Q1. A particle is moving with uniform velocity. Which of the following is true about its acceleration

A) Constant
B) Zero
C) Increasing
D) Decreasing

Answer: B) Zero
Explanation:
Uniform velocity implies no change in velocity with time, hence acceleration = 0.

Q2. The slope of position-time graph gives:

A) Acceleration
B) Displacement
C) Velocity
D) Jerk

Answer: C) Velocity
Explanation:
Slope = $\Delta x/\Delta t$ = velocity in a position-time graph.

Q3. A body is dropped from a height. What is its acceleration just before hitting the ground? (Neglect air resistance)

A) 0
B) 9.8 m/s^2 upward
C) 9.8 m/s^2 downward
D) Infinity

Answer: C) 9.8 m/s² downward
Explanation:
Free fall under gravity implies constant acceleration = g = 9.8 m/s² downward.

Q4. What is the SI unit of displacement?

A) m/s
B) m
C) m/s²
D) s

Answer: B) m
Explanation:
Displacement is a measure of length, so SI unit = meter (m).

Q5. When is average velocity equal to average speed?

A) Always
B) Never
C) When motion is uniform
D) When displacement equals total distance

Answer: D) When displacement equals total distance
Explanation:
Average velocity = displacement/time;
Average speed = distance/time.
If displacement = distance, both are equal.

Q6. A car accelerates uniformly from 10 m/s to 20 m/s in 5 seconds. What is its acceleration?

A) 2 m/s²
B) 3 m/s²
C) 5 m/s²
D) 10 m/s²

Answer: A) 2 m/s²
Explanation:
a = (v - u)/t = (20 - 10)/5 = 2 m/s²

Q7. If the velocity-time graph is a straight line inclined to time axis, then the motion is:

A) Uniform
B) With constant acceleration
C) With variable acceleration
D) At rest

Answer: B) With constant acceleration
Explanation:
Straight line in v–t graph → constant slope → constant acceleration.

Q8. A particle moves along x-axis with velocity v = 5t. What is its acceleration?

A) 0
B) 5
C) 10
D) t

Answer: B) 5

Explanation:
Acceleration = $dv/dt = d(5t)/dt = 5\ m/s^2$

Q9. Displacement can be:

A) Only positive
B) Positive or zero
C) Negative, zero or positive
D) Only negative

Answer: C) Negative, zero or positive
Explanation:
Displacement is a vector with direction, so it can take all three values.

Q10. A body starts from rest and moves with uniform acceleration. Which graph represents this motion correctly?

A) Straight horizontal line in x–t graph
B) Parabola in x–t graph
C) Straight line in x–t graph
D) Exponential curve in x–t graph

Answer: B) Parabola in x–t graph
Explanation:
For uniform acceleration,
$x = ut + \frac{1}{2}at^2$ → parabolic equation → parabola in x–t graph

Q11. A body moves with uniform acceleration. Its velocity after time t is given by:

A) $v = u + at^2$

B) $v = u + \frac{1}{2}at$
C) $v = u + at$
D) $v = ut + \frac{1}{2}a$

Answer: C) $v = u + at$
Explanation:
This is the first equation of motion for uniformly accelerated motion.

Q12. The area under velocity-time graph represents:

A) Velocity
B) Acceleration
C) Displacement
D) Force

Answer: C) Displacement
Explanation:
Area under v–t graph = displacement.

Q13. A car travels 100 m in 5 s and then 200 m in 10 s. What is its average speed?

A) 10 m/s
B) 15 m/s
C) 12 m/s
D) 20 m/s

Answer: A) 10 m/s
Explanation:
Total distance = 100 + 200 = 300 m
Total time = 5 + 10 = 15 s
Average speed = 300 / 15 = 10 m/s

Q14. A train accelerates from 20 m/s to 30 m/s in 10 s. Find the distance covered during this time.

