PHYSICS MCQ BOOKLET

Grade 11 · Chapter 4 · Rotational and Circular Motion

FBISE / National Book Foundation Model Textbook companion

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Independent MCQs on angular kinematics, centripetal force, banking, vertical circles, moment of inertia, torque, angular momentum, and conservation of angular momentum. Not copied from the book exercise. Total: 108 questions. Each item has four options, the correct letter, and a short explanation of why it is correct.

A. Important / Main Topics

1. Rotational motion occurs when a body moves about:

(A) a fixed axis
(B) only in a straight line
(C) the centre of Earth only
(D) zero radius always

Correct Answer: A

Explanation: Rotation is turning about an axis; straight-line motion is translation.

2. One complete revolution equals an angular displacement of:

(A) pi rad
(B) 2 pi rad
(C) 360 m
(D) 1 rad

Correct Answer: B

Explanation: A full turn is 360 degrees, which is 2 pi radians.

3. The SI unit of angular displacement when using radians is:

(A) degree
(B) revolution per second
(C) radian
(D) metre

Correct Answer: C

Explanation: Radians are the natural SI unit for angle in rotational kinematics.

4. Angular velocity is defined as:

(A) change of radius per time
(B) force per mass
(C) mass times radius
(D) change of angle per unit time

Correct Answer: D

Explanation: Angular velocity is defined as change of angle per unit time.

5. If a wheel turns through 2 pi rad in 4 s at constant rate, angular speed is:

(A) pi/2 rad/s
(B) 2 pi rad/s
(C) 8 pi rad/s
(D) 0.5 rad/s

Correct Answer: A

Explanation: If a wheel turns through 2 pi rad in 4 s at constant rate, angular speed is pi/2 rad/s.

6. RPM (revolutions per minute) can be converted to rad/s by:

(A) multiplying by 60 only
(B) multiplying by 2 pi and dividing by 60
(C) dividing by 2 pi

(D) using v = r omega directly on RPM

Correct Answer: B

Explanation: Each revolution is 2 pi rad; divide by 60 s per minute.

7. 1150 rpm is approximately:

(A) 19 rad/s
(B) 1150 rad/s
(C) 120 rad/s
(D) 2 rad/s

Correct Answer: C

Explanation: 1150 x 2 pi / 60 is about 120 rad/s.

8. For a point at radius r, linear speed v and angular speed omega are related by:

(A) v = omega / r
(B) v = r / omega
(C) v = r + omega
(D) v = r omega

Correct Answer: D

Explanation: Arc length per time is radius times angular speed.

9. Arc length s swept in angle theta (in rad) is:

(A) s = r theta
(B) s = r / theta
(C) s = theta / r
(D) s = r + theta

Correct Answer: A

Explanation: Arc length s swept in angle theta (in rad) is s = r theta.

10. Angular acceleration alpha is:

(A) centripetal acceleration
(B) rate of change of angular velocity
(C) v squared over r
(D) mass times radius

Correct Answer: B

Explanation: Angular acceleration alpha is rate of change of angular velocity.

11. Tangential acceleration at of a point on a rotating body is:

(A) at = v squared / r
(B) at = r omega
(C) at = r alpha
(D) at = m r

Correct Answer: C

Explanation: Tangential acceleration at of a point on a rotating body is at = r alpha.

12. Centripetal acceleration always points:

(A) tangent to the path
(B) away from the centre
(C) parallel to velocity
(D) toward the centre of the circle

Correct Answer: D

Explanation: Centripetal means centre-seeking acceleration.

13. Centripetal acceleration magnitude is:

(A) v squared / r
(B) r v
(C) v r

(D) g only

Correct Answer: A

Explanation: Ac = v squared over r, also equal to r omega squared.

14. Centripetal acceleration can also be written as:

(A) r alpha only
(B) r omega squared
(C) omega / r
(D) v r squared

Correct Answer: B

Explanation: Centripetal acceleration can also be written as r omega squared.

