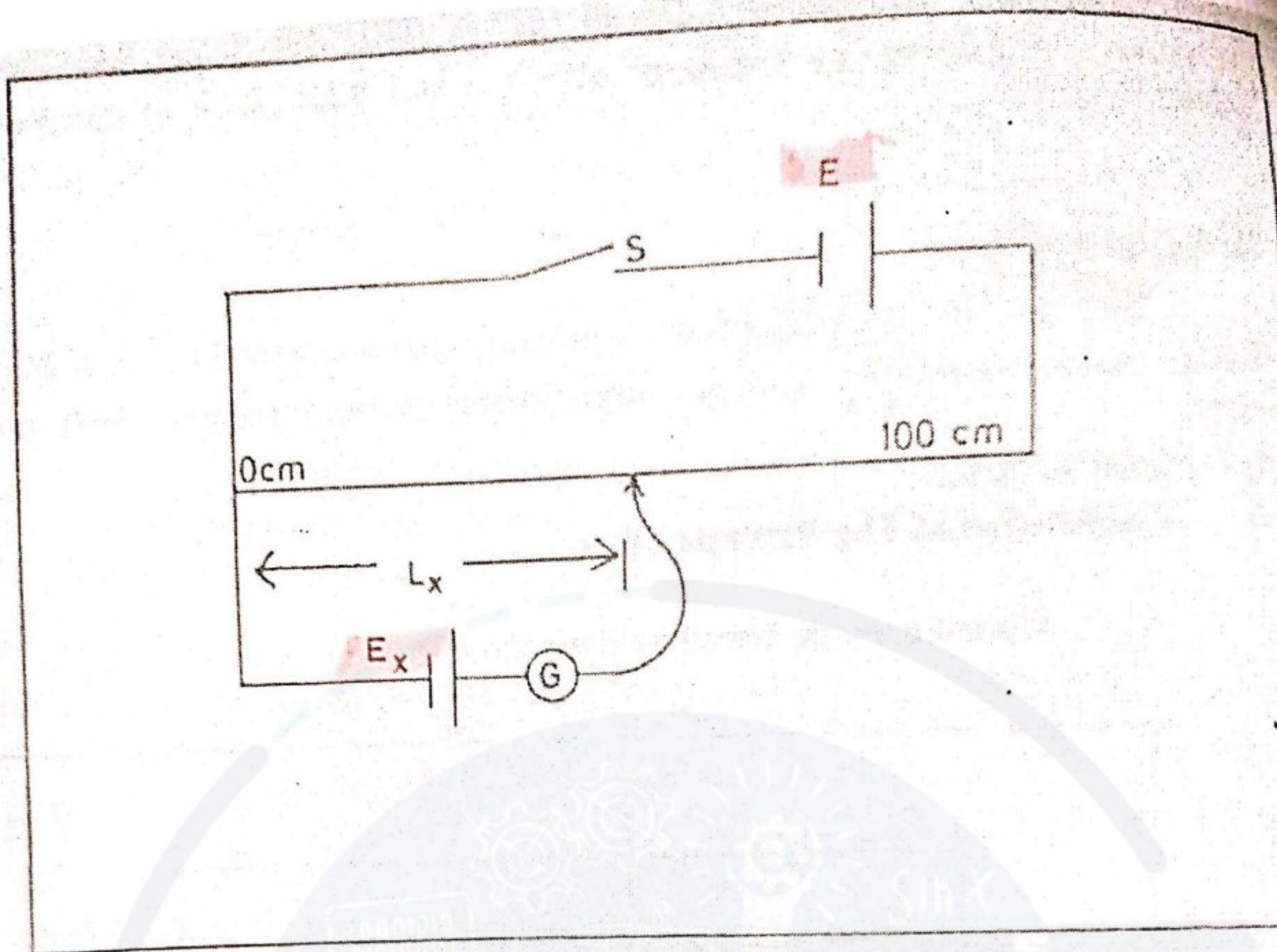## EXPERIMENT 6
THE POTONTIOMETER

- In the **Potentiometer** experiment, the circuit configuration will allow for the determination of an Unknown Electromotive Force (emf) E_X or an **Unknown Potential Difference** V_X by comparison with the **emf** of a standard cell E_B.

- Initially, the **Potentiometer** will be **Calibrated** using a **Voltmeter**.