A) 200 m
B) 250 m
C) 300 m
D) 400 m

Answer: B) 250 m
Explanation:
Use:
$s = \frac{1}{2}(v + u)t = \frac{1}{2}(30 + 20) \times 10 = 250$ m

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Q15. If a body is moving with constant velocity, then which of the following is true?

A) Displacement is zero
B) Acceleration is zero
C) Acceleration is constant
D) Velocity is zero

Answer: B) Acceleration is zero
Explanation:
Constant velocity means no change in velocity → zero acceleration

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Q16. Displacement-time graph of a body is a straight line parallel to the time axis. What does it mean?

A) Body is at rest
B) Body is moving
C) Body is accelerating
D) Body is moving with variable velocity

Answer: A) Body is at rest
Explanation:
No change in displacement → body not moving.

Q17. If a particle covers equal distances in equal intervals of time, its motion is:

A) Non-uniform
B) Accelerated
C) Uniform
D) Retarded

Answer: C) Uniform
Explanation:
Equal distances in equal time = uniform motion.

Q18. What does the negative slope of a velocity-time graph indicate?

A) Uniform acceleration
B) Zero acceleration
C) Uniform retardation
D) Increasing speed

Answer: C) Uniform retardation
Explanation:
Negative slope = negative acceleration = retardation

Q19. A body thrown vertically upward returns to ground in 4 seconds. What was its initial velocity? ($g = 9.8\ m/s^2$)

A) 9.8 m/s
B) 19.6 m/s
C) 39.2 m/s
D) 4.9 m/s

Answer: B) 19.6 m/s
Explanation:
Total time = 4 s → time to reach top = 2 s
$v = u - gt \rightarrow 0 = u - 9.8 \times 2 \rightarrow u = 19.6\ m/s$

Q20. A body is thrown upward with velocity 29.4 m/s. Time to reach maximum height is: ($g = 9.8\ m/s^2$)

A) 1 s
B) 2 s
C) 3 s
D) 4 s

Answer: C) 3 s
Explanation:
At topmost point, v = 0
Use: $0 = u - gt \rightarrow 0 = 29.4 - 9.8t \rightarrow t = 3$ s

Q21. Which of the following is a vector quantity?

A) Speed
B) Distance
C) Velocity

D) Time

Answer: C) Velocity
Explanation:
Velocity has both magnitude and direction → vector quantity.

Q22. A particle is moving in negative x-direction with acceleration in positive x-direction. What happens to its speed?

A) Increases
B) Decreases
C) Remains constant
D) First increases then decreases

Answer: B) Decreases
Explanation:
Acceleration opposite to velocity → motion is retarded, speed decreases.

Q23. For a uniformly accelerated motion, which graph is a straight line?

A) Displacement-time
B) Velocity-time
C) Acceleration-time
D) Velocity-displacement

Answer: B) Velocity-time
Explanation:
For uniform acceleration, v–t graph is a straight line with constant slope.

Q24. If a body travels in a straight line and returns to its starting point, its displacement is:

A) Equal to distance
B) Zero
C) Positive
D) Equal to velocity

Answer: B) Zero
Explanation:
Displacement is the net change in position. Start and end same → 0.

Q25. A car starts from rest and attains a velocity of 20 m/s in 10 s. Find distance covered.

A) 100 m
B) 200 m
C) 50 m
D) 150 m

Answer: A) 100 m
Explanation:
Use: $s = ut + \frac{1}{2}at^2$
$u = 0$, $v = 20$, $t = 10$ → $a = (v - u)/t = 2$
Then, $s = 0 + \frac{1}{2} \times 2 \times 10^2 = 100$ m

Q26. SI unit of acceleration is:

A) m/s
B) m

C) m/s^2
D) s/m^2

Answer: C) m/s^2
Explanation:
Acceleration = change in velocity / time → m/s^2

Q27. A car is moving with uniform acceleration. Which of the following remains constant?

