Physics Problem Set 4 - Week 4 (5668480)

Question 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

1. Question Details OSColPhys1 3.5.053.mod [2908532]

A seagull flies at a velocity of 10.00 m/s straight into the wind.

(a) If it takes the bird 17.0 min to travel 6.00 km relative to the earth, what is the velocity of the wind?
[ ] -4.12 m/s

(b) If the bird turns around and flies with the wind, how long will he take to return 6.00 km?
[ ] 425 s

2. Question Details OSColPhys1 3.P.032.WA. mod [2908513]

A computer model displays the motion of a particle on a coordinate system in real time. At time t = 0, the particle is at the origin of the coordinate system and has velocity components v_x = 0 and v_y = 5.2 m/s. The particle has acceleration components of $a_x = -4.8$ m/s^2 and a_y = 0.

(a) What are the velocity components of the particle at t = 5.0 s?
v_x = [ ] -24 m/s
v_y = [ ] 5.2 m/s

(b) What are the x and y positions of the particle at t = 5.0 s?
x = [ ] -60 m
y = [ ] 26 m

3. Question Details OSColPhys1 3.P.033.WA.mod [2908530]

A satellite in outer space is moving at a constant velocity of 21.4 m/s in the $+y$ direction when one of its onboard thruster turns on, causing an acceleration of 0.350 m/s^2 in the $+x$ direction. The acceleration lasts for 41.0 s, at which point the thruster turns off.

What is the magnitude of the satellite's velocity when the thruster turns off?
[ ] 25.8 m/s

4. Question Details OSColPhys1 3.P.034.WA.mod [2908527]

A spacecraft on its way to Mars has small rocket engines mounted on its hull; one on its left surface and one on its back surface. At a certain time, both engines turn on. The one on the left gives the spacecraft an acceleration component in the x direction of a_x = 5.10 m/s^2, while the one on the back gives an acceleration component in the y direction of a_y = 7.30 m/s^2. The engines turn off after firing for 635 s, at which point the spacecraft has velocity components of v_x = 3720 m/s and v_y = 4462 m/s. What was the magnitude of the spacecraft's initial velocity, before the engines were turned on?
magnitude [ ] 512 m/s

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5. Question Details OSColPhys1 3.P.044.WA. [2439404]

A seagull flying horizontally over the ocean at a constant speed of 3.10 m/s carries a small fish in its mouth. It accidentally lets go of the fish, and 2.50 s after letting go the fish lands in the ocean.

(a) Just before reaching the ocean, what is the horizontal component of the fish's velocity? Ignore air resistance. Assume the bird is initially traveling in the positive x direction. (Indicate the direction with the sign of your answer.)
[ ] 3.1 m/s

(b) Just before reaching the ocean, what is the vertical component of the fish's velocity? Ignore air resistance. Assume upward is the positive y direction and downward is the negative y direction. (Indicate the direction with the sign of your answer.)
[ ] -24.5 m/s

(c) If the seagull's initial speed were increased, which of the following regarding the fish's velocity upon reaching the ocean would be true? (Select all that apply.)
- [ ] The horizontal component of the fish's velocity would increase.
- [ ] The horizontal component of the fish's velocity would decrease.
- [ ] The horizontal component of the fish's velocity would stay the same.
- [ ] The vertical component of the fish's velocity would increase.
- [ ] The vertical component of the fish's velocity would decrease.
- [ ] The vertical component of the fish's velocity would stay the same.