- Then by using the **Calibration Curve**, the unknown emf E_X is determined.
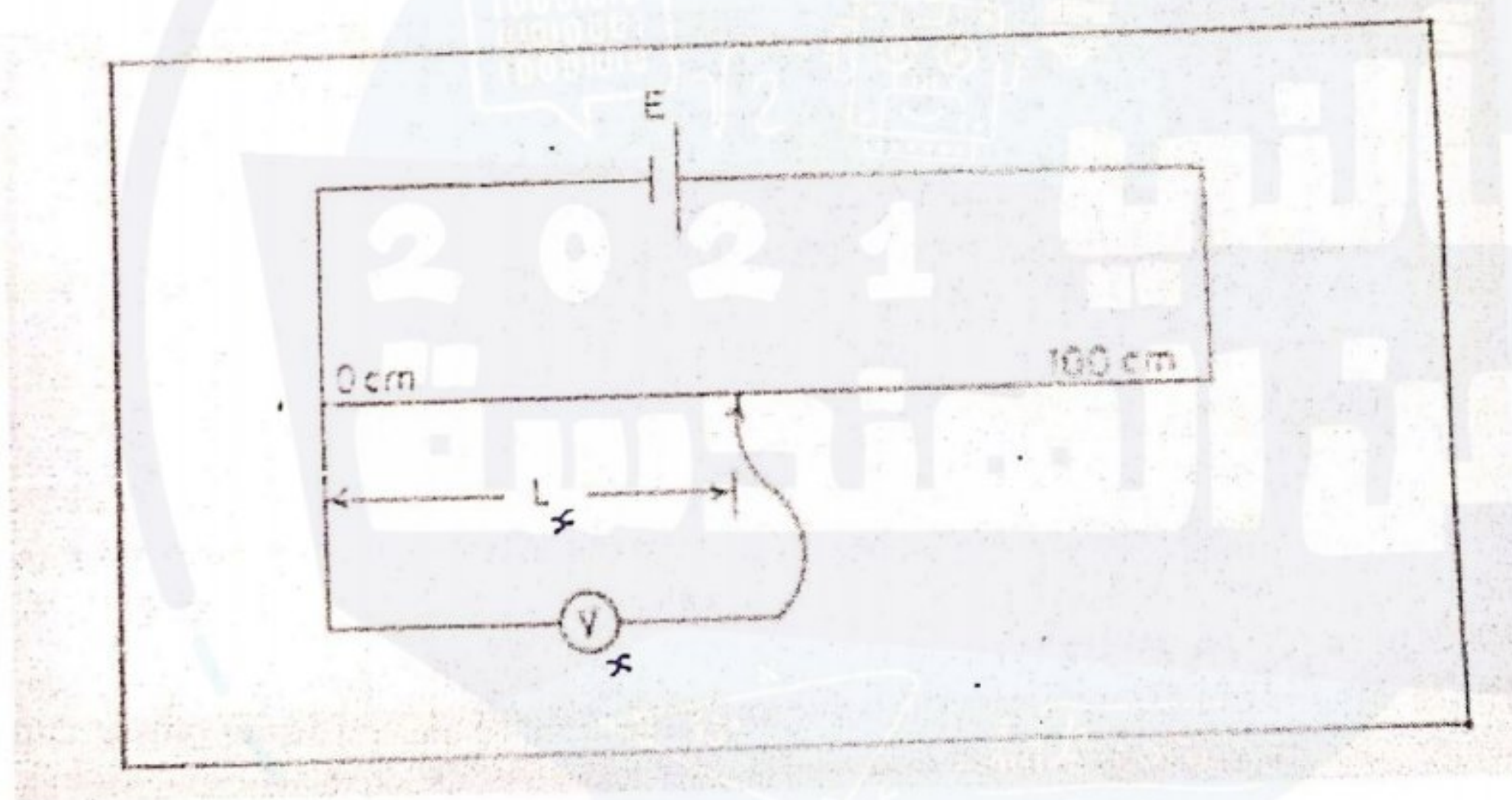
2 parts

CALIBRATION OF THE POTENTIOMETER FIG **6.1**

- Table 6.1 will be filled by the measured values of V_Y versus L_X for the Calibration Curve which is a graph of V_X (as dependent variable) versus L_X.
  (Remember that the Potentiometer wire will heat up if measurements took longer time).

