Name: _____ ID: _____ Sec: ___ Group: __ Date: _____

Experiment no: ___

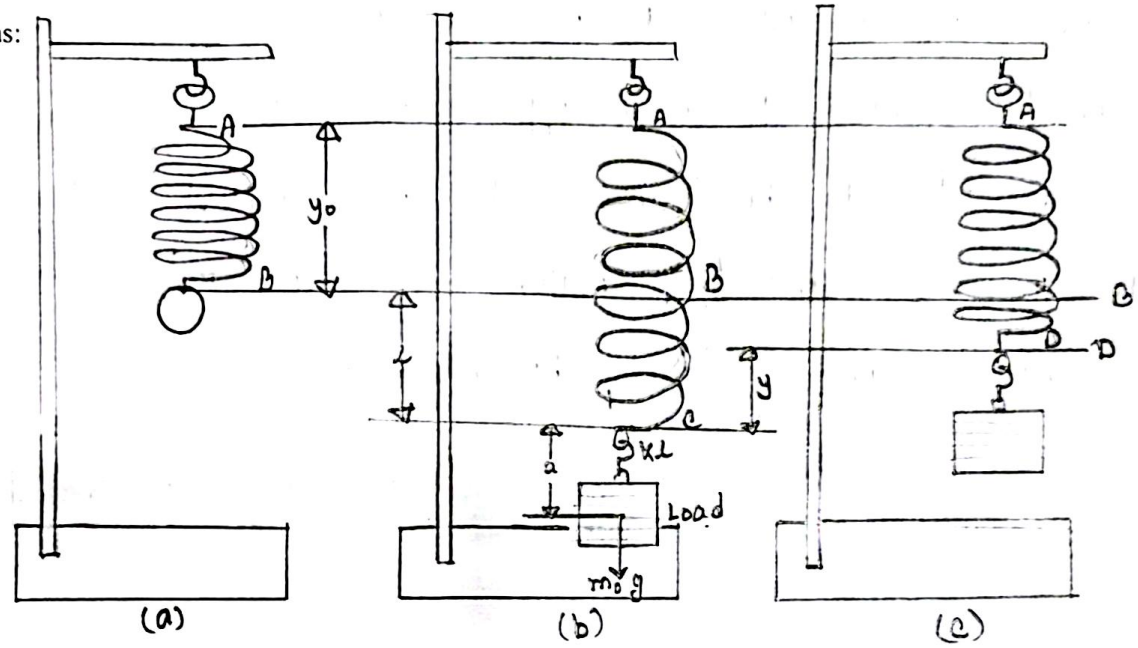
Name of the Experiment: _____

_____

Questions on Theory

*1) Draw the arrangement of this experiment. [0.5]

Ans:



*2) States Hooke's law for an elastic spring. [0.5]

Ans: Hooke's law states that the extention of the spring is proportional to the load that is applied to it.

*3) Suppose, an external force is applied on a spring to stretch it. Extension of the spring is *l*. If the spring constant is *k* then what is the restoring force of the spring due to its elasticity? [0.5]

Ans: The restoring force of the spring due to its elasticity is $F = -kl$ where k is the spring constant, l is the extension of the spring

- **Draw the data table(s) and write down the variables to be measured shown below (in the 'Data' section), using pencil and ruler BEFORE you go to the lab class.**

- **Write down your NAME and ID on the top of the page.**
- **This part should be separated from your Answers of "Questions on Theory" part.**
- **Keep it with yourself after coming to the lab.**
- **DO NOT forget to bring two GRAPH PAPERS.**

Data Data

A) Initial length of the spring, y_0 = AB = 6 cm

B) Table 1: Data of m_0, l and T

Mass of load m_0 (gm)	Extension of the spring, l (cm)	Time required to complete 20 oscillations, t (s)	Period of oscillation, T (s)	T^2 (s^2)
500	40	23	1.15	1.323
400	33	20	1.0	1.0
300	27	18	0.9	0.81
200	21	17	0.75	0.569

C) Mass of the spring by using weight-meter, m = 20 gm

D) Effective mass of the spring by using the value of its mass- measured by weight-meter, m' = 9.67 gm

Please attach two graphs here.