15. Centripetal force is:

(A) a separate new force added to weight always
(B) always friction
(C) any net force toward the centre causing circular motion
(D) always outward

Correct Answer: C

Explanation: Fc is the radial inward net force, not a new kind of force by itself.

16. Centripetal force magnitude is:

(A) m g always
(B) m v r
(C) m / r
(D) m v squared / r

Correct Answer: D

Explanation: Newton's second law with inward acceleration v squared over r.

17. Uniform circular motion means:

(A) constant speed along a circular path
(B) zero acceleration
(C) constant velocity vector
(D) straight line at constant speed

Correct Answer: A

Explanation: Speed is constant but velocity direction changes, so there is centripetal acceleration.

18. In uniform circular motion, velocity and acceleration vectors are:

(A) parallel
(B) perpendicular
(C) always opposite
(D) both zero

Correct Answer: B

Explanation: Velocity is tangent; centripetal acceleration is radial inward.

19. A car rounding a flat curve at constant speed needs centripetal force from:

(A) engine thrust outward
(B) gravity alone horizontally
(C) static friction toward the centre
(D) no force

Correct Answer: C

Explanation: A car rounding a flat curve at constant speed needs centripetal force from static friction toward the centre.

20. If curve speed doubles (same radius), required centripetal force becomes:

(A) double
(B) half

(C) unchanged
(D) four times

Correct Answer: D

Explanation: If curve speed doubles (same radius), required centripetal force becomes four times.

21. Tendency to overturn on a curve at double speed becomes:

(A) quadrupled
(B) doubled
(C) halved
(D) unchanged

Correct Answer: A

Explanation: Inertial effects scale like v squared for the same path.

22. A ball on a string in horizontal circle: the string tension provides:

(A) centrifugal force as a real outward push
(B) centripetal force
(C) only gravity
(D) zero force

Correct Answer: B

Explanation: A ball on a string in horizontal circle: the string tension provides centripetal force.

23. For a satellite in circular orbit, centripetal force is provided by:

(A) air resistance
(B) rocket thrust continuously
(C) gravitational attraction toward Earth
(D) normal force from air

Correct Answer: C

Explanation: Gravity supplies the inward force for orbit.

24. On a friction-free banked curve, the horizontal component of normal force:

(A) balances weight only
(B) points outward
(C) is zero
(D) provides centripetal force

Correct Answer: D

Explanation: On a friction-free banked curve, the horizontal component of normal force provides centripetal force.

25. On a banked curve (no friction), FN cos theta balances:

(A) weight mg
(B) centripetal force
(C) tension
(D) engine force

Correct Answer: A

Explanation: On a banked curve (no friction), FN cos theta balances weight mg.

26. For ideal banking without friction, tan theta equals:

(A) r g / v squared
(B) v squared / (r g)
(C) v / r
(D) m g / v

Correct Answer: B

Explanation: For ideal banking without friction, tan theta equals v squared / (r g).

27. Banking angle for given v and r does not depend on:

(A) radius
(B) speed

(C) vehicle mass
(D) g

Correct Answer: C

Explanation: Banking angle for given v and r does not depend on vehicle mass.

28. Steeper banking is needed for:

(A) lower speed only
(B) larger mass only
(C) zero speed
(D) higher speed or smaller radius

Correct Answer: D

Explanation: Steeper banking is needed for higher speed or smaller radius.

29. At the top of a vertical circle, minimum speed to keep contact (ideal) is:

(A) sqrt(g r)
(B) g r squared
(C) zero
(D) 2 g r

Correct Answer: A

Explanation: At minimum, tension can be zero and mg alone supplies m v squared / r.

30. Artificial gravity in a rotating spacecraft uses:

(A) zero rotation
(B) centripetal acceleration as felt weight: g_eff = r omega squared
(C) only electric fields
(D) linear acceleration only

Correct Answer: B

Explanation: Artificial gravity in a rotating spacecraft uses centripetal acceleration as felt weight: g_eff = r omega squared.

