

AP Physics Summer Assignment 2009

The completed assignment is due the first AP physics class.

Please number the problems and label each part as a, b and so forth. You must show all work and it must be neat and easy to follow.

- 1) From the top of a building of height 30m, a mass is dropped, and at the same time from ground level, and directly beneath the dropped mass, another mass is thrown straight up with a speed of 15m/s. (a) How far apart will the masses be after 0.5s? (b) Will the masses ever meet or pass each other? If yes, will the meeting take place while both masses are falling, or when one is rising and the other is falling?
- 2) On a mass of 50kg, a force of 120N acts right and at an up angle of 30 degrees to the horizontal. If the coefficient of sliding friction is .1, what is the acceleration of the mass?
- 3) Consider a car making a turn at a constant speed. (a) Is the net force on the car zero? Please explain your answer. (b) Is the velocity of the car constant? Please explain your answer. (c) Is the car accelerating? Please explain your answer.
- 4) Sitting on a horizontal track is a mass of 10kg. One end of the track is raised until the mass just begins to slip. If the coefficient of static friction is .4, what is the minimum angle at which the mass begins to slip?
- 5) Two masses of 20 and 10kg are moving in the same direction and one directly behind the other. The 20-kg mass is behind and is moving at 10m/s, and the other is moving at 5m/s. The masses collide, and after the collision, the 20-kg mass moves at 6m/s, find the after-collision velocity of the 10-kg mass.
- 6) Moving at 20m/s, a remote controlled car of mass 1000kg hits a pile of sand and comes to rest in 10s. Find the average force that acted to stop the car. The same car now hits a wall and comes to rest in 1s. Find the average force that acted to stop car. Use knowledge gained from this problem to explain why airbags generally reduce injuries during automobile crashes.
- 7) At the instant a traffic light turns green, an automobile that has been waiting at an intersection accelerates at a constant rate of 2.00 m/s^2 . At the same instant, a truck, traveling with a constant speed of 18.0 m/s, overtakes the automobile. (a) How far beyond its starting point does the automobile overtake the truck? (b) How fast is the automobile traveling when it overtakes the truck?

- 8) On a 20-km bike ride, you rode the first 10km at an average speed of 10 km/h. What must your average speed be over the next 10km so that the average for the entire trip 20km is 15km/h?