Name: _____

Lab Quiz 03: Constant Acceleration

Answer each of the following questions using the information you collected during the lab. Please submit your completed quiz before you leave the lab. No papers will be accepted after the end of the lab period.

1. (1 point) Why does the graph of distance as a function of time appear linear?
   A) Because it is linear! $d = vt$ means the line has a slope equal to the constant velocity.
   B) Because we have only graphed a very small portion of the curve, which will be a quadratic ($d = v_o t + \frac{1}{2}at^2$).
   C) Because the LabQuest cannot graph anything other than a line.

2. (20 points) Complete the tables below with the measurements you have made, and the calculations you have performed.

Downhill	d vs t: Coefficient A	$a = 2A$ (m/s²)	a = Slope of v vs t (m/s²)	average a (m/s²)
Run 1				
Run 2				
Run 3				

Uphill	d vs t: Coefficient A	$a = 2A$ (m/s²)	a = Slope of v vs t (m/s²)	average a (m/s²)
Run 4				
Run 5				
Run 6				

3. (3 points) Calculate the **predicted acceleration**, $a = g\sin\theta$ using the ramp angle that you measured. Please show your work.

4. (3 points) Calculate the **% error** in your **average value** for the **downhill** experiment (Trials 1–3). Please show your work.

5. (1 points) Why is the acceleration for the **uphill** trials **negative**?
   A) It isn't. There is no such thing as negative acceleration!
   B) The cart is speeding up. Negative acceleration means increasing speed.
   C) The cart is slowing down. Negative acceleration means decreasing speed!

6. (1 points) What would a graph of **acceleration** (y-axis) vs **time** (x-axis) look like for your **downhill** data?
   A) Acceleration = constant would be a straight, horizontal line.
   B) Acceleration vs time would be a line with a positive slope.
   C) The graph would be a quadratic, like the position vs time graph.
   D) The graph would be a natural exponent, like last week's cooling curves.

7. (2 points) If you increased the ramp angle from 5° to 10°, what would happen to your **uphill** acceleration?
   A) Nothing. The magnitude of the acceleration would remain the same value, and the sign would still be negative.
   B) The magnitude of the acceleration would remain the same, but the sign would change, becoming positive.
   C) The magnitude of the acceleration would decrease to a smaller numeric value, but remain negative.
   D) The magnitude of the acceleration would increase to a larger numeric value, and remain negative.
   E) The magnitude of the acceleration would decrease to a smaller numeric value, and become positive.

8. (1 point) Why doesn't the **magnitude** (absolute value) of the acceleration uphill match the downhill acceleration? Shouldn't they be exactly the same?
   A) The downhill acceleration is much, much larger. As it should be. Any object that speeds up has a greater acceleration than any object which slows down!
   B) Same ramp, same angle, same magnitude. The rate at which the speed increases (downhill) is exactly the same as the rate at which the speed decreases (uphill). If they are different, your lab group must have done something wrong.
   C) The accelerations should have the same magnitude. If they don't, and it's not a procedural error, the data are telling you that your assumption is flawed.

9. (1 point) What is one possible reason for the difference in uphill and downhill acceleration values?
   A) If different people performed the experiment, they would automatically get different results.
   B) If there is friction, then the prediction $a = gsin\theta$ will not be accurate, since it assumes only gravity acts on the cart.
   C) The Lab Quest cannot be relied upon to perform accurate calculations, no matter which sensor is attached.

10. (2 points) Examine the **position vs. time graph** on the right. What is your best prediction for the shape of the velocity (y-axis) vs. time (x-axis) for this motion? (Hint: Check the velocity at a few different instants of time.)
    A) Horizontal line (slope = 0).
    B) Vertical line (slope = ∞).
    C) Line with a negative slope.
    D) Parabola curving up from zero.
    E) Parabola curving down from zero.
    F) Natural exponent, decreasing as time increases.