31. A cylinder of diameter 8 m rotated at 20 rpm gives artificial g about:

(A) 9.8 m/s^2
(B) 0
(C) 0.35 m/s^2
(D) 20 m/s^2

Correct Answer: C

Explanation: r = 4 m, omega = 20 x 2 pi / 60; g_art = r omega squared is about 0.35 m/s^2.

32. Moment of inertia of a point mass m at distance r from the axis is:

(A) m r
(B) m / r
(C) r omega
(D) m r squared

Correct Answer: D

Explanation: I = m r squared for a single particle.

33. For a rigid body, moment of inertia depends on:

(A) mass distribution relative to the axis
(B) angular velocity only
(C) linear speed only
(D) colour of the body

Correct Answer: A

Explanation: I sums m r squared for all parts; layout matters.

34. Moment of inertia does NOT depend on:

(A) mass

(B) angular velocity of the spinning body
(C) distribution of mass
(D) choice of axis orientation

Correct Answer: B

Explanation: I is a geometric/inertial property; omega is separate.

35. For a uniform solid disk about its central axis, I equals:

(A) m R squared
(B) (2/5) m R squared
(C) (1/2) m R squared
(D) (1/4) m R squared

Correct Answer: C

Explanation: Standard result for a uniform disk: I = half m R squared.

36. Torque is defined as:

(A) m v
(B) I omega only
(C) F / r always
(D) r F sin theta (tendency to rotate)

Correct Answer: D

Explanation: Torque is the turning effect of a force about an axis.

37. For a force applied perpendicular to the lever arm at distance r, torque magnitude is:

(A) r F
(B) F / r
(C) r + F
(D) r F cos 90

Correct Answer: A

Explanation: For a force applied perpendicular to the lever arm at distance r, torque magnitude is r F.

38. Newton's rotational analogue is:

(A) F = I omega
(B) tau = I alpha
(C) L = m a
(D) tau = m g

Correct Answer: B

Explanation: Newton's rotational analogue is tau = I alpha.

39. Angular momentum of a particle about an axis is:

(A) L = m v only
(B) L = F t only
(C) L = r p sin theta, or vector r cross p
(D) L = I alpha

Correct Answer: C

Explanation: Angular momentum of a particle about an axis is L = r p sin theta, or vector r cross p.

40. For a rigid body rotating about a fixed axis, net angular momentum is:

(A) L = m v r only
(B) L = tau t only
(C) L = zero always
(D) L = I omega

Correct Answer: D

Explanation: For a rigid body rotating about a fixed axis, net angular momentum is L = I omega.

41. Rate of change of angular momentum equals:

(A) applied net torque

(B) mass times g
(C) centripetal force
(D) always zero

Correct Answer: A

Explanation: tau = delta L / delta t is the rotational impulse-momentum law.

42. If net external torque on a system is zero, angular momentum:

(A) must become zero
(B) is conserved
(C) doubles always
(D) equals mass times v

Correct Answer: B

Explanation: If net external torque on a system is zero, angular momentum is conserved.

43. A spinning skater pulling arms in spins faster because:

(A) mass increases
(B) torque from air is zero so omega must drop
(C) I decreases while L stays constant, so omega increases
(D) g increases

Correct Answer: C

Explanation: A spinning skater pulling arms in spins faster because I decreases while L stays constant, so omega increases.

44. A grinding wheel (3.6 kg, R = 0.31 m) at 1150 rpm has L about:

(A) 3.6 kg m/s
(B) 0.31 J
(C) 1150 J
(D) 21 kg m^2/s

Correct Answer: D

Explanation: A grinding wheel (3.6 kg, R = 0.31 m) at 1150 rpm has L about 21 kg m^2/s.

45. Torque to stop that wheel in 7.8 s (L about 21) is about:

(A) -2.7 N m
(B) +21 N m
(C) 0 N m
(D) -21 N m

Correct Answer: A

Explanation: Torque to stop that wheel in 7.8 s (L about 21) is about -2.7 N m.

