

### 5.3 Projectile Motion

8. Horizontal and vertical motions of a projectile are independent of each other. What is meant by this?
- Any object in projectile motion falls at the same rate as an object in freefall, regardless of its horizontal velocity.
  - All objects in projectile motion fall at different rates, regardless of their initial horizontal velocities.
  - Any object in projectile motion falls at the same rate as its initial vertical velocity, regardless of its initial horizontal velocity.
  - All objects in projectile motion fall at different rates and the rate of fall of the object is independent of the initial velocity.
9. Using the conventional choice for positive and negative axes described in the text, what is the y-component of the acceleration of an object experiencing projectile motion?
- $-9.8 \text{ m/s}$
  - $-9.8 \text{ m/s}^2$
  - $9.8 \text{ m/s}$
  - $9.8 \text{ m/s}^2$
19. Two identical items, object 1 and object 2, are dropped from the top of a 50.0 m building. Object 1 is dropped with an initial velocity of 0 m/s, while object 2 is thrown straight downward with an initial velocity of 13.0 m/s. What is the difference in time, in seconds rounded to the nearest tenth, between when the two objects hit the ground?
- Object 1 will hit the ground 3.2 s after object 2.
  - Object 1 will hit the ground 2.1 s after object 2.
  - Object 1 will hit the ground at the same time as object 2.
  - Object 1 will hit the ground 1.1 s after object 2.
20. An object is launched into the air. If the y-component of its acceleration is  $9.8 \text{ m/s}^2$ , which direction is defined as positive?
- Vertically upward in the coordinate system
  - Vertically downward in the coordinate system
  - Horizontally to the right side of the coordinate system
  - Horizontally to the left side of the coordinate system
29. A water balloon cannon is fired at 30 m/s at an angle of  $50^\circ$  above the horizontal. How far away will it fall?
- 2.35 m
  - 3.01 m
  - 70.35 m
  - 90.44 m
30. A person wants to fire a water balloon cannon such that it hits a target 100 m away. If the cannon can only be launched at  $45^\circ$  above the horizontal, what should be the initial speed at which it is launched?
- 31.3 m/s
  - 37.2 m/s
  - 980.0 m/s
  - 1,385.9 m/s
43. After a projectile is launched in the air, in which direction does it experience constant, non-zero acceleration, ignoring air resistance?
- The x direction
  - The y direction
  - Both the x and y directions
  - Neither direction
44. Which is true when the height of a projectile is at its maximum?
- $v_y = 0$
  - $v_y = \text{maximum}$
  - $v_x = \text{maximum}$
45. A ball is thrown in the air at an angle of  $40^\circ$ . If the maximum height it reaches is 10 m, what must be its initial speed?
- 17.46 m/s
  - 21.78 m/s
  - 304.92 m/s
  - 474.37 m/s
46. A large rock is ejected from a volcano with a speed of 30 m/s and at an angle  $60^\circ$  above the horizontal. The rock strikes the side of the volcano at an altitude of 10.0 m lower than its starting point. Calculate the horizontal displacement of the rock.
- 84.90 m
  - 96.59 m
  - 169.80 m
  - 193.20 m

66. How can you express the velocity,  $\vec{v}$ , of a projectile in terms of its initial velocity,  $\vec{v}_0$ , acceleration,  $\vec{a}$ , and time,  $t$ ?
- $v = \vec{a}t$
  - $\vec{v} = \vec{v}_0 + \vec{a}t$
  - $\vec{v} + \vec{v}_0 = \vec{a}t$
  - $\vec{v}_0 + \vec{v} + \vec{a}t$
67. In the equation for the maximum height of a projectile, what does  $v_{0y}$  stand for?  $h = \frac{v_{0y}^2}{2g}$
- Initial velocity in the x direction
  - Initial velocity in the y direction
  - Final velocity in the x direction
  - Final velocity in the y direction
68. True or False—Range is defined as the maximum vertical distance travelled by a projectile.
- True
  - False
69. For what angle of a projectile is its range equal to zero?
- $0^\circ$  or  $30^\circ$
  - $0^\circ$  or  $45^\circ$
  - $90^\circ$  or  $0^\circ$
  - $90^\circ$  or  $45^\circ$
85. Ignoring drag, what is the x-component of the acceleration of a projectile? Why?
- The x-component of the acceleration of a projectile is 0 because acceleration of a projectile is due to gravity, which acts in the y direction.
  - The x component of the acceleration of a projectile is  $g$  because acceleration of a projectile is due to gravity, which acts in the x direction.
  - The x-component of the acceleration of a projectile is 0 because acceleration of a projectile is due to gravity, which acts in the x direction.
  - The x-component of the acceleration of a projectile is  $g$  because acceleration of a projectile is due to gravity, which acts in the y direction.
86. What is the optimum angle at which a projectile should be launched in order to cover the maximum distance?
- $0^\circ$
  - $45^\circ$
  - $60^\circ$
  - $90^\circ$