A) Speed
B) Distance
C) Acceleration
D) Displacement

Answer: C) Acceleration
Explanation:
Uniform acceleration means constant acceleration.

Q28. A body thrown vertically upwards reaches a height of 19.6 m. What was its initial speed? ($g = 9.8\ m/s^2$)

A) 9.8 m/s
B) 14 m/s
C) 19.6 m/s
D) 0 m/s

Answer: B) 14 m/s
Explanation:
Use: $v^2 = u^2 – 2gh$, at max height $v = 0$
$0 = u^2 – 2\times9.8\times19.6 \rightarrow u^2 = 384.16 \rightarrow u = \sqrt{384.16} \approx 14$ m/s

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Q29. Instantaneous speed is equal to the magnitude of instantaneous velocity when:

A) The object is at rest
B) The motion is circular
C) The motion is along a straight line
D) The object returns to its starting point

Answer: C) The motion is along a straight line
Explanation:
When motion is linear, speed = |velocity|

Q30. A particle's position is given by $x(t) = 3t^2 + 2t + 1$. What is its acceleration?

A) 6 m/s^2
B) 2 m/s^2
C) 3 m/s^2
D) Constant

Answer: A) 6 m/s^2
Explanation:
$x(t) = 3t^2 + 2t + 1$
$v = dx/dt = 6t + 2 \rightarrow a = dv/dt = 6\ m/s^2$

Q31. A boy walks 10 m north, then 10 m south. What is his displacement?

A) 20 m
B) 10 m

C) 0 m
D) 5 m

Answer: C) 0 m
Explanation:
Displacement is net change in position → comes back to original point → 0

Q32. The magnitude of average velocity can never be:

A) Greater than average speed
B) Equal to average speed
C) Less than average speed
D) Zero

Answer: A) Greater than average speed
Explanation:
Average speed ≥ average velocity
(because distance ≥ displacement)

Q33. The dimension of velocity is:

A) [LT]
B) [L/T]
C) $[L^2/T^2]$
D) [T/L]

Answer: B) [L/T]
Explanation:
Velocity = displacement/time → [length/time]

Q34. If velocity-time graph is a curve, then the motion is:

A) Uniform
B) With uniform acceleration
C) With non-uniform acceleration
D) Retarded

Answer: C) With non-uniform acceleration
Explanation:
Non-linear v–t graph indicates changing acceleration → non-uniform acceleration

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Q35. Displacement of a particle is given by $s = t^3 – 3t^2 + 2t$. Find velocity at $t = 2$ s.

A) 2 m/s
B) 4 m/s
C) 6 m/s
D) 0 m/s

Answer: A) 2 m/s
Explanation:
$v = ds/dt = 3t^2 – 6t + 2$
v at $t = 2 \rightarrow 3(4) – 6(2) + 2 = 12 – 12 + 2 = 2$ m/s

Q36. A particle starts from rest and moves with uniform acceleration of 2 m/s². What is the ratio of distances covered in the 4th and 3rd seconds?

A) 7:5
B) 5:3
C) 9:7
D) 13:7

Answer: A) 7:5
Explanation:
Distance in the nth second is given by:
s_n = u + (a divided by 2) × (2n − 1)
Since u = 0 and a = 2,
s_4 = (2 divided by 2) × (2×4 − 1) = 1 × 7 = 7
s_3 = (2 divided by 2) × (2×3 − 1) = 1 × 5 = 5
Ratio = 7:5

Q37. The acceleration of a particle is given by a = $3t^2$. If initial velocity is zero, what is the displacement after time t?

A) ($3t^3$) divided by 3
B) (t^3) divided by 3
C) ($3t^4$) divided by 4
D) (t^4) divided by 4

Answer: D) (t^4) divided by 4
Explanation:
Acceleration a = dv/dt = $3t^2$
⇒ v = ∫$3t^2$ dt = t^3 (since initial velocity = 0)
⇒ Displacement x = ∫v dt = ∫t^3 dt = (t^4) divided by 4

Q38. A particle is thrown vertically upward and another is dropped simultaneously from the same height. When they meet, which of the following is correct?

