**EXAM REVIEW PART I: LINEAR MOTION**

Answer questions on a separate sheet of paper. Save both this paper and your answers so you can quiz yourself as you prepare for the exam

IMPORTANT VOCABULARY: vector, scalar, magnitude, position, distance, displacement, speed, velocity, acceleration

1. Explain what is meant by a scalar quantity and give some examples.
    Has magnitude but no direction, ex. Mass, distance, speed, density, temperature, energy, power
2. Explain what is meant by a vector quantity and give some examples.
    Has a magnitude and a direction, ex. Displacement, velocity, acceleration, force, momentum
3. How long does it take to hear a thunderclap 6.8 km away if the sound wave moves at 340 m/s?
    20 seconds
4. It takes a pulse of light 35 microseconds to travel down a 5.0 km length of fiber optic cable. How fast does the light move through the cable?
    1.43 x 10⁸ m/s
5. What is the difference between distance and displacement? When is the magnitude of the displacement equal to the distance traveled?

6. A car drives 22 miles north then drives 14 miles south. What is its displacement?
    8 miles north
7. A raven flies south for 120 seconds at a speed of 12 m/s, then flies 0.56 km north in 80 seconds.
    - What is the total distance?   *2.0 km*
    - What is the total displacement?   *0.88 km south*
    - What is the average speed?   *10 m/s*
    - What is the average velocity?   *4.4 m/s sourth*

8. What is the acceleration of an object that steadily increases its speed from 6.0 m/s to 18.0 m/s over a 2.0 second time interval without changing direction?   *6.0 m/s²*

9. What is the acceleration of an object that maintains a steady speed of 24.0 m/s for 6.0 seconds without changing direction?   *0.0 m/s²*

10. A car that is initially moving at 22 m/s hits the brakes and stops in 5.0 seconds. What is the acceleration?   *-4.4 m/s²*

11. An airplane that is initially moving at 320 m/s accelerates at 3.0 m/s² for 20.0 seconds. How far does it move during that time period and what is its final velocity?   *7.0 km, 380 m/s*

12. How long does it take a rock to reach a speed of 24.5 m/s if you drop it from a very tall cliff? *2.5 s*

13. A baseball is thrown straight upward at a speed of 17 m/s.
    - How high does it go above the spot from which it was thrown? *14.7 m*
    - What are its position, velocity, and acceleration 2.3 seconds after being thrown? *13.2 m, -5.5 m/s, -9.8 m/s²*

14. The graph below shows the position of an object that is moving along a straight line that runs north-south with north being the positive direction.

Position (meters) vs Time (seconds)

- How far does the object move during the first 3 seconds?   *12 m*
- How fast is the object moving at t=1.0 second? *4 m/s*
- What is the velocity at t=1, 4, and 7 seconds? *4 m/s, 0 m/s, -2 m/s*
- What is the acceleration at t=7 seconds? *0 m/s²*
- What is the total displacement? *6 m*
- What is the average velocity? *0.75 m/s*
- Sketch a velocity time graph that shows the same motion.
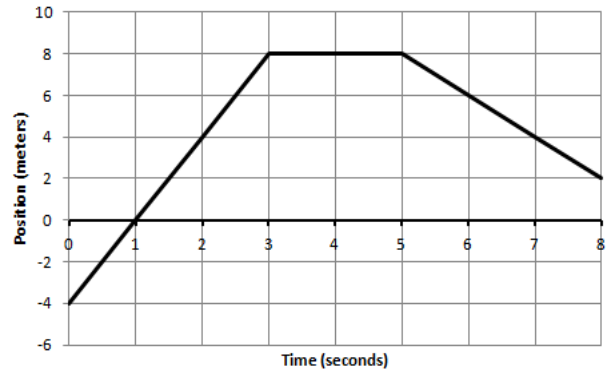
15. The graph below shows the velocity of an object that is moving along a straight line that runs east-west with east being the positive direction.

Velocity (m/s) vs Time (seconds)

- How far does the object move during the first 2 seconds? *24 m*
- How fast is the object moving at t=4 seconds? *8 m/s*
- What is the acceleration at t=1, 4 and 9 seconds? *0 m/s², -2m/s², 4m/s²*
- Which direction is the object moving from 2 to 4 seconds? *east*
- What is the total displacement of the object during the entire 10 seconds? *24+20+12+8+20=84 m*
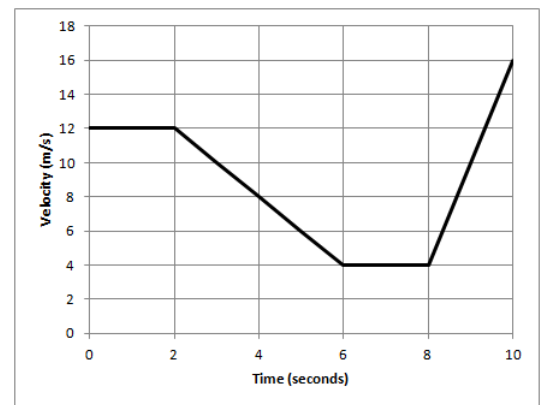
16. Write a song, rap, poem, or short short story that vividly and creatively describes either vector and scalar quantities OR velocity and acceleration.
    - First, write down all the information must you need to include in order to effectively explain the terms and how they are related.
    - Next, brainstorm ways to make the definitions come alive. You may want specific examples, imagery, emotional connections, …?)
    - Finally, let your inner artist get to know your inner physicist and compose your masterpiece.