**PHYS 201L TORQUE**Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Partner(s):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

a. Center of gravity of a meter stick:

Mass of the knife-edge clamp = \_\_\_\_\_\_\_\_\_\_ Mass of the meter stick = \_\_\_\_\_\_\_\_\_\_

Location of the center of gravity (C.G) = \_\_\_\_\_\_\_\_ cm

b. DATA for Unknown Mass

Mass of the knife-edge clamp = \_\_\_\_\_\_\_\_ Mass of the meter stick =\_\_\_\_\_\_\_\_\_

Location of the center of gravity (C.G) = \_\_\_\_\_\_\_\_ cm

Location of the unknown mass          = \_\_\_\_\_\_\_\_\_ cm    \_\_\_\_\_\_\_\_\_cm    \_\_\_\_\_\_\_\_\_\_cm

Location of the known mass              = \_\_\_\_\_\_\_\_\_ cm    \_\_\_\_\_\_\_\_\_cm    \_\_\_\_\_\_\_\_\_\_cm

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Known mass, m(g) | Lever-arm for known mass, l (cm) | Lever-arm for unknown mass, L (cm) | Unknown mass, M (g) | Normal force at the support point  |
| 200 |  |  |  |  |
| 250 |  |  |  |  |
| 300 |  |  |  |  |
| Average of the unknown mass, M |  |  |
| Unknown mass measured using electronic balance |  |
| % difference |  |

c. Measuring the mass of a meter stick (M)

Now you need to move the support point away from the center of gravity (C.G). This way you get the rotation effect of M, mass of the meter stick. Draw a free-body diagram for the meter stick.




DATA for Mass of Meter Stick

Mass of the knife-edge clamp = \_\_\_\_\_\_\_\_

Mass of the meter stick =\_\_\_\_\_\_\_\_\_

Location of the center of gravity (C.G) = \_\_\_\_\_\_\_\_ cm.

Location of the support point               = \_\_\_\_\_\_\_\_ cm    \_\_\_\_\_\_\_\_\_\_cm    \_\_\_\_\_\_\_\_\_cm

Location of the known mass                = \_\_\_\_\_\_\_\_ cm    \_\_\_\_\_\_\_\_\_\_cm    \_\_\_\_\_\_\_\_\_cm

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Known mass, m (g) | Lever-arm for known mass, l (cm) | Lever-arm for mass of meter stick, L (cm) | Mass of meter stick, M (g) | Normal force at the support point  |
| 50 |  |  |  |  |
| 100 |  |  |  |  |
| 150 |  |  |  |  |
| Average of the mass of meter stick, M |  |  |
| Mass of meter stick measured using electronic balance |  |
| % difference |  |

d) Torques


Draw a free-body diagram for the meter stick and identify all the forces acting on it. Use masses as force.

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|  |

4. What is the normal force at the support point?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. Write an equation by balancing the torques about the support point.

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|  |

DATA for Torques (Include units):

    Experimental value of the location for the 100-g mass = \_\_\_\_\_\_\_\_\_\_\_

    Calculated value of the location for the 100-g mass    = \_\_\_\_\_\_\_\_\_\_\_

                                                    % Difference                = \_\_\_\_\_\_\_\_\_\_\_

    Counterclockwise torque about X0 = \_\_\_\_\_\_\_\_\_

    Clockwise torque about X0           = \_\_\_\_\_\_\_\_\_\_

                                    % difference = \_\_\_\_\_\_\_\_\_