

SET 3 – MCQs (Motion in a Plane)

Q101. Which of the following is a scalar quantity?

- a) Force
- b) Momentum
- c) Density
- d) Displacement

Ans: c

Q102. A vector quantity is fully represented by –

- a) Only magnitude
- b) Only direction
- c) Both magnitude and direction
- d) None

Ans: c

Q103. Work done is –

- a) Scalar
- b) Vector
- c) Both
- d) None

Ans: a

Q104. A vector can be represented graphically by –

- a) Line
- b) Directed line segment
- c) Point
- d) Arrow without length

Ans: b

Q105. Magnitude of displacement vector is –

- a) Always greater than path length
- b) Always smaller than path length
- c) Always equal to path length
- d) Less than or equal to path length

Ans: d

Q106. The rule of vector addition is –

- a) Triangle law
- b) Parallelogram law
- c) Both
- d) None

Ans: c

Q107. Addition of vectors is –

- a) Associative
- b) Commutative
- c) Both
- d) None

Ans: c

Q108. Null vector has –

- a) Zero magnitude and no direction
- b) Unit magnitude
- c) Infinite magnitude
- d) Constant direction

Ans: a

Q109. Which of these is true?

- a) $A + (-A) = 0$
- b) $A - A = 0$
- c) Both
- d) None

Ans: c

Q110. If $|A| = 0$, then A is –

- a) Unit vector
- b) Null vector
- c) Position vector
- d) Scalar

Ans: b

Q111. A vector can be resolved into two components –

- a) Always along x- and y- axes
- b) Along any two non-parallel directions in the plane
- c) Along z-axis only
- d) Along resultant

Ans: b

Q112. Unit vector along x-axis is –

- a) $\hat{i}$
- b) $\hat{j}$
- c) $\hat{k}$
- d) Zero

Ans: a

Q113. For vector $A = 8\hat{i}$, its y-component is –

- a) 8
- b) 0
- c) 1
- d) 2

Ans: b

Q114. The magnitude of vector $(3\hat{i} - 4\hat{j})$ is –

- a) 1
- b) 5
- c) 7
- d) 25

Ans: b

Q115. Direction of $A = 3\hat{i} - 4\hat{j}$ with x-axis = ?

- a) 37° below x-axis
- b) 37° above x-axis
- c) 53° above x-axis
- d) 53° below x-axis

Ans: a

Q116. If $A = 2\hat{i} + 3\hat{j}$, $B = -\hat{i} + 2\hat{j}$, then $R = ?$

- a) $\hat{i} + 5\hat{j}$
- b) $3\hat{i} + 5\hat{j}$
- c) $\hat{i} + \hat{j}$
- d) None

Ans: a

Q117. If $A = 7$, $B = 24$, angle between them = 90° , resultant = ?

- a) 24
- b) 25
- c) 31
- d) 17

Ans: b

Q118. Resultant of two equal vectors inclined at $120^\circ = ?$

- a) 0
- b) Equal to either vector
- c) $\sqrt{3}$ times either vector
- d) Double of vector

Ans: b

Q119. Components of displacement vector (6, 8) are –

- a) 6 and 8
- b) 10 and 0
- c) 3 and 4
- d) 12 and 16

Ans: a

Q120. The angle between resultant and x-axis is given by –

- a) $\tan^{-1}(R_y/R_x)$
- b) $\tan^{-1}(R_x/R_y)$
- c) $\sin^{-1}(R_x/R_y)$
- d) None

Ans: a

Q121. The position vector of a particle is $r = xi + yj$. Here x and y represent –

- a) Coordinates
- b) Velocity
- c) Scalars without meaning
- d) None

Ans: a

Q122. If a particle moves from (2, 3) to (5, 7), displacement = ?

- a) 7
- b) $\sqrt{25}$
- c) $\sqrt{(3^2+4^2)} = 5$
- d) 4

Ans: c

Q123. Average velocity is along –

- a) Tangent
- b) Displacement vector
- c) Normal
- d) Centre

Ans: b

Q124. Instantaneous velocity is always –

- a) Along tangent to path
- b) Along displacement
- c) Along acceleration

d) Along resultant force

Ans: a

Q125. If $x = t^2$, $y = t^3$, then velocity components v_x , $v_y = ?$

a) $(2t, 3t^2)$

b) $(t^2, 2t)$

c) $(3t, 2t^2)$

d) None

Ans: a

Q126. Instantaneous acceleration is rate of change of –

a) Position

b) Velocity

c) Force

d) Time

Ans: b

Q127. If $\mathbf{v} = (3\hat{i} + 4\hat{j})$ m/s, then acceleration = ?