- **READ the PROCEDURE carefully and perform the experiment by YOURSELVES. If you need help to understand any specific point draw attention of the instructors.**
- **DO NOT PLAGIARIZE data from other group and/or DO NOT hand in your data to other group. It will bring ZERO mark in this experiment. Repetition of such activities will bring zero mark for the whole lab.**
- **Perform calculations by following the PROCEDURE . Show every step in the Calculations section.**
- **Write down the final result(s).**

Calculations $K = \frac{m_0 g}{l} = \frac{0.3 \times 9.8}{0.27} = 10.89\ Nm^{-1}$ $K = \frac{g}{\text{slope}}$

Result:

Spring constant is ~~10.89~~ ~~9.41 Nm⁻¹~~ ~~11.76 Nm⁻¹~~ $= g \times \frac{x}{y}$

Effective mass is ~~14~~ 9.67gm $= 9.8 \times \frac{0.3}{0.25}$

$= 11.76\ Nm^{-1}$

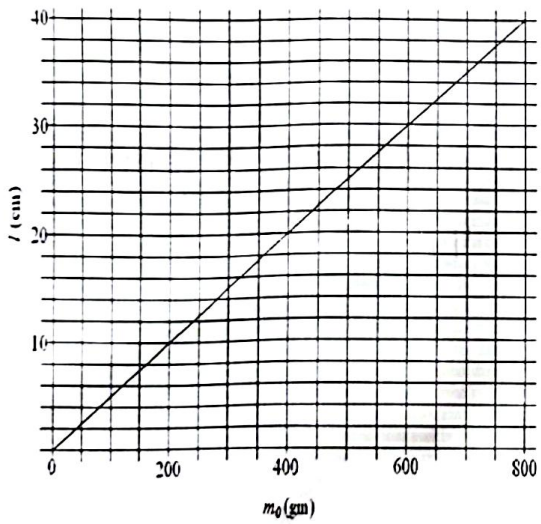
*4) If a load of m_0 is connected with the bottom end of a vertically suspended spring, the extension of the spring is l. The spring constant is k. At the equilibrium condition what is the relationship among m_0, k, l and g? [0.5]

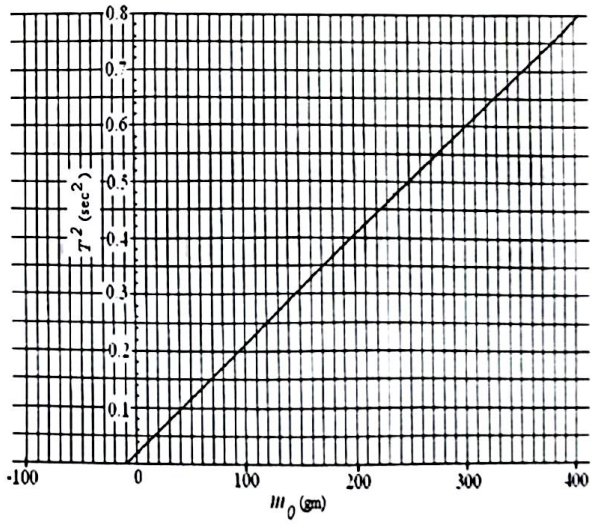
Ans: At the equilibrium condition, the weight of the load (m_0) is balanced by the restoring force of the spring, so the extension of the spring is zero. At equilibrium the relationship among m_0, K, l, g is $m_0 g = kl$

5) What is the effective mass of the spring? (See Appendix A/textbook/websites) [1]

Ans: The effective mass of the spring is the mass added to it for correctly observing system behaviour. Effective mass is $\frac{1}{3}$ of the mass of the spring and it is defined as $m' = \frac{m}{3}$. here, m is the total mass of the spring and m' is the effective mass

6) An l vs. m_0 and a T^2 vs. m_0 graphs are shown below. Work out the spring constant and effective mass. [2]





[You may use additional page(s) to answer this question]