- Later, another circuit configuration will be set up to allow the use of the calibration curve for the determination of the unknown emf E_X.

MEASURMENT OF AN UNKNOWN EMF, FIG 6.2

■ Using the **Galvanometer** will allow to locate the Balance Point P at which L_X is recorded (This should be done three times and average value is calculated $\overline{L_X}$.

■ Using the **Calibration Curve**, the value of E_X corresponding to $\overline{L_X}$ will be found.
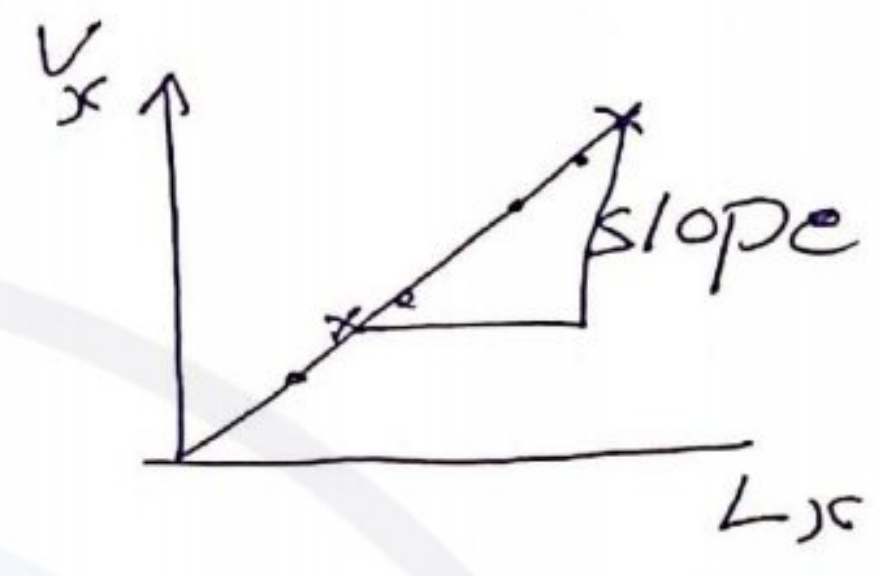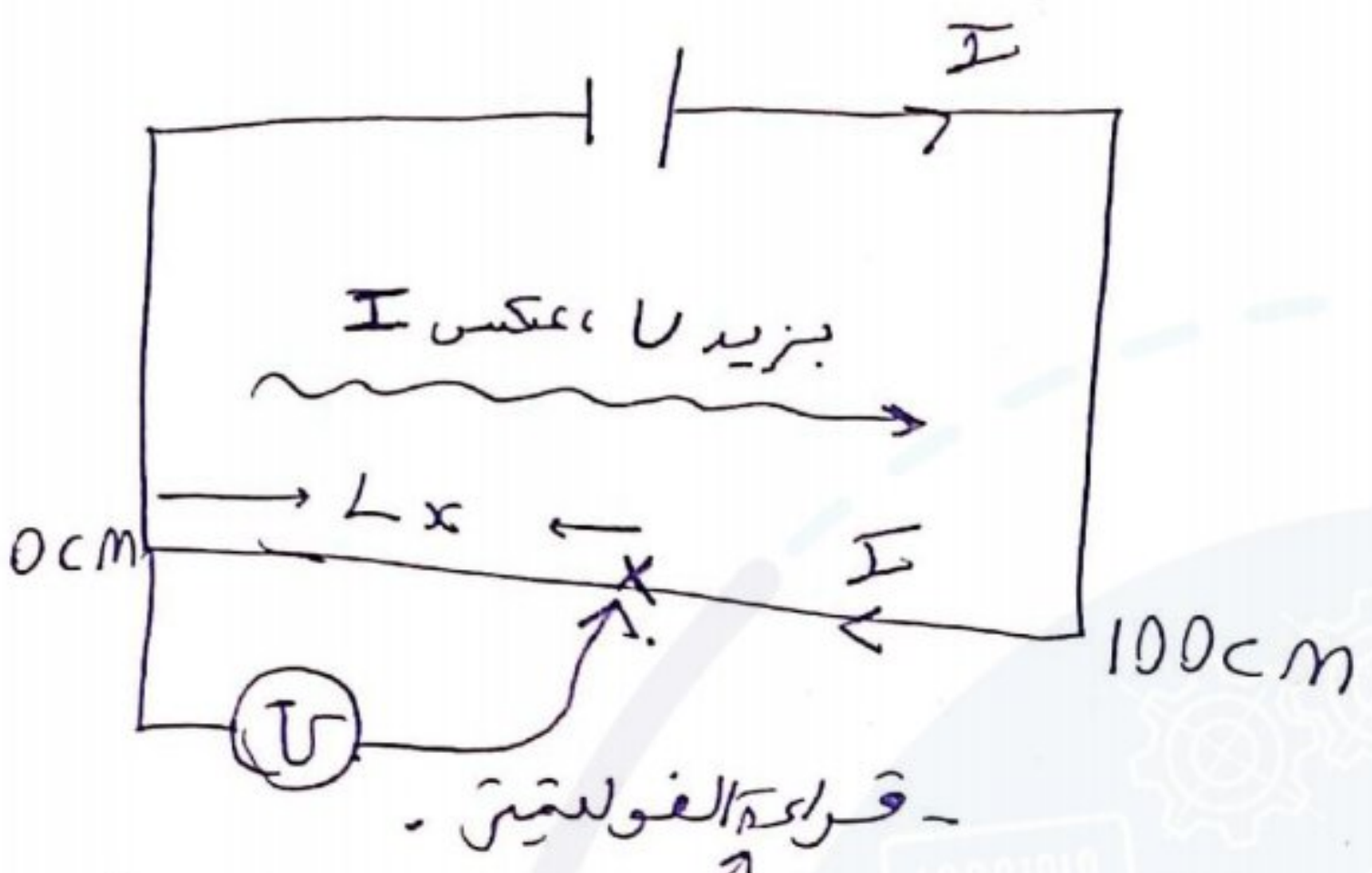
THE POTENTIOMETER CONFIGURATION

