Name:

Physics 11 M. Lam

## Kinematics Review

Block:

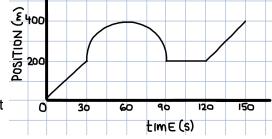
- 1. What is the difference between average velocity and instantaneous velocity?
- 2. What is the difference between velocity and speed?
- 3. What is the definition of acceleration?
- 4. A high-powered racing car accelerates from rest at a rate of 7.0 m/s<sup>2</sup>. How fast will it be moving after 10.0 s? Express your answer in m/s and km/h.
- 5. A child on a toboggan slides down a snowy hill, accelerating uniformly at 2.8 m/s². When the toboggan passes the first observer, it is travelling with a speed of 1.4 m/s. How fast will it be moving when it passes a second observer who is 2.5 m downhill from the first observer?
- 6. A space vehicle is orbiting the earth at a speed of 7.58 x 10<sup>3</sup> m/s. In preparation for a return to earth, it fires retro-rockets which provide an acceleration in the opposite direction of 78.4 m/s<sup>2</sup>. Ignoring any change in altitude that might occur, how long will it take the vehicle to slow down to 1.52 x 10<sup>3</sup> m/s?
- 7. A truck is moving along at 80 km/h when it hits a gravel patch, which causes it to accelerate in the opposite direction at 1.4 m/s². How far will the truck travel before it slows down to 20.0 km/h?
- 8. Avery, a frustrated physics student, drops a physics textbook off the top of the CN tower. If the tower is 5.3 x 10<sup>2</sup> m high, how long will the book take to reach the ground, assuming there is negligible air resistance?
- 9. If an electron inside a TV tube accelerates in a space of 5.0 cm from rest to 10.0% of the speed of light, what is its acceleration? (the speed of light is 3.00 x 108 m/s)
- 10. Snoopy is taking off in his World War I biplane. He coasts down the runway at a speed of 40.0 m/s, then accelerates for 5.2 s at a rate of 4.90 m/s². How fast is the plane moving after the 5.2 s?
- 11. A woman biker is driving along the highway at 80.0 km/h, in a 60 km/h speed zone. She sees a police car ahead, so she brakes so her bike accelerates in the opposite direction at 2.22 m/s². How far along the road will she travel before she is at the legal speed limit?
- 12. Spiderman is crawling up a building at a rate of 0.50 m/s. Seeing Spiderwoman 56 m ahead of him, he accelerates at a rate of 2.3 m/s<sup>2</sup>.
  - a) How fast will he be moving when he reaches Spiderwoman?
  - b) How much time will it take to reach Spiderwoman?
  - c) When he reaches Spiderwoman, Spiderman discovers that she is a Black Widow and, as you may know, Black Widows eat their mates! If he is 200.00 m from the road below, how long will it take him to fall to the safety of the road.

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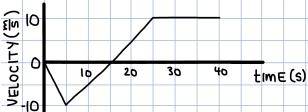
- 13. A stone is dropped from the top of a tall building. How long will the stone take to pass a window that is 2.0 m high if the top of the window is 20.0 m below the point from which the stone is dropped?
- 14. A car accelerates from rest at 6.00 m/s<sup>2</sup>. How far does it move between 10.0 s and 15.0 s?
- 15. A skier accelerates steadily down a hill from 3.50 m/s to 11.40 m/s in 4.20 s.
  - a) What is the average speed for the trip?
  - b) What distance is travelled?
- 16. An arrow shot straight up into the air at 50.0 m/s accelerates downward at 9.8 m/s² until it reaches a speed of zero at its peak. Draw a velocity vs. time graph of this motion.
- 17. A glider on an air track is made to accelerate uniformly by tilting the track at a slight angle. The distance travelled by the glider was measured at the end of each 0.10 s interval and the following data was gathered:

distance d (cm)	0	0.025	0.100	0.225	0.400	0.625
time t(s)	0	0.100	0.200	0.300	0.400	0.500

- a) Plot a graph with distance, *d*, on the y-axis and time, *t*, on the x-axis.
- b) Plot a second graph with d on the y-axis and  $t^2$  on the x-axis.
- c) Use the slope of your second graph to figure out the acceleration of the glider on the air track. (Hint: Write the equation of the line in y = mx + b form and compare it to the equation  $d = v_i t + \frac{1}{2}at^2$ .)
- 18. Use the following position vs. time graph to answer the following:
  - a) What is the total displacement of the car between 30 and 60 s?
  - b) When is the car moving in the positive direction?
  - c) What is the velocity of the car between 0 and
  - d) What is the instantaneous velocity of the car at 60 s?
  - e) What is the average speed of the car between 0 and 150 s?



- 19. Use the following velocity vs. time graph to answer the following:
  - a) When is the car moving in the positive direction?
  - b) When does the car have a positive acceleration?
  - c) Describe the motion of the car from 25 to 40 s
  - d) What is the total displacement of the car over the 40 s?



- e) What is the total distance travelled by the car over the 40 s?
- f) What is the average velocity of the car over the 40 s?