46. Change in angular momentum when torque 2.5 N m acts for 2 s is:

(A) 1.25
(B) 5 kg m^2/s
(C) 2.5
(D) 0

Correct Answer: B

Explanation: Delta L = tau Delta t = 2.5 x 2 = 5 J s (same units as kg m^2/s).

47. Centrifugation separates substances by:

(A) heating only
(B) evaporation only
(C) spinning and density differences
(D) freezing

Correct Answer: C

Explanation: Spinning creates effective heavy phases outward for separation.

48. If fan blade length increases (same motor power), rotational speed tends to:

(A) increase
(B) stay exactly the same always
(C) become infinite
(D) decrease

Correct Answer: D

Explanation: Larger I for the same torque/power usually lowers omega.

49. Period T of uniform circular motion relates to omega by:

(A) T = 2 pi / omega
(B) T = omega / 2 pi
(C) T = r omega
(D) T = v r

Correct Answer: A

Explanation: One revolution is 2 pi rad, so T = 2 pi / omega.

50. Frequency f and angular speed are related by:

(A) omega = f / 2 pi
(B) omega = 2 pi f
(C) f = r omega
(D) f = v squared / r

Correct Answer: B

Explanation: Frequency f and angular speed are related by omega = 2 pi f.

51. A point farther from the axis on a rotating disk has:

(A) smaller linear speed
(B) zero speed always
(C) greater linear speed
(D) smaller omega

Correct Answer: C

Explanation: Same omega but v = r omega increases with r.

52. All points on a rigid rotating disk share the same:

(A) linear speed
(B) tangential acceleration if alpha is zero
(C) radius
(D) angular velocity

Correct Answer: D

Explanation: Rigid rotation means one omega for the whole body.

53. When alpha is nonzero, points farther from the axis have:

(A) larger tangential acceleration
(B) smaller tangential acceleration
(C) zero tangential acceleration
(D) no centripetal acceleration

Correct Answer: A

Explanation: When alpha is nonzero, points farther from the axis have larger tangential acceleration.

54. Centripetal force is not:

(A) provided by tension
(B) a separate force added to free-body diagrams in addition to real forces
(C) provided by gravity in orbit
(D) toward the centre

Correct Answer: B

Explanation: It is the name for the net inward force, not an extra push.

55. On a level curve, if friction is insufficient, the car:

(A) slides toward the centre
(B) stops instantly
(C) slides outward off the turn
(D) gains mass

Correct Answer: C

Explanation: On a level curve, if friction is insufficient, the car slides outward off the turn.

56. On a banked curve at the design speed without friction, the car:

(A) must always slide down
(B) flies upward off the bank
(C) has zero normal force
(D) needs no friction to stay on the circle

Correct Answer: D

Explanation: On a banked curve at the design speed without friction, the car needs no friction to stay on the circle.

57. Too slow on a banked curve (no friction) makes the car:

(A) slide down the incline
(B) slide up the incline
(C) orbit faster
(D) lose all weight

Correct Answer: A

Explanation: Too slow on a banked curve (no friction) makes the car slide down the incline.

58. Too fast on a banked curve (no friction) makes the car:

(A) slide down
(B) slide up/outward
(C) stop
(D) reverse

Correct Answer: B

Explanation: Too fast on a banked curve (no friction) makes the car slide up/outward.

59. Vertical circular motion at the bottom has normal force:

(A) always zero
(B) less than mg always
(C) greater than mg if speed is nonzero
(D) horizontal only

Correct Answer: C

Explanation: Vertical circular motion at the bottom has normal force greater than mg if speed is nonzero.

60. At the top of a loop, if speed is above minimum, normal force is:

(A) zero always
(B) upward away from centre
(C) equal to mv only
(D) downward (toward centre) and can be less than mg

Correct Answer: D

Explanation: Both weight and normal can supply inward Fc.