■ In today's experiment, we want to:
  ■ **Build up simple electric circuit** using different **circuit elements** including:
    ▪ **Electric wires** (considered as perfect conductors eventhough they tend to heat up during the experiment, hence, their power dessipation is gnored).
    ▪ **DC Power Supply** (3.0 Volts).
    ▪ **Two different Resistors:**
       • Meter Bridge (wire resistance).
       • Resistance (5 – 10 Ω).
    ▪ **Voltmeter** to register the voltage correspondance of the current passing through the wire resistance.
    ▪ **Galvanometer** to register the balance point.
    ▪ **Unknown emf** E_X.
  ▪ **Ploting** a Calibration Curve
  ▪ **Calculating** the average value of $\overline{L_X}$.
  ▪ **Determining** the unknown emf E_X.

الجزء الأول → voltmeter

الثاني

Galvanometer

2

The Potentiometer

- تجربة هدفها قياس القوة الدافعة لمصدر وقوة دافعة مجهولة.

Part 1 : Calibration of the potentiometer

$L_x (cm)$ $V_x (volt)$

$$U_\delta = (slope) L_x$$

بنقطني فروق الجهد بدلالة L_x

بوصل ال sliding contact مع ال voltmeter بلمس فيها السلك المعدني ، فيقيس فروق الجهد

- كل ما زاد الطول تزيد ال R

$$R = \frac{\rho L_x}{A}$$

$$U_\delta = I R$$ تعنشرح

$$\therefore U_\delta = I \left(\frac{\rho L_x}{A} \right)$$ ثوابت

→ slope

↓ slope

$\therefore V_x$ طردي L_x

- لبس أجبر slope بعتبر أحسب ال ... عند يا مش موجودين ال الطر الاساسي "غير مقياسي يعني" بزيد فروق الجهد إذا مشيت عكس ال current

