

## Sample Exam 1 -- Physics 105

1

One meter is equivalent to 3.281 ft. A cube with each edge 1.5 feet long has a volume of:

- A)  $9.5 \times 10^{-2} \text{ m}^3$       B)  $9.6 \times 10^{-2} \text{ m}^3$       C)  $10.5 \text{ m}^3$   
D)  $0.21 \text{ m}^3$       E)  $.2 \times 10^2 \text{ m}^3$

2.

A motorcycle starts from rest at a traffic light. It travels 100 meters in 5 seconds. The acceleration of the motorcycle is:

- A)  $4.0 \text{ m/s}^2$       B)  $8.0 \text{ m/s}^2$       C)  $20.0 \text{ m/s}^2$       D)  $40.0 \text{ m/s}^2$       E)  $80.0 \text{ m/s}^2$

3.

A rifle that shoots bullets at 500 m/s is fired at a target on level ground. If the rifle is pointed 15 degrees above the horizontal when it is fired, how far away horizontally from the target should the person shooting be to hit the target? Neglect all air resistance and assume that  $g$  is the same everywhere.

- A) 854 m      B) 1708 m      C) 3416 m      D) 6380 m      E) 12,760 m.

4 A vector has a magnitude of 12 and its direction below the x-axis is  $60^\circ$ . Its y component is:

- A)  $-6(3)^{1/2}$   
B)  $6(3)^{1/2}$   
C) -6  
D) 6  
E) 12

5. Two vectors have magnitudes and directions:  $A=200$  at  $60^\circ$  and  $B=300$  at  $135^\circ$  the magnitude of the vector  $\mathbf{A+B}$  is :

- A) 200  
B) 300  
C) 350  
D) 400  
E) 500

6.

The position  $y$  of a particle moving along the  $y$  axis depends on the time  $t$  according to the equation  $y = at - bt^2$ . The dimensions of the quantities  $a$  and  $b$  are respectively:

- A.  $L^2/T, L^3/T^2$   
B.  $L/T^2, L^2/T$   
C.  $L/T, L/T^2$   
D.  $L^3/T, T^2/L$   
E. none of these

7. A bullet fired from a gun, travels 2000 m in 8 s along a straight line with constant acceleration. The acceleration is:

- A)  $10 \text{ m/s}^2$   
B)  $32.5 \text{ m/s}^2$   
C)  $62.5 \text{ m/s}^2$   
D)  $122.5 \text{ m/s}^2$   
E)  $98 \text{ m/s}^2$

8. A car traveling at a constant speed of 24 m/s passes a trooper. He sets immediately off in chase with a constant acceleration of  $6 \text{ m/s}^2$ . How long does it take the trooper to over take the speeding car?

- A) 8 s
- B) 12 s
- C) 24 s
- D) 32 s
- E) 40 s

9. A projectile is fired straight upward at 174 m/s. How fast is it moving 4 s later?  $g=10 \text{ m/s}^2$

- A) 160 m/s
- B) 110m/s
- C) 10 m/s
- D) 134 m/s
- E) 40m/s

10. A projectile is fired straight upward at 174 m/s, velocity of projectile 20 s later is:

- A) 126 m/s up
- B) 374 m/s down
- C) 26 m/s down
- D) 374 m/s up
- E) 40m/s down

11. A brick dropped from the roof of a building hits the ground in 5 s. If  $g=10 \text{ m/s}^2$ , the height of the building is:

- A) 250 m
- B) 125m
- C) 25 m
- D) 12.5 m
- E) 40m

12. Velocity vector  $\mathbf{V} = (-3\text{m/s})\mathbf{i} - (3(3)^{1/2} \text{ m/s})\mathbf{j}$ . What is the angle between  $\mathbf{V}$  and positive x-axis?

- A)  $60^\circ$
- B)  $120^\circ$
- C)  $30^\circ$
- D)  $240^\circ$
- E)  $-60^\circ$

**Ans: 1b, 2b, 3e, 4b, 5d, 6c, 7c, 8a, 9d, 10c, 11b, 12d**

### Workout problem 1

You throw a ball with a launch velocity of  $\mathbf{V}_0 = (30\text{m/s})\mathbf{i} + (40\text{ m/s})\mathbf{j}$  toward a wall . Your distance from the wall is 90 m.  $g = 10\text{ m/s}^2$

- a) At what height above release point does the ball hit the wall?(ans  **$h = 75\text{m}$** )  
b) What is the magnitude of velocity when it hits the wall?(ans: **$32\text{ m/s}$** )

### Workout problem 2

Three vectors  $\mathbf{a}$ ,  $\mathbf{b}$ ,  $\mathbf{c}$  each have a magnitude of 50 m and lie in an xy plane. Their directions relative to the positive direction of the x axis are  $30^\circ$ ,  $195^\circ$ ,  $315^\circ$ , respectively.

What are

- a) x, and y components of  $\mathbf{a} + \mathbf{b} + \mathbf{c}$   
(ans. **$30.4\text{m}, -23.3\text{m}$** )  
b) the magnitude of  $\mathbf{a} + \mathbf{b} + \mathbf{c}$   
(ans. **$38\text{ m}$** )  
c) the angle of the vector  $\mathbf{a} + \mathbf{b} + \mathbf{c}$   
(ans.  **$-53^\circ$** )