61. Gravitational force on the Moon provides:

(A) centripetal force for its orbit
(B) outward centrifugal force
(C) no force
(D) only tangential force

Correct Answer: A

Explanation: Gravitational force on the Moon provides centripetal force for its orbit.

62. Linear momentum p and angular momentum L are related for a particle by:

(A) L = p / r always
(B) L = r cross p
(C) L = m v squared
(D) L = F r only

Correct Answer: B

Explanation: Linear momentum p and angular momentum L are related for a particle by L = r cross p.

63. Torque and angular momentum are both:

(A) always scalars
(B) measured in newtons
(C) vectors (or have direction about an axis)
(D) independent of axis choice always

Correct Answer: C

Explanation: Right-hand rule gives direction for both.

64. Increasing applied torque on a fixed I body increases:

(A) moment of inertia
(B) mass
(C) radius only
(D) angular acceleration

Correct Answer: D

Explanation: tau = I alpha so larger tau means larger alpha.

65. If torque stops acting on a freely spinning body (no friction), omega:

(A) stays constant
(B) must become zero instantly
(C) doubles
(D) becomes g

Correct Answer: A

Explanation: Zero net torque means constant L and constant omega for fixed I.

66. The unit of torque is:

(A) J only without distinction
(B) N m
(C) kg m/s
(D) rad/s

Correct Answer: B

Explanation: Torque is force times lever arm: newton-metre.

67. Angular momentum SI unit is:

(A) N m
(B) rad/s
(C) kg m^2/s
(D) kg m/s

Correct Answer: C

Explanation: Same dimensions as joule-second (J s).

68. Moment of inertia SI unit is:

(A) N m
(B) rad/s^2
(C) kg/m
(D) kg m^2

Correct Answer: D

Explanation: Moment of inertia SI unit is kg m^2.

69. Centripetal acceleration at v = 10 m/s, r = 5 m is:

(A) 20 m/s^2
(B) 2 m/s^2
(C) 50 m/s^2
(D) 0.5 m/s^2

Correct Answer: A

Explanation: Centripetal acceleration at v = 10 m/s, r = 5 m is 20 m/s^2.

70. If r doubles but v stays the same, centripetal acceleration:

(A) doubles
(B) halves
(C) quadruples
(D) unchanged

Correct Answer: B

Explanation: If r doubles but v stays the same, centripetal acceleration halves.

71. If v doubles but r stays the same, centripetal acceleration:

(A) doubles
(B) halves
(C) quadruples
(D) unchanged

Correct Answer: C

Explanation: If v doubles but r stays the same, centripetal acceleration quadruples.

72. A 2 kg mass on a 3 m string at 4 m/s has centripetal force:

(A) 8 N
(B) 24 N
(C) 2 N
(D) 10.7 N

Correct Answer: D

Explanation: A 2 kg mass on a 3 m string at 4 m/s has centripetal force 10.7 N.

73. Angular displacement in degrees for half a turn is:

(A) 180 degrees
(B) 90 degrees
(C) 360 degrees
(D) 2 pi degrees

Correct Answer: A

Explanation: Half revolution is 180 degrees or pi rad.

74. Radian measure is useful because:

(A) it removes all units
(B) s = r theta links arc length directly
(C) it equals degrees
(D) it is force times distance

Correct Answer: B

Explanation: With theta in rad, arc length is simply r theta.

75. In circular motion, acceleration has two parts when speed changes:

(A) only centripetal always
(B) only gravitational
(C) tangential and centripetal
(D) zero

Correct Answer: C

Explanation: In circular motion, acceleration has two parts when speed changes tangential and centripetal.

76. For pure uniform circular motion (constant speed), tangential acceleration is:

(A) v squared / r
(B) r omega squared tangentially
(C) equal to g
(D) zero

Correct Answer: D

Explanation: No change of speed means at = 0; only centripetal remains.

77. Which provides centripetal force for a car on a banked track at design speed?

(A) normal force component
(B) weight alone
(C) air drag outward
(D) magnetic force

Correct Answer: A

Explanation: Normal force component — this correctly answers the question.

