Physics 3204
Assignment 2
(Outcomes 325-6)

Name:_____

1. Which best represents the velocity components of a projectile at its maximum height?

(A) 

(B) 

(C)

(D) 

2. What is the vertical speed component of a projectile that is launched at an angle of 20.0^{o} to the horizontal with an initial speed of 30.0 m/s?

(A) $30.0 \cos 20.0°$

(B) $30.0 \sin 20.0°$

(C) $\dfrac{30.0}{\sin 20.0^{o}}$

(D) $\dfrac{30.0}{\cos 20.0^{o}}$

3. Which expression represents the time it takes for a projectile, with initial velocity *v*1, an angle θ above the horizontal, to reach its maximum height?

(A) $v_1 g \cos\theta$

(B) $v_1 g \sin\theta$

(C) $\dfrac{v_1 \cos\theta}{g}$

(D) $\dfrac{v_1 \sin\theta}{g}$

4. An egg is thrown in the air with a velocity of 15 m/s at 45º above the horizontal. What is ts horizontal velocity and vertical acceleration when it reaches the maximum height?

	horizontal velocity (m/s)	vertical acceleration (m/s^2)
(A)	0	0
(B)	0	-9.8
(C)	11	0
(D)	11	-9.8

5. A projectile is launched at a 30.0^{o} angle above the horizontal with a speed of 20.0 m/s. What is the vertical displacement after 3.0 s?
(A) - 74 m
(B) - 14 m
(C) + 12 m
(D) + 31 m

6. If a ball is thrown at an initial speed of 8.0 m/s at an angle of 35^{o} above the ground, what is the speed of the ball when it returns to its original height?
   (A) 4.6 m/s
   (B) 6.6 m/s
   (C) 8.0 m/s
   (D) 9.8 m/s

7. An arrow is fired at 45.5 m/s from a 5.75 m high tree branch, at an angle of 60^{o} above the horizontal. What maximum height, above the ground, will the arrow reach?
   (A) 32.1 m
   (B) 73.4 m
   (C) 79.1 m
   (D) 84.9 m

8. A ball is launched at a 60^{o} angle to the horizontal. If, 3.0 s later, it lands 12 m from the launch site, what was the magnitude of the initial velocity?
   (A) 2.3 m/s
   (B) 4.0 m/s
   (C) 4.6 m/s
   (D) 8.0 m/s

9. If a projectile is launched at an angle of 65^{o} from the horizontal at a speed of 2.1 m/s, what is the maximum height reached by the object?
   (A) 0.040 m
   (B) 0.097 m
   (C) 0.18 m
   (D) 0.23 m

10. If a steel ball was launched horizontally from a height of 90.0 cm and lands 1.3 m from the base, what was the initial velocity?
   (A) 0.30 m/s
   (B) 2.7 m/s
   (C) 3.0 m/s
   (D) 7.1 m/s

11. A juggler throws a ball at 0.22 m/s at an angle of 60.0^{o} above the horizontal. What is the y-component of the velocity of the ball?
   (A) 0.11 m/s
   (B) 0.19 m/s
   (C) 0.25 m/s
   (D) 0.44 m/s

12. How much time does it take a soccer ball to travel 50.0 m horizontally if it is kicked with a velocity of 18.4 m/s at an angle of 30.0o above the horizontal?
   (A) 0.184 s
   (B) 0.319 s
   (C) 3.14 s
   (D) 5.43 s

13. Jimmy is on a 45.0 m tall building and aims his paintball gun upwards at 18.0 º above horizontal. The paintball leaves the end of the gun, 1.25 m above the roof, at a speed of 35.0 m/s. There is a tall building 87.5 m directly across the level street. At what height on the building, measured from the ground upwards, will the paintball impact the building? **(6)**

14. a) A juggler throws a ball at a 70^{o} angle to the horizontal from a height of 1.6 m. If the room is 2.8 m high, what is the maximum velocity at which the ball can be thrown to avoid hitting the ceiling? **(4)**

b) If it is caught at the same level as being launched, how far apart must his hands be to execute the catch? **(3)**

15. A circus clown was shot from a cannon and lands in a net at the same elevation from which he was shot. His initial velocity was 28.0 m/s at an angle of 50 degrees above the horizontal. Determine

a) the time that he was in the air. **(3)**

b) the maximum height that he reached. **(2)**

c) his range. **(2)**

d) his landing velocity. **(1)**

16. A spear is thrown upward from a cliff 48 m above the ground. Given an initial speed of 24 m/s at an angle of 30.0 º to the horizontal,

a) How long is the spear in flight? **(4)**

b) How far will the spear travel horizontally from its original position into the ground? **(2)**

c) What is the magnitude and direction of the spear's velocity just before it hits the ground below the cliff? **(4)**

17. A cannon is set up on top of a 87.5 m high cliff. The cannon is carefully aimed at an angle of 12.0º below the horizontal. If the cannonball leaves the cannon at 28.3 m/s,

    a) How far from the base of the vertical cliff will it impact the level ground below? **(6)**

    b) What is the cannonball's impact velocity? **(6)**

18. A ball is kicked from a point 38.9 m away from the goal. The crossbar at the top of the net is 3.05 m high. If the ball leaves the ground with a speed of 20.4 m/s at an angle of 52.2º to the horizontal.

    a) Will the ball be over or under the crossbar? Support with calculations. **(6)**

b) What is the vertical velocity of the ball at the time it reaches the crossbar? **(6)**

19. A strike in baseball occurs between 0.50 m and 1.0 m directly above home plate. A pitcher, 18.0 m from home plate, throws a ball with an initial velocity of 17.0 m/s at 15° above the horizontal. If the ball is released 2.0 m above the ground, will the pitch be a strike? Show workings. **(6)**