Name: _____ BU ID: _____ Lab Section: _____
Partner's name: _____ BU ID: _____ Date: _____
TF's signature: _____

# PY105 Lab 2: Constant Acceleration Experiment - Report Sheet

**1.** Draw the free-body diagram of the cart (neglecting friction) (0.4 point) and that of the hanging mass (0.4 point). Derive equation (1) in the manual. (0.4 point)

| FBD of the cart (without friction): | FBD of the hanging mass: | Derive equation (1): |
|---|---|---|
| | | |

**2.** Friction is the resistive force a surface acts on an object when it is moving or trying to move on it. Therefore, its direction is always opposite to the direction or intended direction of the motion. Sketch the free-body diagram of the cart when it is moving to the right *with friction.* (0.3 point) Indicate the direction of *a*. (0.1 point) Hence, derive an expression for the acceleration, a, in terms of m, M, g, and the frictional force, f. (0.5 point)

| FBD of the cart (with friction): | Derive a in terms of m, M, g and f: |
|---|---|
| | |

**3.** What would be the direction of *a* for the cart (0.2 point) and the expression of *a* (0.2 point) if the cart is moving to the left still *with friction*?

**4.** As said in the manual, you can determine the value of acceleration in an experiment from the position-time, velocity-time or acceleration-time graph. Which graph do you think is the most reliable? Why? (0.2 point)

**5.** Fill the table bellow (0.2 points each, 4.8 points in total) for the case when you let go the cart so the hanging mass falls down and the other case when you give a quick push to the cart and so the hanging mass moves up.

| | M(kg) | m (kg) | Theoretical **a** ( N/kg) | Experimental **a** up (N/kg) | Experimental **a** down (N/kg) | Average a (N/kg) |
|---|---|---|---|---|---|---|
| Case 1 | | | | | | |
| Case 2 | | | | | | |
| Case 3 | | | | | | |
| Case 4 | | | | | | |

**6.** Compare the values of Experimental **a** obtained in both the "down" and "up" cases to the theoretical values. Do you notice any systematic differences? (0.1 point) If you do, what is the systematic difference in each case? (0.2 point) Do the values of Average **a** compare better to the theoretical values? (0.1 point) Why? (0.1 point)

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Pre-lab: _____ (10 ( 20% = 2 points)

Lab: _____ (10 ( 80% = 8 points)

- Punctuality (1 point) + Lab. performance (1 point): _____ (2 points)
- Report sheet _____ (8 points)

Total: _____

TF: _____ Grader: _____