78. Conservation of angular momentum applies when:

(A) linear momentum is zero
(B) net external torque is zero
(C) speed is constant
(D) I is constant always

Correct Answer: B

Explanation: External torque would change L; without it, L is fixed.

79. A rigid body has angular velocity omega. Linear speed of a point at 0.5 m is 2 m/s. omega is:

(A) 2 rad/s
(B) 1 rad/s
(C) 4 rad/s
(D) 0.5 rad/s

Correct Answer: C

Explanation: A rigid body has angular velocity omega. Linear speed of a point at 0.5 m is 2 m/s. omega is 4 rad/s.

80. If omega = 3 rad/s and alpha = 2 rad/s^2, after 2 s omega becomes:

(A) 5 rad/s
(B) 6 rad/s
(C) 3 rad/s
(D) 7 rad/s

Correct Answer: D

Explanation: If omega = 3 rad/s and alpha = 2 rad/s^2, after 2 s omega becomes 7 rad/s.

B. Less Important / Secondary Topics

81. Circular motion requires:

(A) continuous change of velocity direction
(B) zero acceleration
(C) constant velocity vector
(D) no force

Correct Answer: A

Explanation: Turning means changing direction, hence acceleration toward centre.

82. Centrifugal force in a rotating frame is:

(A) the real inward force
(B) a fictitious outward effect in the rotating frame, not a real force in inertial analysis
(C) same as gravity
(D) measured in kg

Correct Answer: B

Explanation: In inertial frames we use real inward forces, not centrifugal as real.

83. Degrees and radians are related by:

(A) 360 degrees = pi rad
(B) 1 degree = 1 rad
(C) 180 degrees = pi rad
(D) 90 degrees = 2 pi rad

Correct Answer: C

Explanation: Degrees and radians are related by 180 degrees = pi rad.

84. One radian is approximately:

(A) 180 degrees
(B) 360 degrees
(C) 1 degree
(D) 57 degrees

Correct Answer: D

Explanation: 180/pi is about 57.3 degrees per radian.

85. For uniform circular motion, kinetic energy:

(A) can stay constant if speed is constant
(B) must always increase
(C) is always zero
(D) equals m g h only

Correct Answer: A

Explanation: Speed constant means scalar KE unchanged even though velocity turns.

86. Friction on a flat turn can point:

(A) only outward
(B) toward the centre (static friction)
(C) only upward
(D) only zero

Correct Answer: B

Explanation: Friction on a flat turn can point toward the centre (static friction).

87. Tension in a vertical loop at the bottom is:

(A) always zero
(B) less than weight always
(C) greater than weight for circular motion
(D) horizontal

Correct Answer: C

Explanation: Normal/tension must exceed mg to supply extra centripetal need.

88. Orbital speed of a satellite depends on:

(A) satellite colour
(B) satellite name
(C) only its mass
(D) radius and central mass (via gravity)

Correct Answer: D

Explanation: For circular orbit, v is set by r and g effective at that height.

89. I for two equal point masses on opposite ends of a light rod (centre axis) is:

(A) 2 m (L/2)^2 if separation L
(B) zero
(C) m L only
(D) independent of separation

Correct Answer: A

Explanation: I for two equal point masses on opposite ends of a light rod (centre axis) is 2 m (L/2)^2 if separation L.

90. Doubling mass at same r doubles:

(A) angular velocity
(B) moment of inertia contribution m r squared
(C) omega always
(D) nothing

Correct Answer: B

Explanation: I is proportional to mass for fixed geometry.

91. Torque can be zero if:

(A) force is large
(B) I is large
(C) force line passes through the axis (r = 0 or parallel)
(D) omega is large

Correct Answer: C

Explanation: Torque can be zero if force line passes through the axis (r = 0 or parallel).

92. Angular momentum direction is given by:

(A) always downward
(B) always east
(C) random
(D) right-hand rule

Correct Answer: D

Explanation: Curl fingers with rotation; thumb gives L direction.