Ans: For, $m_0 = 200\,gm = 0.2\,kg$

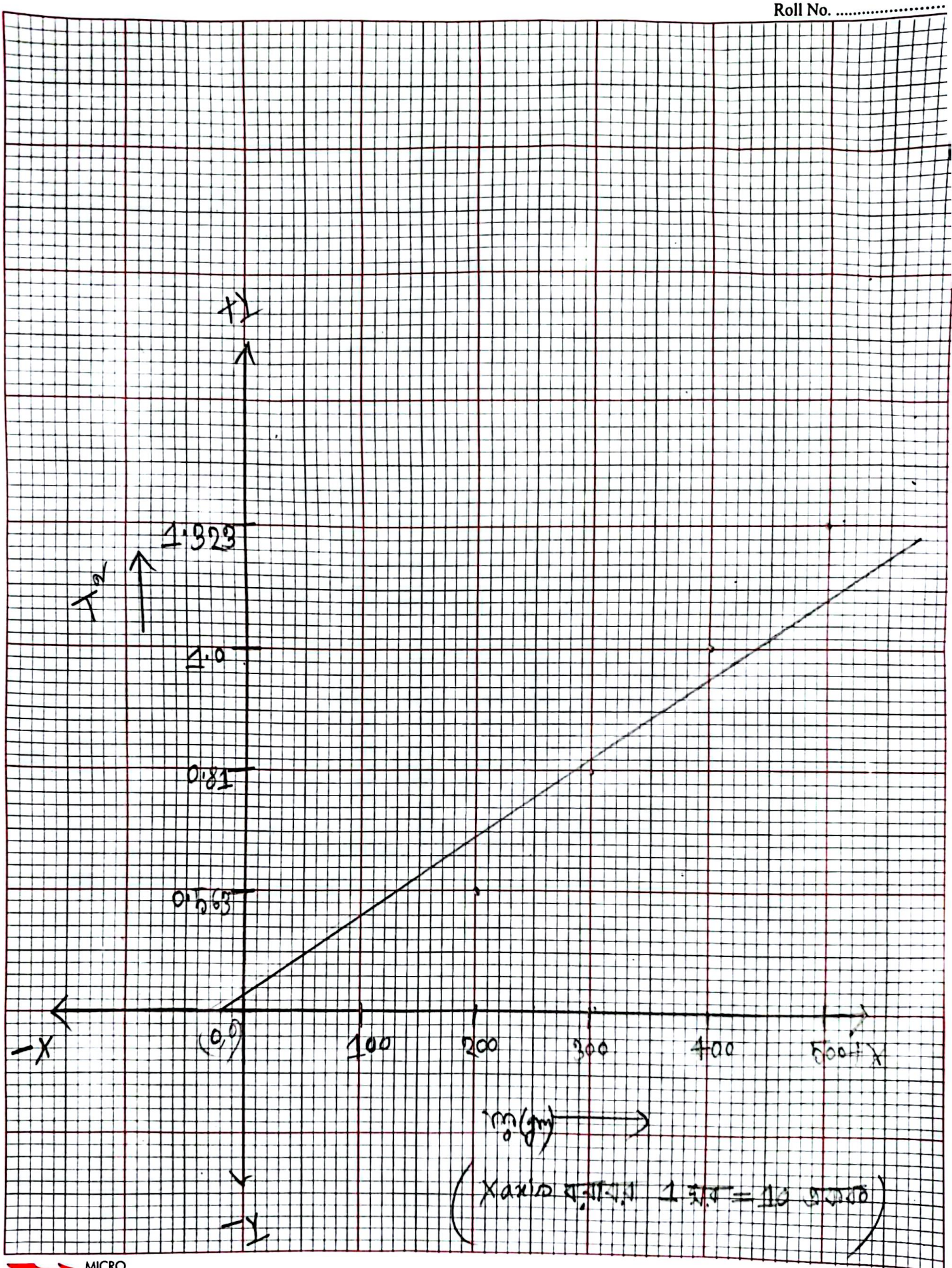
$l = 10\,cm = 0.1\,m$

Spring constant, $k = \frac{m_0 g}{l}$

$= \frac{0.2 \times 9.8}{0.1}\ Nm^{-1}$

