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Physics Grade 9 — Chapter 3

Dynamics I

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Independent practice MCQs from the supplied Class 9 Physics notes pack. Total: 50 questions. Each item has four options, the correct letter, and a short explanation.

A. Important / Main Topics

1. The branch of mechanics that deals with the study of motion along with its causes is called:

(A) Dynamics
(B) Kinematics
(C) Statics
(D) Geometry

Correct Answer: A

Explanation: The text states that dynamics is the branch of mechanics in which we discuss the motion of bodies along with the causes of motion.

2. Force is a:

(A) Scalar quantity
(B) Vector quantity
(C) Base quantity
(D) Derived quantity

Correct Answer: B

Explanation: The text states that force is a vector quantity because it has both magnitude and direction.

3. The SI unit of force is the:

(A) Joule
(B) Watt
(C) Newton
(D) Pascal

Correct Answer: C

Explanation: The SI unit of force is the newton (N).

4. Which of the following is a contact force?

(A) Gravitational force
(B) Electrostatic force
(C) Magnetic force
(D) Friction

Correct Answer: D

Explanation: Friction requires physical contact between surfaces. The others are non-contact forces.

5. The force that keeps the positively charged protons packed in the nucleus of an atom is the:

(A) Strong nuclear force
(B) Gravitational force
(C) Electromagnetic force
(D) Weak nuclear force

Correct Answer: A

Explanation: The text states that the strong nuclear force keeps the positively charged protons tightly packed in the nucleus.

6. Newton's first law of motion is also called the law of:

(A) Acceleration
(B) Inertia

(C) Momentum
(D) Reaction

Correct Answer: B

Explanation: Newton's first law is often called the law of inertia because it describes the tendency of an object to resist changes in motion.

7. Newton's second law of motion is mathematically expressed as:

(A) $F = m/v$
(B) $F = m + a$
(C) $F = ma$
(D) $F = v/t$

Correct Answer: C

Explanation: The text states that Newton's second law is $F_{\text{net}} = ma$.

8. Newton's third law of motion states that:

(A) Force equals mass times acceleration.
(B) An object at rest stays at rest.
(C) Momentum is conserved.
(D) To every action, there is an equal and opposite reaction.

Correct Answer: D

Explanation: The text states that to every action, there is an equal and opposite reaction.

9. The quantity of matter in a body is called:

(A) Mass
(B) Weight
(C) Force
(D) Momentum

Correct Answer: A

Explanation: The text defines mass as the quantity of matter in a body.

10. The downward force with which the Earth pulls a body is called:

(A) Mass
(B) Weight
(C) Inertia
(D) Momentum

Correct Answer: B

Explanation: The text defines weight as the downward force with which the earth pulls a body towards its center.

11. The product of mass and velocity is called:

(A) Force
(B) Acceleration
(C) Momentum
(D) Weight

Correct Answer: C

Explanation: The text defines momentum as the product of mass and velocity ($\vec{p} = m\vec{v}$).

12. The law of conservation of momentum states that the momentum of an isolated system:

(A) Always increases
(B) Always decreases
(C) Becomes zero
(D) Remains constant

Correct Answer: D

Explanation: The text states that if there is no external force applied to a system, the momentum of that system remains constant.

13. Gravitational field strength is defined as:

(A) Force per unit mass
(B) Mass per unit force
(C) Force per unit volume
(D) Mass per unit volume

Correct Answer: A

Explanation: The text defines gravitational field strength as the force per unit mass that earth exerts on a body.

14. Which of the following is a vector quantity?

(A) Mass
(B) Weight
(C) Speed
(D) Distance

Correct Answer: B

Explanation: Weight is a force and is a vector quantity. Mass, speed, and distance are scalars.

15. The acceleration produced by a net force acting on an object is directly proportional to the:

(A) Mass of the object
(B) Volume of the object
(C) Magnitude of the net force
(D) Weight of the object

Correct Answer: C

Explanation: According to Newton's second law, acceleration is directly proportional to the net force and inversely proportional to the mass.