Part 2 : Finding the known emf
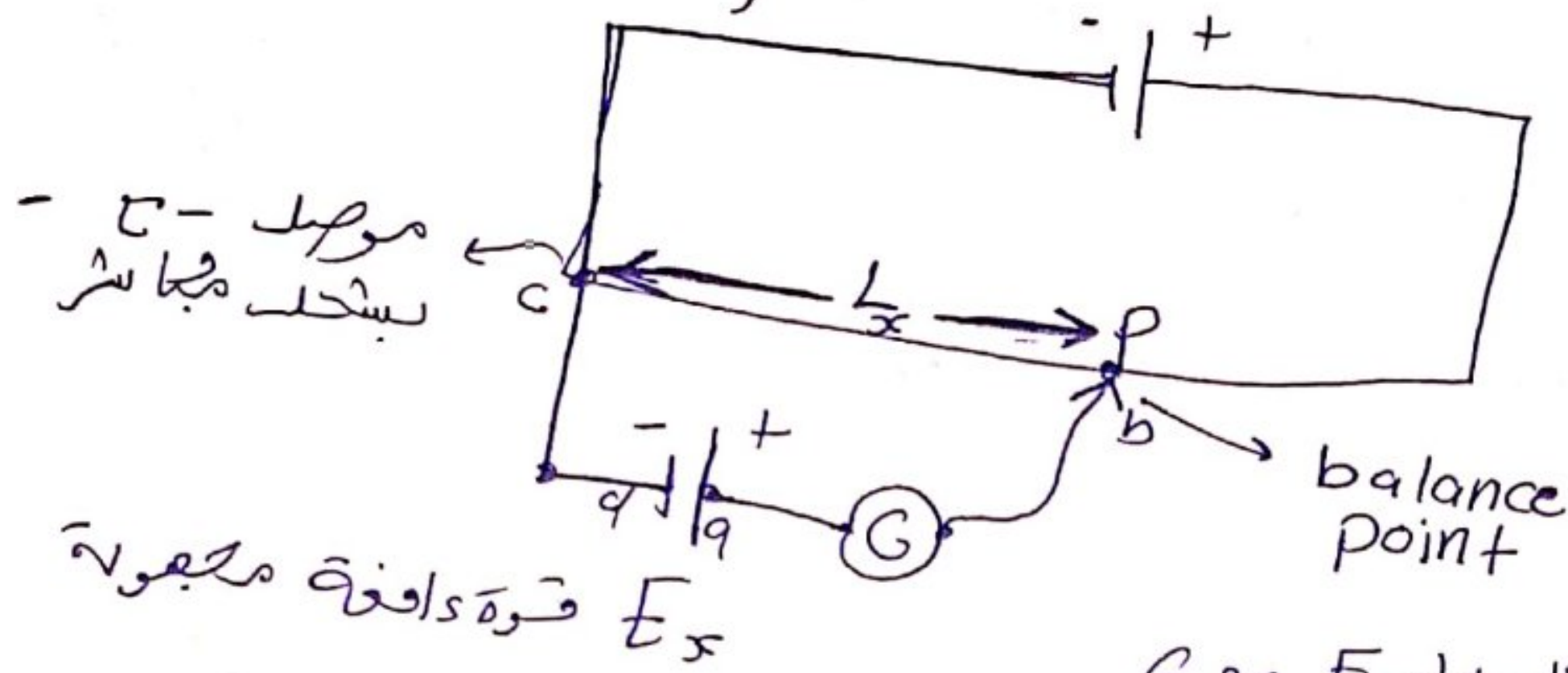
موصل -T- بشكل مباشر ⟵ C

L_x ⟶ P

b ⟶ balance point

E_s قوة دافعة مجهولة ⟵ a

بوصل ال +- ال E_s مع G
والسلك الثاني ل G مع sliding contact

balance point ← وببحث عن النقطة الي $G = 0$ هي

مونها فرق جهد $G = 0$ لأنو الجهد نفس الجهد
cd نفس الجهد

$$\therefore \text{فرق } cb = da$$

$$\boxed{E_s = (slope) \cdot L_x} \leftarrow \text{حنيجد ال slope بأخذ ميل الرسم}$$

ـ العملي : <u>part 1</u>
الموجب لل power مع ال 100 والسالب مع 0cm للسلك
ـ سالب ال volt meter مع ال zero والموجب مع ال pointer
— sliding contact

بعد ها بقرأ المسافة وبقرأ ال U
وبحرك وبا خذ قيم

<u>Part2</u> —
بد ال voltmeter عنا قوة رافقة ← بطارية سالب الجهد
والموجب للبطارية مع سالب ال Givano مع ال zero الي موصل
الراديو والموجب G مع ال pointer ويدور
ـ لما اكس جهة ال 0 يزوف لليسار جهة ال 100 للعكس