

Q1.

The volume V of an object as a function of time is calculated by $V = (A/B) t^4 + Bt$, where t is measured in seconds and V is in cubic meters. Determine the dimension of the constant A .

- A) $L^6 T^{-5}$
- B) $L^{-5} T^6$
- C) $L^{-1} T^3$
- D) $L^{-3} T^4$
- E) $L^3 T^{-1}$

Q2.

Copper has a density of 8.96 g/cm^3 , and the mass of a copper atom is $1.06 \times 10^{-25} \text{ kg}$. If the atoms are spherical and tightly packed, what is the radius of a copper atom?

- A) $1.41 \times 10^{-10} \text{ m}$
- B) $2.41 \times 10^{-11} \text{ m}$
- C) $5.44 \times 10^{-10} \text{ m}$
- D) $7.45 \times 10^{-10} \text{ m}$
- E) $3.41 \times 10^{-9} \text{ m}$

Q3.

A ball is thrown vertically upwards with an initial velocity of 20 m/s . It takes 4.0 s for the ball to come back to its original position. What is the magnitude of the average velocity of the ball for the whole trip? (Neglect air resistance)

- A) 0.0 m/s
- B) 10 m/s
- C) 4.0 m/s
- D) 2.0 m/s
- E) 5.0 m/s

Q4.

The position of a particle moving along an x -axis is given by $x = 6.00 t^2 - 3.00 t^3$, where x is in meters and t is in seconds. What is the acceleration of the particle at its maximum x -position?

- A) -12.0 m/s^2
- B) 15.1 m/s^2
- C) -11.2 m/s^2
- D) 9.51 m/s^2
- E) -19.5 m/s^2

Q5.

A particle is moving along an x -axis with a constant acceleration of -3.0 m/s^2 . The velocity of the particle is given by the equation $v(t) = 4.0 - 3.0t$, where v is in m/s and t is in seconds. Find the displacement of the particle during the time interval $t = 0$ to $t = 2.0 \text{ s}$.

- A) 2.0 m
- B) 2.8 m
- C) 1.4 m
- D) 3.1 m
- E) 7.7 m

Q6.

A stone is thrown vertically upwards with an initial speed of 4.0 m/s from a window which is 8.0 m above the ground. With what speed will the stone hit the ground? (Neglect air resistance)

- A) 13 m/s
- B) 1.0 m/s
- C) 4.0 m/s
- D) 22 m/s
- E) 12 m/s

Q7.

Initially an object moves 1.00 m in a straight-line from point A to point B. Then, it changes direction and moves another 1.00 m in a straight-line until it reaches point C. Point C is at a distance of 1.00 m from point A. Through what angle did the object change its direction with respect to its initial direction of motion?

- A) 120°
- B) 70.0°
- C) 100°
- D) 135°
- E) 140°

Q8.

Oasis B is 20 km due east of oasis A. Starting from Oasis A, a camel walks 20 km in a direction 37° south of east and then walks 8.0 km due north. How far is the camel then from oasis B?

- A) 5.7 km
- B) 4.0 km
- C) 6.6 km
- D) 2.7 km
- E) 1.4 km

Q9.

Vector \vec{A} has a magnitude of 5.0 units and vector \vec{B} has a magnitude of 10 units. Which of the following values is not possible for the scalar product of vectors \vec{A} and \vec{B} ?

- A) 55
- B) 45
- C) 35
- D) Zero
- E) 25

Q10.

Vector $\vec{A} = 1.00\hat{i} + 3.00\hat{j}$, vector $\vec{B} = 4.00\hat{i} - 1.00\hat{j}$ and the vector $\vec{C} = 2.00\hat{k}$. Find the angle (in degrees) between vector \vec{A} and vector $\vec{B} \times \vec{C}$.

- A) 176
- B) 103
- C) 76.0
- D) 1.1
- E) 24.0

Q11.

A soccer ball is kicked from the ground and follows a parabolic path before landing on the ground. Which one of the following statements is **True**? (Neglect air resistance)

- A) The horizontal component of the velocity of the ball is the same throughout its flight
- B) The acceleration of the ball decreases as the ball moves upward
- C) The velocity of the ball is zero when the ball is at its maximum height
- D) The acceleration of the ball is zero when the ball is at its maximum height
- E) The vertical component of the velocity of the ball is zero just before hitting the ground

Q12.

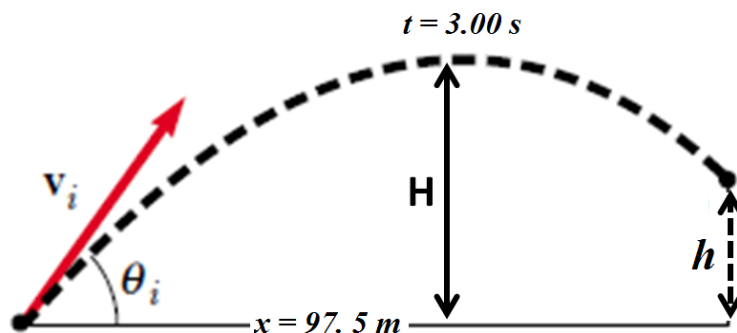
A particle starts from the origin at $t = 0$ with a velocity of $(6.0 \text{ m/s})\hat{i}$ and moves in the xy plane with a constant acceleration of $(-2.0 \text{ m/s}^2)\hat{i} + (4.0 \text{ m/s}^2)\hat{j}$. At the instant the particle reaches its maximum positive x -coordinate, what is its corresponding y -coordinate?

- A) 18 m
- B) 36 m
- C) 11 m
- D) 27 m
- E) 15 m

Q13.

A baseball is hit at ground level as shown in **Figure 1**. The ball is observed to reach its maximum height above ground level 3.00 s after being hit. And 2.50 s after reaching this maximum height, the ball is observed to barely clear a fence of height h that is at a horizontal distance of 97.5 m from the point where it was hit. What is the height h of the fence? (Neglect air resistance)

Fig#



- A) 13.5 m
 - B) 30.6 m
 - C) 2.80 m
 - D) 44.1 m
 - E) 4.90 m
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Q14.

A star with a diameter of 40.0 km rotates about its central axis making two revolutions per second. What is the speed (km/s), of an object on the star's equator?

- A) 251
 - B) 628
 - C) 400
 - D) 100
 - E) 450
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Q15.

A boat is traveling upstream towards the east at 10 km/h with respect to the water of a river. The water is flowing at 5.0 km/h with respect to the ground. A man on the boat walks from front to rear at 3.0 km/h with respect to the boat. What are the magnitude and direction of the man's velocity with respect to the ground?

- A) 2.0 km/h, towards the east
 - B) 2.0 km/h, towards the west
 - C) 8.0 km/h, towards the east
 - D) 12 km/h, towards the east
 - E) 18 km/h, towards the west
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