Supporting Materials

Physical Constants

6. Question Details OSColPhys1 3.P.038.WA.mod [2908535]

A cargo plane is moving with a constant horizontal velocity of v_x = +219 m/s at a height of y = 870 m above level ground when it releases a package. Ignoring air resistance, how much time will it take the package to reach the ground? Note that at the instant of release, the package has the exact same speed and direction as the plane, though after release, the plane maintains its constant horizontal velocity but the package now has constant acceleration due to gravity. (Express your answer to the nearest tenth of a second.)
[ ] 13.3 s

7. Question Details OSColPhys1 3.P.041.WA. mod [2908516]

While standing on the roof of a building, a child tosses a tennis ball with an initial speed of 16 m/s at an angle of 30° below the horizontal. The initial x-component of the ball's velocity is 13.9 m/s and its initial y-component of velocity is -8.00 m/s. The ball lands on the ground 3.3 s later. How tall is the building?
[ ] 79.8 m

8. Question Details OSColPhys1 3.P.040.WA. [2439407]

An Olympic diver is on a diving platform 3.60 m above the water. To start her dive, she runs off of the platform with a speed of 1.22 m/s in the horizontal direction. What is the diver's speed just before she enters the water?

[ ] 8.49 m/s

Supporting Materials

Physical Constants

9. Question Details OSColPhys1 3.P.037.WA. mod [2908515]

A football is kicked from ground level with an initial velocity of 24.0 m/s at angle of 32.5° above the horizontal. The initial x-component of the velocity is 20.2 m/s and the initial y-component of the velocity is 12.9 m/s. How long is the football in the air before it hits the ground? Ignore air resistance.

[ ] 2.63 s

10. Question Details OSColPhys1 3.P.039.WA. [2439396]

A baseball pitcher throws a ball horizontally at a speed of 42.6 m/s. A catcher is 18.6 m away from the pitcher. Find the magnitude of the vertical distance that the ball drops as it moves from the pitcher to the catcher. Ignore air resistance.

[ ] 0.934 m

Supporting Materials

Physical Constants

11. Question Details OSColPhys1 3.P.042.WA. [2439433]

A tennis player serves a tennis ball such that it is moving horizontally when it leaves the racquet. When the ball travels a horizontal distance of 12 m, it has dropped 51 cm from its original height when it left the racquet. What was the initial speed of the tennis ball? (Neglect air resistance.)

[ ] 37.2 m/s

Supporting Materials

Physical Constants

12. Question Details OSColPhys1 3.P.043.WA. [2439414]

The acceleration due to gravity at the surface of a planet depends on the planet's mass and size; therefore other planets will have accelerations due to gravity different from 9.8 m/s^2. Imagine an astronaut stands on an alien planet, which has no atmosphere, and throws a rock with a speed of 6.95 m/s in the horizontal direction, releasing it at a height of 1.40 m above the surface of the planet. The rock hits the surface a horizontal distance of 8.00 m from the astronaut. Find the magnitude of the acceleration due to gravity on this alien planet.

[ ] 2.11 m/s^2

Supporting Materials

Physical Constants

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13. Question Details OSColPhys1 3.4.046. [2153215]

A basketball player is running at 5.40 m/s directly toward the basket when he jumps into the air to dunk the ball. He maintains his horizontal velocity.

(a) What vertical velocity does he need to rise 0.850 meters above the floor?

[ ] 4.08 m/s

(b) How far from the basket (measured in the horizontal direction) must he start his jump to reach his maximum height at the same time as he reaches the basket?

[ ] 2.25 m

14. Question Details OSColPhys1 3.P.053.WA.mod [2908520]

A stunt pilot is attempting to drop a water balloon from a moving airplane onto a target on the ground. The plane moves at a speed of 76.6 m/s and a 43° above the horizontal when the balloon is released; the x-component of its initial velocity is 56.0 m/s and the y-component is 52.2 m/s. At the point of release, the plane is at an altitude of 800 m.

How far horizontally, measured from a point directly below the plane's initial position, will the balloon travel before striking the ground? Neglect air resistance.

[ ] 1070 m

15. Question Details OSColPhys1 3.P.036.Tutorial.WA.mod [2908519]

A child on top of a roof of a building kick a soccer ball. The soccer ball is kicked at 37° from the edge of the building with an initial velocity of 21 m/s. The ball's initial velocity components are 16.8 m/s in the horizontal direction and 12.6 m/s in the vertical direction. The ball lands 55 meters away from the edge of the building. How tall is the building that the child is standing on?

[ ] 11.3 m