$= 19.6\ Nm^{-1}$

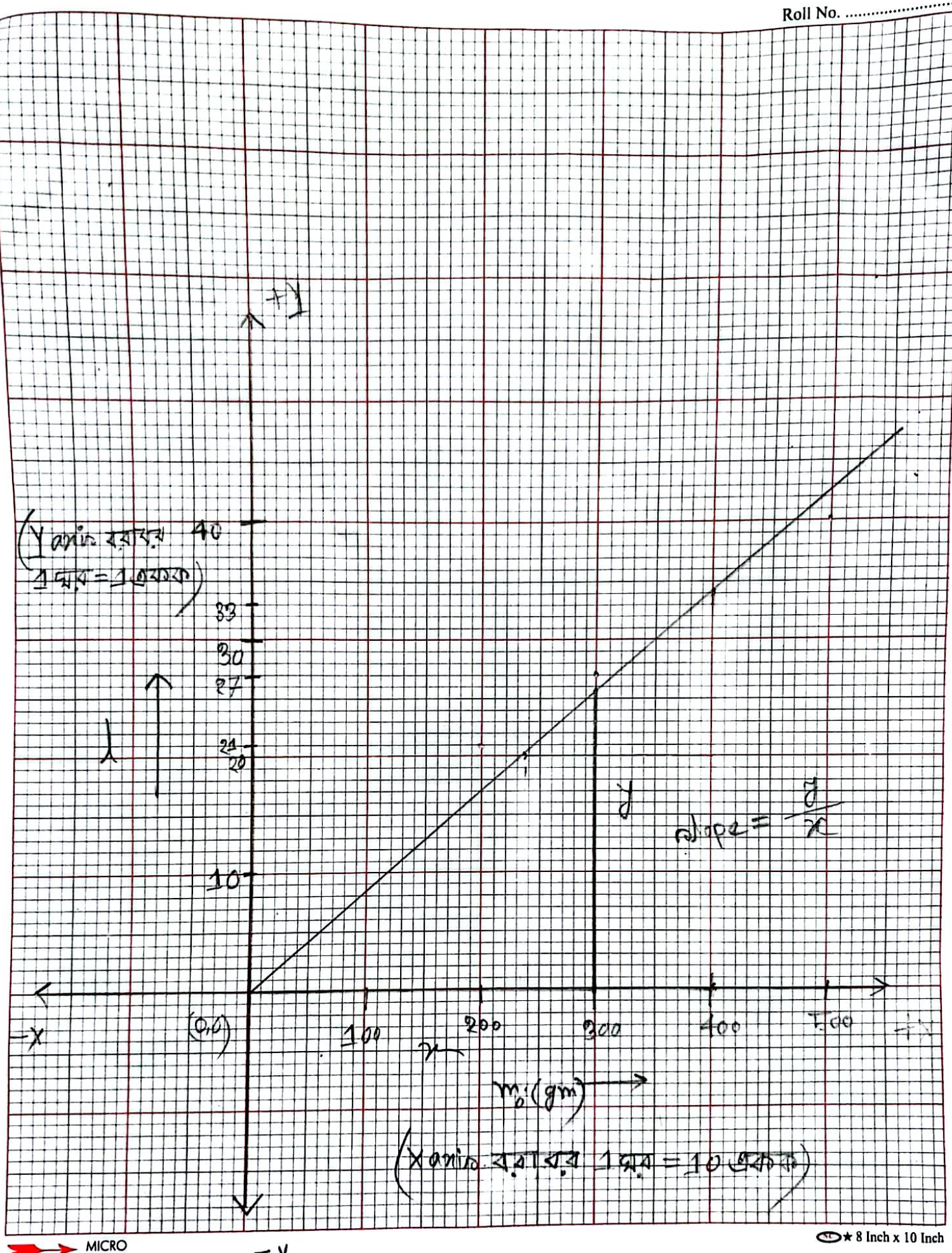
Roll No. .....



MICRO

★ 8 Inch x 10 Inch

Roll No. .....



MICRO

★ 8 Inch x 10 Inch