UNIT VI TEST (v2) : MODELS FOR 2-D MOTION

For all questions on this test assume air resistance and friction to be negligible forces unless otherwise specified.

__ 1. If a freely falling object were somehow equipped with a speedometer, its speed would increase each second by about
   a. 2 m/s.
   b. 5 m/s.
   c. 10. m/s.
   d. a variable amount.
   e. It depends on its initial speed.

__ 2. If a freely falling object were somehow equipped with an odometer to measure the distance it travels, then the distance it travels each succeeding second would be
   a. less than the previous second.
   b. greater than the previous second.
   c. the same.
   d. The distance cannot be predicted.

__ 3. A projectile is launched straight upwards at 45 m/s. Three seconds later, its velocity is
   a. 75 m/s
   b. 30 m/s
   c. 15 m/s
   d. zero

__ 4. Starting from rest, a freely-falling object will fall in 10. seconds, a distance of about
   a. 10. m.
   b. 100. m.
   c. 500. m.
   d. 1000. m.
   e. more than 1000.m.

__ 5. A projectile is fired straight up at a speed of 200. m/s. When the projectile returns to its starting position, its speed is
   a. more than 200. m/s.
   b. less than 200. m/s.
   c. 200. m/s.
   d. It depends on how long it takes to return.

__ 6. When a rock thrown straight upward gets to the exact top of its path, the magnitude of its
   a. velocity is zero and its acceleration is zero.
   b. velocity is about 10 m/s and its acceleration is zero.
   c. velocity is zero and its acceleration is about 10 m/s².
   d. velocity is about 10 m/s and its acceleration is about 10 m/s².
Questions 7 and 8 refer to the situation and diagram described below.

Two spheres of equal mass, A and B, are projected off the edge of a 1.0 m bench. Sphere A has a horizontal velocity of 10 m/s and sphere B has a horizontal velocity of 5 m/s.

__ 7. If both spheres leave the edge of the table at the same instant, sphere A will land
   a. at some time after sphere B.
   b. at the same time as sphere B.
   c. at some time before sphere B.
   d. There is not enough information to decide.

__ 8. If both spheres leave the edge of the table at the same instant, sphere A hits the floor at the spot marked X. Sphere B will hit the floor
   a. at some point between the edge of the table and X.
   b. at some point past X.
   c. at the same distance from the table as X.
   d. there is not enough information to decide.

Questions 9 & 10 refer to the diagram and situation below:

Two spheres A & B are projected off the edge of a 1.0 m high table with the same horizontal velocity. Sphere A has a mass of 20. g and sphere B has a mass of 10. g.

__ 9. If both spheres leave the edge of the table at the same instant, sphere A will land
   a. at some time after sphere B.
   b. at the same time as sphere B.
   c. at some time before sphere B.
   d. There is not enough information to decide.

__ 10. If both spheres leave the edge of the table at the same instant, sphere A hits the floor at the spot marked X. Sphere B will hit the floor
   a. at some point between the edge of the table and X.
   b. at some point past X.
   c. at the same distance from the table as X.
   d. There is not enough information to decide.
Questions 11 & 12 refer to the diagram and situation described below:

Two spheres A and B, where A has twice the mass of B, are projected at the same horizontal velocity off the edge of two different height shelves. Sphere A leaves from a height of 2.0 m. Sphere B leaves a shelf 1.0 m off the floor.

11. If both spheres leave the edge of the table at the same instant, sphere A will land
   a. at some time after sphere B.
   b. at the same time as sphere B.
   c. at some time before sphere B.
   d. There is not enough information to decide.

12. If both spheres leave the edge of the table at the same instant, sphere A hits the floor at the spot marked X. Sphere B will hit the floor
   a. at some point between the edge of the table and X.
   b. at some point past X.
   c. at the same distance from the table as X.
   d. There is not enough information to decide.

Questions 13 & 14 refer to the situation and diagram below:

Sphere A is projected off the edge of a 1.0 m high bench with a horizontal velocity of 5.0 m/s. Sphere B is dropped from the same height as Sphere A. Both spheres have the same size and mass.

13. If sphere A leaves the edge of the table at the same instant sphere B is dropped, sphere A will land
   a. at some time after sphere B.
   b. at the same time as sphere B.
   c. at some time before sphere B.
   d. There is not enough information to decide.

14. Sphere A's vertical speed at the point of impact is
   a. less than that of sphere B.
   b. the same as that of sphere B.
   c. greater than that of sphere B.
   d. There is not enough information to decide.
15. A truck is moving at constant speed. Inside the storage compartment, a rock is dropped from the midpoint of the ceiling and strikes the floor below. The rock hits the floor

   a. ahead of the midpoint of the ceiling.
   b. exactly below the midpoint of the ceiling.
   c. behind the midpoint of the ceiling.
   d. More information is needed to answer the question.

16. Suppose you roll a bowling ball at 2.5 m/s across the roof of a flat building. It leaves the edge and strikes the ground 2.0 s later.
   a. How high was the roof?
   b. How far from the edge of the roof does the ball hit the ground?

17. A ball player wishes to determine her pitching speed by throwing a ball horizontally from an elevation of 3.0 m above the ground. She sees the ball land 15 m down range.
   a. Draw a diagram of the situation indicating distances and the path of the ball.
   b. Determine the speed of the ball as it leaves her hand.

18. A diver leaps up and out off the edge of a cliff with an initial velocity of 8.0 m/s at a 30° angle from the horizontal. The cliff is 12 m above the water
   a. Determine the x and y components of the jumper's initial velocity.
   b. Determine how long the diver is in the air.
   c. How far from the base of the cliff did the diver hit the water?