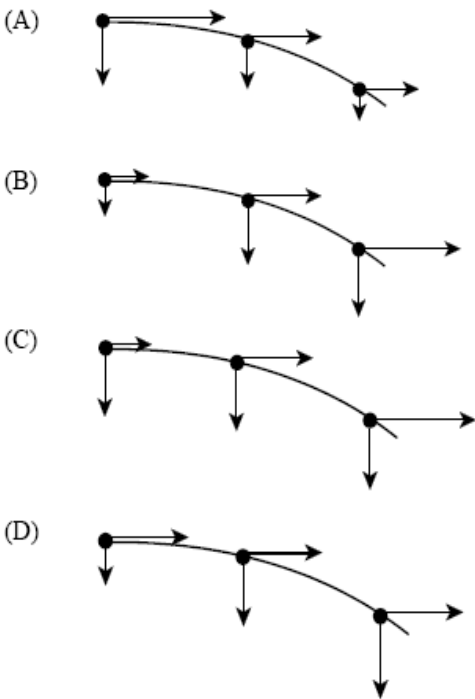


Assignment 1
Free-Falling Objects and Horizontally Launched Projectiles
Outcomes: 325-6

Name: _____

1 Which picture below shows the correct vertical and horizontal components a short time after a ball is thrown horizontally from a cliff?



2 Marble A and marble B roll off a tabletop simultaneously. At that instant marble B is moving twice as fast as marble A. Which statement below is true?

- (A) marble B reaches the floor first
- (B) the marbles land at the same distance from the table legs
- (C) the marbles have the same horizontal velocity
- (D) the marbles have the same downward velocity

3 Which movement is an example of projectile motion?

- (A) climbing a wall
- (B) running around a track
- (C) throwing a ball off a cliff
- (D) walking at a constant velocity

4 A rock is thrown horizontally off the roof of a building at 18 m/s. What is the horizontal component of the velocity just before the rock hits the ground?

- (A) -18 m/s
- (B) -9.8 m/s
- (C) 9.8 m/s
- (D) 18 m/s

5 A rock is thrown horizontally from the top of a hill. If air friction is negligible, which best represents the horizontal and vertical accelerations?

	horizontal acceleration (m/s ²)	vertical acceleration (m/s ²)
(A)	0	-9.8
(B)	0	0
(C)	9.8	-9.8
(D)	9.8	0

6 Which is constant for any given projectile?

- (A) horizontal displacement
- (B) horizontal velocity
- (C) vertical displacement
- (D) vertical velocity

- 7 A naughty chemistry student uses her pen as a blowgun and fires a paper projectile horizontally towards a nice innocent physics student. The blowgun is 1.42 m above the floor when fired, and the projectile strikes the physics student at a spot that is 1.11 m above the floor. If the distance between the students is 3.60 m, what is the "muzzle velocity" of the blowgun?
- (A) 60.0 m/s
(B) 14.3 m/s
(C) 6.79 m/s
(D) 0.9 m/s
- 8 If a coin is pushed horizontally from a 1.2 m high table and lands 0.68 m from the base, what was the speed at which it left the table?
- (A) 1.4 m/s
(B) 1.9 m/s
(C) 2.8 m/s
(D) 5.7 m/s
- 9 An airplane is moving at a constant velocity when you reach out and drop a ball. Assuming that friction is negligible (the wind is blowing in exactly the right direction and with the precise velocity needed) describe the ball's path as it falls to ground from your point of reference. (3)



- B) Describe, with a diagram, the path observed by a person standing on the ground and observing the drop. (2)
- 10 A pool ball leaves a 0.60 m high table with an initial horizontal velocity of 2.4 m/s. Determine:
- A) How much time does it take for the ball to fall to the ground? (2)
- B) What is the **vertical velocity** of the ball just before it strikes the ground? (2)
- C) What is the horizontal velocity of the ball just before it hits the ground? Why? (2)

D) What is the **magnitude** of the ball's velocity just before it hits the ground? (2)

E) How far from the table does the ball strike the ground? (2)

11 You are traveling at a constant speed of 75.0 km/h on a straight road in a school bus with your arm extended out the window (you weren't listening to the bus driver's warnings). You hold a softball in your hand and drop it from a height of 2.45 m from the flat road surface below.

A) From the moment of release, how much further forward will the ball travel before hitting the road surface? (4)

B) How long would it take the softball to strike the ground if the student dropped the ball when the bus was moving with a speed of 55 km/h? Why? (2)

C) Calculate the impact velocity (speed and angle) of the ball as it hits the road surface. (7)

12 A bullet is fired horizontally. If the gun barrel was 1.25 m above the ground and the bullet strikes the ground 4000.0 m from where it was fired,

A) determine its initial velocity. (4)

B) the **direction** of the bullet's velocity just before it hit the ground (i.e. the angle)? (4)

- 13 Two buildings are separated by a distance of 80.0 meters. A ball is thrown from one building to the other and strikes the other building 3.6 seconds later.
- A) How far down on the second building does the ball hit? (2)
- B) With what speed must the ball be thrown to strike the second building at a height of 20.0 meters (above the ground) if the ball is thrown from a height of 35 meters? (4)
- C) Using the speed from part B above as the initial speed, what will be the horizontal and Vertical displacement 1.5 seconds after the ball is thrown? (4)
- 14 If a bullet's final velocity was 700.0 m/s 10.0° to the horizontal, determine the height from which it was fired. (4)
- 15 A strike in baseball occurs between 0.50 m and 1.0 m directly above home plate. A pitcher, 18 m from home plate, releases a ball, in line with the plate, parallel to the ground. If the ball is released 2.0 m above the ground, with a velocity of 36.0m/s, would the pitch be a strike? Show calculations. (5)

- 16 Will a tennis ball served horizontally at 105 km/h from a height of 2.25 m clear a net 0.95 m high and 10.0 m away? Using calculations, show why or why not? (4)

- 17 In a movie scene, a car is moving at 26.0 m/s when it rolls off a cliff.

- A) If the car takes 5.5 s to reach the ground below, how high is the cliff? (2)



- B) How far from the bottom of the cliff would the car have landed? (2)

- C) What was the impact velocity of the car? (7)