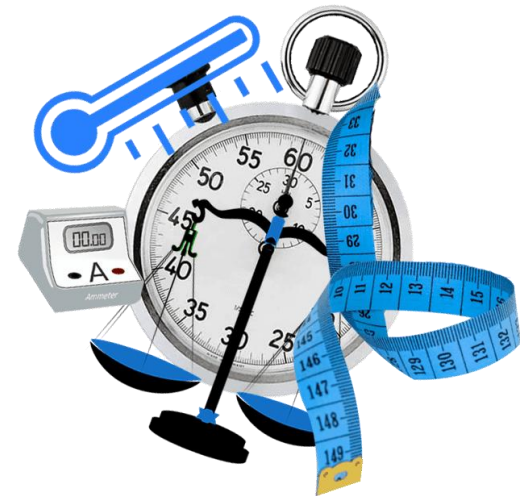




# Mechanics and Properties of Matter II

## Question Bank chapters 3-5

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### Question1

The position function of a particle is  $\vec{r}(t) = 2.0t^2 \hat{i} + (2.0 + 3.0t) \hat{j} + 5.0t \hat{k}$  m. (a) What is the instantaneous velocity and speed at  $t = 2.0$  s? (b) What is the average velocity between 1.0 s and 3.0 s?

**Answer. Page 163**

### Question2

A particle has a velocity of  $\vec{v}(t) = 5.0t \hat{i} + t^2 \hat{j} - 2.0t^3 \hat{k}$  m/s. (a) What is the acceleration function? (b) What is the acceleration vector at  $t = 2.0$  s? Find its magnitude and direction.

**Answer. Page 166**

### Question3

A jet is flying at 134.1 m/s along a straight line and makes a turn along a circular path level with the ground. What does the radius of the circle have to be to produce a centripetal acceleration of 1  $g$  on the pilot and jet toward the center of the circular trajectory?

**Answer. Page 184**

### Question4

A proton has speed  $5 \times 10^6$  m/s and is moving in a circle in the  $xy$  plane of radius  $r = 0.175$  m. What is its position in the  $xy$  plane at time  $t = 2.0 \times 10^{-7}$  s = 200 ns? At  $t = 0$ , the position of the proton is  $0.175 \text{ m } \hat{i}$  and it circles counterclockwise. Sketch the trajectory.

**Answer. Page 186**

### Question 5

A 0.400-kg soccer ball is kicked across the field by a player; it undergoes acceleration given by  $\vec{a} = 3.00 \hat{i} + 7.00 \hat{j} \text{ m/s}^2$ . Find (a) the resultant force acting on the ball and (b) the magnitude and direction of the resultant force.

**Answer. Page 224**

### Question 6

A farmer is lifting some moderately heavy rocks from a field to plant crops. He lifts a stone that weighs 40.0 lb. (about 180 N). What force does he apply if the stone accelerates at a rate of  $1.5 \text{ m/s}^2$ ?

**Answer. Page 228**









