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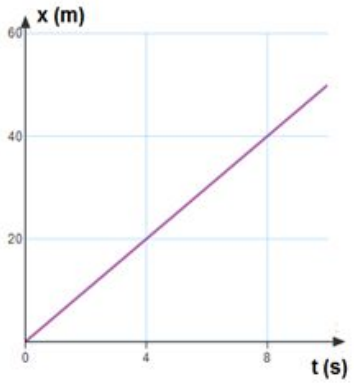
AP PHYSICS: SEMESTER 1 FINAL REVIEW

Multiple Choice Questions

UNIT 2: One Dimensional Kinematics with Constant Velocity

1. Define and explain speed and velocity.

The following graph represents the position as a function of time for a moving object. Use this graph to answer questions #2-4.



2. What is the velocity of the object?
3. Write an equation that represents the motion of the object?
4. Use the graph to estimate the displacement of the object after moving for a minute.
5. On graduation day you leave for the Metra 30.0 minutes before the ceremony is to begin, which should be plenty of time since the Metra is only 10.0 miles away. On the way, however, you have to make an unanticipated stop for construction work on the road. As a result, your average speed for the first 15 minutes is only 5.0 mi/h. What average speed do you need for the rest of the trip to get you to the Metra on time?

UNIT 3: One Dimensional Kinematics with Constant Acceleration

1. Define and explain acceleration.
2. Identify the difference between positive and negative acceleration.
3. If a rocket is initially at rest and accelerates at a rate of 50 m/s^2 for one minute, then what is its final speed?
4. It takes 6 seconds for a stone to fall to the bottom of a mine shaft. How deep is the shaft?

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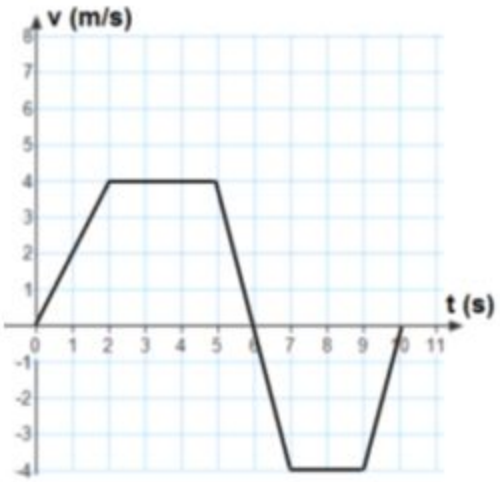
The graph below describes the relationship between velocity and time for a moving object.



5. Use the graph to identify the velocity, acceleration, and displacement of the object.

UNIT 4: Vectors

1. Identify and explain the difference between scalars and vectors.
2. A vector has components $\mathbf{A}_x$ = 12 m and $\mathbf{A}_y$ = 5.0 m. What is the magnitude and direction of vector **A**?
3. A displacement vector of 20 m is directed at 30 degrees above the positive x-axis. Draw the vector and find its components.
4. A plane is headed eastward at a speed of 156 m/s. A 20.0 m/s wind is blowing southward at the same time as the plane is flying. What is the velocity of the plane relative to the ground?
5. Vector **A** = 8.0 m and points 30° north of east, vector **B** = 6.0 m and points 30° west of north, and vector **C** = 5.0 m and points 30° west of south. What is the magnitude and direction of the resultant vector **R = A**+**B**+**C**?

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UNIT 5: Two Dimensional Kinematics and Projectile Motion

1. A cannonball is fired horizontally from the top of a cliff. At the same instant that the cannon fires, another cannonball is dropped straight down from the same height. Explain which cannonball will land first?
2. A hockey puck slides off the edge of a table with an initial velocity of 20.0 m/s. The height of the table above the ground is 2.00 m. How far from the edge of the table, measured along the floor, does the puck hit the floor?
3. A toy car runs off the edge of a table that is 1.225 m high. The car lands 0.400 m from the base of the table. How fast is the car traveling when it strikes the ground?
4. A boy kicks a football from ground level with an initial velocity of 20 m/s at an angle of 60° above the horizontal. What is the horizontal distance to the point where the football hits the ground?
5. A projectile is shot from the edge of a vertical cliff 60.0 m above the ocean. It has a speed of 100 m/s and is fired at an angle of 35.0° above the horizontal. How far from the foot of the vertical cliff does the projectile hit the water?

UNIT 6: Newton's Laws of Motion

1. Define Newton's three laws of motion and give examples of each.
2. A physics class is split into two teams for a competitive game of tug-of-war. There is a scale to measure force in the middle of the tug-of-war rope. One team pulls with 400 N of force and the other team also pulls with 400 N of force. What is the reading on the scale in the middle of the rope? Explain.
3. A force of 120 N is applied to an object whose mass is 30 kg. What is the object's acceleration.
4. A 40.0-kg crate is being raised by means of a rope. Its upward acceleration is 2.00 m/s^2. What is the force exerted by the rope on the crate?
5. A 3.0-kg and a 5.0-kg box rest side-by-side on a smooth, level floor. A horizontal force of 32 N is applied to the 3.0-kg box pushing it against the 5.0-kg box, and, as a result, both boxes slide along the floor. How large is the contact force between the two boxes?

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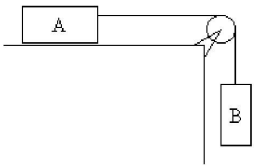
UNIT 7: Dynamics

1. Define and explain normal, friction, tension, and spring forces.
2. A spring stretches 14 cm when an object weighing 28 N is hung from it. What is the spring constant?
3. Block A has a mass of 3.00 kg and rests on a smooth table and is connected to block B, which has a mass of 2.00 kg, after passing over an ideal pulley, as shown. Block B is released from rest. What is the acceleration of the masses?



4. In a game of shuffleboard (played on a horizontal surface), a puck is given an initial speed of 6.0 m/s. It slides a distance of 4.6 m before coming rest. What is the coefficient of kinetic friction between the puck and the surface?
5. A 2.00-kg mass and a 6.00-kg mass hang vertically at the ends of a rope that goes over an ideal pulley. If the masses are released, what is the resulting tension in the rope?

UNIT 8: Circular Motion and Gravitation

1. Define and explain centripetal acceleration and centripetal force.
2. Define and explain Newton's Law of Universal Gravitation.
3. A 2-kg ball is moving with a constant speed of 5 m/s in a horizontal circle whose radius is 50 cm. What is the magnitude of the net force on the ball?
4. At their closest approach, Venus and Earth are 4.20×10^{10} m apart. The mass of Venus is 4.87×10^{24} kg, the mass of Earth is 5.98×10^{24} kg, and $G = 6.67 \times 10^{-11}$ N□m^2/kg^2. What is the force exerted by Venus on Earth at that point?
5. Jupiter completes one revolution about its own axis every 9.92 hours. What is the radius of the orbit required for a satellite to revolve about Jupiter with the same period? Jupiter has a mass of 1.90×10^{27} kg and $G = 6.67 \times 10^{-11}$ N•m^2/kg^2.