93. Spinning ice skater: arms in increases I or decreases I?

(A) decreases I
(B) increases I
(C) no change
(D) I becomes zero

Correct Answer: A

Explanation: Decreases I — this correctly answers the question.

94. Earth rotation assignment uses L = I omega with omega about:

(A) 1 rad/s
(B) 7.29 x 10^-5 rad/s
(C) 2 pi rad/s
(D) zero

Correct Answer: B

Explanation: Earth's angular speed is about 7.29 x 10^-5 rad/s.

95. Centripetal force on 1 kg at 2 m/s in r = 1 m is:

(A) 2 N
(B) 1 N
(C) 4 N
(D) 0.5 N

Correct Answer: C

Explanation: Centripetal force on 1 kg at 2 m/s in r = 1 m is 4 N.

96. If no net force acted on a circling object, it would:

(A) keep circling
(B) stop instantly
(C) move to the centre
(D) move off in a straight line tangent

Correct Answer: D

Explanation: If no net force acted on a circling object, it would move off in a straight line tangent.

97. Banking reduces reliance on:

(A) friction for centripetal force
(B) gravity
(C) mass
(D) radius

Correct Answer: A

Explanation: Banking reduces reliance on friction for centripetal force.

98. Artificial gravity increases if:

(A) omega decreases
(B) rotation rate omega increases
(C) radius to axis decreases while standing on rim... actually on rim larger r increases g_art = r omega^2
(D) rotation stops

Correct Answer: B

Explanation: Artificial gravity increases if rotation rate omega increases.

99. For a disk, doubling R while keeping m same multiplies I by:

(A) 2
(B) 8
(C) 4
(D) 1

Correct Answer: C

Explanation: I proportional to R squared so double R gives 4 times I.

100. Stopping a wheel applies torque:

(A) in same direction as spin
(B) zero
(C) perpendicular to axle only without effect
(D) opposite to spin (negative if L was positive)

Correct Answer: D

Explanation: Torque must oppose angular momentum to slow it.

101. Delta L = 5 kg m^2/s means angular momentum:

(A) changed by that amount
(B) is exactly 5 always
(C) is conserved
(D) equals torque

Correct Answer: A

Explanation: Delta L is the change, here from applied torque over time.

102. Uniform circular motion period at 60 rpm is:

(A) 60 s
(B) 1 s
(C) 0.5 s
(D) 2 s

Correct Answer: B

Explanation: Uniform circular motion period at 60 rpm is 1 s.

103. omega for 60 rpm in rad/s is:

(A) 60 rad/s
(B) 1 rad/s
(C) 2 pi rad/s
(D) pi rad/s

Correct Answer: C

Explanation: One revolution per second is 2 pi rad/s.

104. Centripetal acceleration unit is:

(A) N
(B) rad/s
(C) kg m^2
(D) m/s^2

Correct Answer: D

Explanation: Centripetal acceleration unit is m/s^2.

105. Torque tau = r F sin theta. If theta = 0 (force along r), torque is:

(A) zero
(B) maximum
(C) r F
(D) infinite

Correct Answer: A

Explanation: Torque tau = r F sin theta. If theta = 0 (force along r), torque is zero.

106. L = I omega. If I halved and L constant, omega:

(A) halves
(B) doubles
(C) unchanged
(D) zero

Correct Answer: B

Explanation: omega = L / I so half I doubles omega.

107. A particle moves in a circle at constant speed. Work by centripetal force is:

(A) positive always
(B) m v squared
(C) zero (force perpendicular to displacement)
(D) m g h

Correct Answer: C

Explanation: Centripetal force is perpendicular to each small displacement.

108. Which is a vector product example in this chapter?

(A) W = F dot d
(B) Fc = m v squared / r scalar magnitude
(C) I = m r squared scalar
(D) L = r cross p

Correct Answer: D

Explanation: Angular momentum uses the cross product of r and p.