

## Physics 112

### Assignment # 2 – Kinematics

Due Monday, Feb 24<sup>th</sup>, 2020

#### Multiple Choice

Do the multiple-choice questions on the [schoology.com](http://schoology.com) site.

#### Problems (Read the questions and be careful of directions and units)

1. Steve is in a car sitting at a stop light. When the light changes he accelerates west until he reaches a speed of 40m/s, which takes 12 seconds. a) What is the acceleration? b) How far did the car travel while accelerating?
2. Jennifer is an astronaut who has successfully landed on Mars. She is on a discovery mission and comes to the top of a small mountain. Based on her memory she remembers the magnitude of the acceleration of gravity on Mars is  $3.8\text{m/s}^2$ . She drops a rock and measures the time to hit the ground to be 2.5 seconds. a) How high is she? b) How fast is the rock going when it hits the ground? c) If she was on a mountain with same height on Earth, how fast would the rock be going?
3. A ball is thrown upward from the top of a building with an initial velocity of 36km/h. Determine a) how high the building is if it hits the ground at 72km/h. b) How long it takes to hit the ground.
4. Herman drives his four-wheeler from his house to his neighbor's house which is 10km away with an average velocity of 72km/h. He then turns around and drives home with an average speed of 90km/h but stops at the store which is 2km from his house a) How long did it take to drive to his neighbor's house? b) How long did it take to get from his neighbor's house to the store? b) What is his average velocity for the total trip to the store?
5. Sketch P-t and V-t graphs for the following situations:
  - a. Anna is headed west and is increasing her velocity
  - b. Bradford is heading at a constant velocity in a west direction
  - c. Caleb is travelling east at a constant velocity then slows to a stop
6. How fast would an electron be moving if it took 10 minutes to travel  $1.49 \times 10^{11}\text{m}$  at a constant velocity
7. Explain why the acceleration of gravity is negative. Does the acceleration of gravity slow objects down or cause them to speed up. Support your answer.

#### Practice Questions

1. Sally Jo throws a rock in the air. If it is 15 m high after 2.2 seconds, what initial velocity did she throw the ball at? (17.6m/s)
2. Steven falls during a downhill skiing competition. If he slides for 46 meters while decelerating at a rate of  $1.15\text{m/s}^2$  before coming to a stop, what was his initial velocity? (10.29m/s)
3. Abigail drives her car east for 3 hours. If she is 258 km away when she stops what is her average velocity? If she drives back 200km to the west for 2 hours what is her average velocity for the trip? (86km/h, 11.6km/h)
4. An astronaut drops a ball from a height of 2.4 m above the surface of the moon. If the acceleration of gravity on the moon is  $1.62 \text{m/s}^2$  how long does it take the ball to hit the surface? How fast is it going just before it hits the surface? (1.72s, -2.79m/s)
5. How fast would an electron be moving if it took 10 minutes to travel  $1.49 \times 10^{11}\text{m}$  at a constant velocity? ( $2.48 \times 10^8\text{m/s}$ )
6. Suppose you are driving along a highway at a speed of 90km/h and your brakes can slow you down at a rate of  $4.50 \text{m/s}^2$ . Down the road 80m there is a tree across the road. Will you get stopped in time? State how much room there is to spare or how fast you are going when you get there. (10.56m to spare)
7. Ophelia throws a ball upward with a velocity of 10m/s from the top of her school. The top of the school is 12m high and she releases it 1m above the height of the roof. a) What is the final velocity of the ball? b) How long would it take to hit the ground? (-18.84m/s, 2.94s)

8. Richard Rawlings from the Discovery Channel show "Fast and Loud" and his partner Dennis Collins set a record for the fastest drive across America by travelling from New York to Los Angeles in 32 hours and 59 minutes. a) If the displacement is 3940km determine the average velocity for the trip. b) The road distance was calculated at 2811 miles. Determine the average speed. c) Why is one faster than the other? (119.45km/h, 136.36km/h)
9. A firework is shot straight into the air with an initial velocity of 50m/s. What is the approximate maximum height it reaches? (**125m**)
10. A company called Late Model Racecraft have built a twin-turbo Chevy Camaro to run the standing mile. They are testing their car and achieve a speed of 246.4mph in the standing mile (see video form more info). Based on this information determine their average acceleration. Check the link if you are wondering what it looks like : <http://www.lsxtv.com/news/video-lmr-camaro-hits-246-mph-at-texas-mile-then-catches-fire/> (**3.75m/s<sup>2</sup>**)