Physics 513 Name:
Linear Motion Problem Set Date:

Constant/Average Velocity:

1.) A car is moving at 60 mi/hour for 0.40 hours. How far did the car travel?

2.) A plane travels from LA to New York (4800 km) in 5.0 hours. What was the average speed (in m/s) of the plane?

3.) A woman runs a 400 m race with an average speed of 6.5 m/sec. How long did the race take?

4.) A spacecraft travels 10 meters, 100 meters, 500 meters, and 4200 meters respectively during each of the first four seconds after launch. What is its average speed:

a) Over the first second?
b) Over the first two seconds?
c) Over the first three seconds?
d) Over the first four seconds?

5.) Chris Drury shoots a hockey puck into the goal at a speed of 34.8 m/s from a distance of 20.0 meters. How much time does the goalie have to react to the shot?

Uniform acceleration:

1.) A cart rolls down a 6.0 meter long incline. If the cart started from rest and has a velocity of 6.0 m/s at the bottom of the incline, what is its acceleration?

2.) A ball released from rest starts rolling down a ramp with an acceleration of 3 m/s^2. How fast is it moving after it has rolled 2 m?

3.) A race car can accelerate at 11 m/s^2. How long will it take this car to reach a speed of 55 meters per second if it starts from rest?

4.) How far will a car travel as it slows from a speed of 25 m/s to a stop at a rate of 3 m/s^2?

5.) A train traveling at 15 m/s east changes direction and, 10 seconds later, ends up traveling 30 m/s west. What is the acceleration of the train?

Freefall:

1.) A stone is dropped from a bridge and lands in the river 3.0 seconds later. How high above the water is the bridge? What is the stone's velocity the instant it strikes the water?

2.) An arrow is shot straight upwards with a velocity of 30 m/s. What maximum height will it reach? How long will it take to reach its maximum height?

3.) An object is dropped off a cliff. How long does it take the object to reach a speed of 98 m/s? How far does it fall in this amount of time?

4.) An astronaut drops a rock from rest on the Moon's surface. How far will the rock fall in 2.0 s? What is the rock's velocity after two seconds? (Acceleration due to gravity on the Moon is 1.6 m/s^2)

5.) An object is allowed to fall freely near the surface of a planet. The object falls 54 m in the first 3.0 s. What is the acceleration due to gravity on that planet? What is the object's velocity after 3s?

Vertical Projectiles:

1.) A golfer slices a ball, causing it to fly straight up into the air with a velocity of 8 m/s.

a) How long will it take to land?
b) What is the impact velocity?
c) Sketch a graph of d vs t for the whole trip.
d) Sketch a graph of v vs t for the whole trip.

2.) Matt stands on the edge of a cliff and shoots an arrow vertically into the sky at a velocity of 40 m/s. The arrow lands at the base of the cliff 15 seconds later.

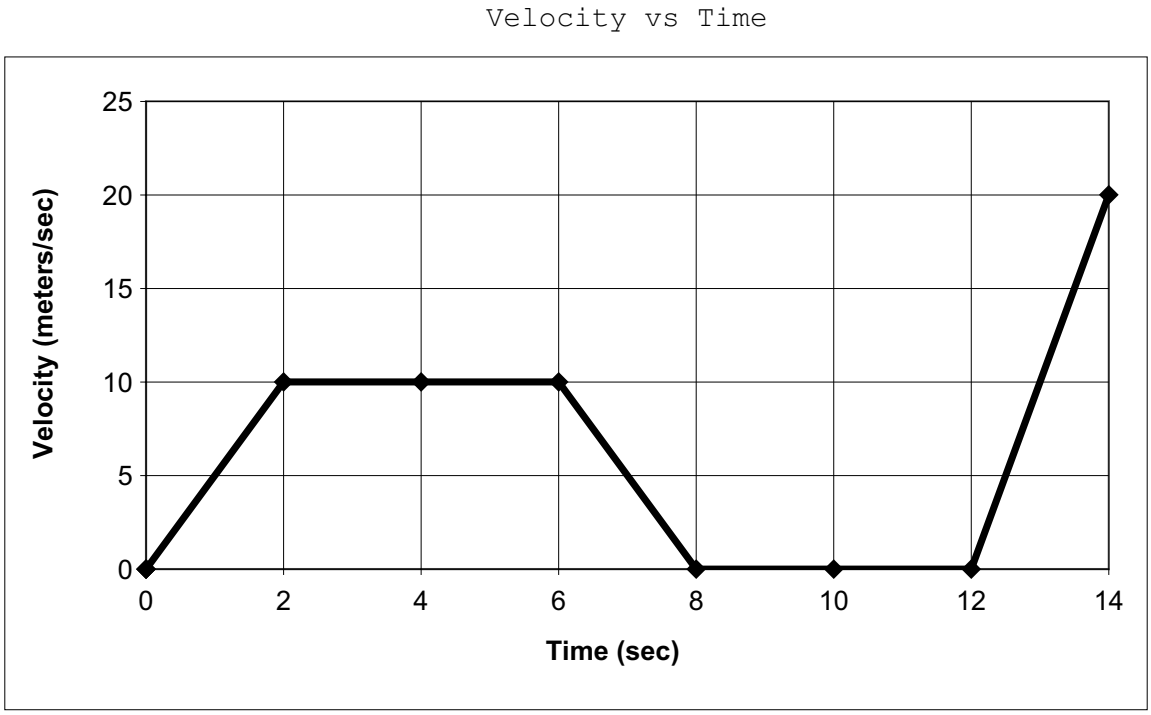
a) What is the height of the cliff?
b) What is the impact velocity?
c) Sketch a graph of d vs t for the whole trip.
d) Sketch a graph of v vs t for the whole trip.

3.) Jim tosses a ball straight up to Mike, who is in a window 15 meters higher than Jim. The ball is thrown at 20 m/s.

a) How long after the ball is thrown will Mike catch it?
b) How fast is the ball traveling just before Mike catches it?
c) Sketch a graph of d vs t for the whole trip.
d) Sketch a graph of v vs t for the whole trip.

Graphing:

The graph below describes the motion of a car during 14 seconds of travel. Answer the questions below by interpreting the graph. Interval A is from 0-2s, interval B is from 2-6s, interval C is from 6-8s, interval D is from 8-12s, interval E is from 12-14s.



1. Describe the motion of the car over each interval. Provide as much information as you can, giving a qualitative description.

2. Solve for the displacement of the car over each interval.

3. Solve for the acceleration of the car over each interval.

4. Create a sketch of a displacement vs time graph.

5. Create a sketch of an acceleration vs time graph.