a) 5 m/s^2

b) 7 m/s^2

c) Depends on change in velocity

d) None

Ans: c

Q128. If velocity is constant in magnitude but direction changes, then

–

a) Acceleration is zero

b) Acceleration exists

c) Both

d) None

Ans: b

Q129. In circular motion, velocity and acceleration are –

a) Parallel

- b) Anti-parallel
- c) Perpendicular
- d) Random

Ans: c

Q130. Acceleration in 2D can be written as –

- a) $a_x \hat{i} + a_y \hat{j}$
- b) $a_x + a_y$
- c) $\sqrt{a_x^2 + a_y^2}$
- d) Both a and c

Ans: d

Q131. A body projected horizontally has initial vertical velocity –

- a) $u \cos\theta$
- b) $u \sin\theta$
- c) 0
- d) u

Ans: c

Q132. If $v_0 = 20 \text{ m/s}$ at 30° , horizontal component = ?

- a) 20
- b) 10
- c) 17.3
- d) 15

Ans: c

Q133. In projectile, horizontal acceleration = ?

- a) g
- b) 0
- c) $-g$
- d) u

Ans: b

Q134. A projectile has range R , if projected at θ , then at $(90^\circ - \theta)$ its range = ?

- a) Different
- b) Same
- c) Zero
- d) None

Ans: b

Q135. Path of projectile is parabola because –

- a) One component uniform, other accelerated
- b) Both uniform
- c) Both accelerated
- d) None

Ans: a

Q136. Maximum height depends on –

- a) $u^2 \sin^2\theta / g$
- b) $u^2 \cos^2\theta / g$
- c) u^2/g
- d) None

Ans: a

Q137. If $u = 40 \text{ m/s}$, $\theta = 45^\circ$, $g = 10 \text{ m/s}^2$, range = ?

- a) 80 m
- b) 100 m
- c) 160 m
- d) 40 m

Ans: c

Q138. Time of flight increases if –

- a) θ increases (0° to 90°)
- b) θ decreases (90° to 0°)
- c) u decreases

d) None

Ans: a

Q139. At topmost point, vertical velocity = ?

a) $u \sin \theta$

b) $u \cos \theta$

c) 0

d) g

Ans: c

Q140. At topmost point, velocity is –

a) $u \cos \theta$ horizontal

b) $u \sin \theta$ vertical

c) g downward

d) Zero

Ans: a

Q141. In UCM, speed is –

a) Constant

b) Variable

c) Zero

d) None

Ans: a

Q142. In UCM, velocity vector is –

a) Constant

b) Changing direction

c) Zero

d) Random

Ans: b

Q143. Acceleration in UCM = ?

a) Centripetal

b) Tangential

- c) Zero
- d) None

Ans: a

Q144. Magnitude of centripetal acceleration = ?

- a) v^2/R
- b) R/v^2
- c) vR
- d) g

Ans: a

Q145. If $R = 2 \text{ m}$, $v = 4 \text{ m/s}$, then $a_c = ?$

- a) 2 m/s^2
- b) 4 m/s^2
- c) 8 m/s^2
- d) $16/2 = 8 \text{ m/s}^2$

Ans: d

Q146. Angular velocity vector is directed along –

- a) Radius
- b) Tangent
- c) Axis of rotation
- d) None

Ans: c

Q147. If $T = 0.5 \text{ s}$, angular velocity = ?

- a) $2\pi \text{ rad/s}$
- b) $4\pi \text{ rad/s}$
- c) $\pi \text{ rad/s}$
- d) None

Ans: b

Q148. Frequency $f = 5 \text{ Hz}$. Then time period = ?

- a) $1/5 \text{ s}$

- b) 5 s
- c) 10 s
- d) None

Ans: a

Q149. Centripetal acceleration formula in terms of frequency = ?

- a) $2\pi fR$
- b) $4\pi^2 f^2 R$
- c) $f^2 R$
- d) None

Ans: b

Q150. If $\omega = 2 \text{ rad/s}$, $R = 3 \text{ m}$, then $v = ?$

- a) 2 m/s
- b) 3 m/s
- c) 6 m/s
- d) 12 m/s

Ans: c