A) They travel equal distances
B) They have same speed
C) Their accelerations are equal
D) They collide at maximum height

Answer: C) Their accelerations are equal
Explanation:
Both are under the same gravitational acceleration g downward.

Q39. A train starts from rest, accelerates at rate 'a' for time t_1, moves at constant speed for time t_2, and then decelerates at rate 'a' for time t_3 to rest. What is the total distance covered?

A) (one-half) a t_1^2 + a t_1 t_2 + (one-half) a t_3^2
B) a (t_1 + t_2 + t_3)
C) a t_1 t_2 + a t_3^2
D) (one-half) a (t_1^2 + t_2^2 + t_3^2)

Answer: A) (one-half) a t_1^2 + a t_1 t_2 + (one-half) a t_3^2
Explanation:
Distance while accelerating = (one-half) a t_1^2
Distance at constant speed = v × t_2 = (a × t_1) × t_2 = a t_1 t_2
Distance while decelerating = (one-half) a t_3^2
Total = all three added.

Q40. A ball is thrown vertically upward and returns after 6 seconds. What is the maximum height reached? (Take g = 9.8 m/s²)

A) 44.1 m
B) 66.2 m
C) 88.2 m
D) 22.05 m

Answer: A) 44.1 m
Explanation:
Total time = 6 s ⇒ time to reach max height = 3 s

Use: $h = (\text{one-half})\, g\, t^2$
$= (\text{one-half}) \times 9.8 \times 3^2 = 44.1$ m

Q41. Which graph best represents uniformly retarded motion?

A) Velocity-time graph with negative slope
B) Displacement-time graph with increasing slope
C) Displacement-time graph with constant slope
D) Acceleration-time graph as a curve

Answer: A) Velocity-time graph with negative slope
Explanation:
Uniform retardation means constant negative acceleration ⇒ velocity decreases linearly ⇒ negative slope.

Q42. The velocity of a particle is given by $v = 6t - t^2$. When does it return to its initial position?

A) 3 s
B) 6 s
C) 9 s
D) Never

Answer: C) 9 s
Explanation:
$v = dx/dt = 6t - t^2$
Integrate to get position:
$x = \int(6t - t^2)\, dt = 3t^2 - (t^3$ divided by 3)
Set $x = 0$:
$3t^2 - (t^3$ divided by 3) $= 0$

⇒ $t^2(3 - t \text{ divided by } 3) = 0$
⇒ t = 0 or t = 9

Q43. A particle moves with constant velocity of 4 m/s. What is the acceleration and the nature of displacement-time graph?

A) Acceleration = 4 m/s^2, Graph = Parabola
B) Acceleration = 0, Graph = Straight line
C) Acceleration = 0, Graph = Parabola
D) Acceleration = 4 m/s^2, Graph = Straight line

Answer: B) Acceleration = 0, Graph = Straight line
Explanation:
Constant velocity means no change in speed ⇒ acceleration = 0
Displacement varies linearly ⇒ s–t graph is a straight line.

Q44. A ball is projected vertically upward with initial velocity u. What is the total time of flight?

A) u divided by g
B) u divided by 2g
C) 2u divided by g
D) 2g divided by u

Answer: C) 2u divided by g
Explanation:
Time to reach max height = u divided by g
Total time = 2 × (u divided by g) = 2u divided by g

Q45. At the maximum height of vertical motion, which statement is correct?

A) Velocity = g
B) Acceleration = 0
C) Velocity = 0, Acceleration = g
D) Velocity = g, Acceleration = 0

Answer: C) Velocity = 0, Acceleration = g
Explanation:
At the highest point, vertical velocity becomes zero but gravitational acceleration remains constant downward.