16. If a net force of 10 N acts on a mass of 2 kg, the acceleration is:

(A) 10 m/s^2
(B) 20 m/s^2
(C) 2 m/s^2
(D) 5 m/s^2

Correct Answer: D

Explanation: If a net force of 10 N acts on a mass of 2 kg, the acceleration is 5 m/s^2.

17. The same engine is installed in a bus (mass 12,000 kg) and a car (mass 1,200 kg), applying a force of 3000 N. The acceleration of the bus is:

(A) 0.25 m/s^2
(B) 2.5 m/s^2
(C) 0.025 m/s^2
(D) 25 m/s^2

Correct Answer: A

Explanation: $a = F/m = 3000/12000 = 0.25\text{ m/s}^2$, as calculated in the text.

18. For the same engine in MCQ 17, the acceleration of the car is:

(A) 0.25 m/s^2
(B) 2.5 m/s^2
(C) 0.025 m/s^2
(D) 25 m/s^2

Correct Answer: B

Explanation: $a = F/m = 3000/1200 = 2.5\text{ m/s}^2$, as calculated in the text.

19. A force of 5 N is applied to a body weighing 10 N. Its acceleration is: (Take $g = 10\text{ m/s}^2$)

(A) 0.5 m/s^2
(B) 2 m/s^2
(C) 5 m/s^2
(D) 50 m/s^2

Correct Answer: C

Explanation: "\(5\text{ m/s}^2\)" is correct: it matches the idea asked in the question ("A force of 5 N is applied to a body weighing 10 N. Its acceleration is: (Take \(g = 10\text{ m/s}^2\))"), while the other choices do not.

20. A book of mass 5 kg is placed on a table. The magnitude of the net force acting on the book is:

(A) \(50\text{ N}\)
(B) \(5\text{ N}\)
(C) \(25\text{ N}\)
(D) \(0\text{ N}\)

Correct Answer: D

Explanation: A book of mass 5 kg is placed on a table. The magnitude of the net force acting on the book is \(0\text{ N}\).

21. A force acts on a body for 2 seconds and produces a change in momentum of \(50\text{ kg·m/s}\). The force is:

(A) \(25\text{ N}\)
(B) \(100\text{ N}\)
(C) \(50\text{ N}\)
(D) \(2\text{ N}\)

Correct Answer: A

Explanation: A force acts on a body for 2 seconds and produces a change in momentum of \(50\text{ kg·m/s}\). The force is \(25\text{ N}\).

22. A golfer hits a ball of mass 45 g, giving it a speed of \(80\text{ m/s}\). The momentum imparted is:

(A) \(36\text{ kg·m/s}\)
(B) \(3.6\text{ kg·m/s}\)
(C) \(0.36\text{ kg·m/s}\)
(D) \(360\text{ kg·m/s}\)

Correct Answer: B

Explanation: \(p = mv = 0.045 \times 80 = 3.6\text{ kg·m/s}\), as calculated in the text.

23. A force of \(5\text{ N}\) to the right and a force of \(3\text{ N}\) to the left act on an object. The net force is:

(A) \(8\text{ N}\) to the right
(B) \(2\text{ N}\) to the left
(C) \(2\text{ N}\) to the right
(D) \(8\text{ N}\) to the left

Correct Answer: C

Explanation: The forces are in opposite directions. Net force = \(5 - 3 = 2\text{ N}\) to the right (direction of the larger force).

24. When a hanging carpet is beaten with a stick, dust flies off because:

(A) The dust is attracted to the stick
(B) The carpet repels the dust
(C) The dust has no mass
(D) The carpet moves and the dust stays due to inertia

Correct Answer: D

Explanation: When the carpet is beaten, it moves, but the dust particles tend to remain at rest due to inertia. This causes the dust to separate from the carpet.

25. The mass of a body is 8 kg. Its weight on Earth is: (Take \(g = 9.8\text{ m/s}^2\))

(A) \(78.4\text{ N}\)
(B) \(8\text{ N}\)
(C) \(9.8\text{ N}\)
(D) \(80\text{ N}\)

Correct Answer: A

Explanation: \(W = mg = 8 \times 9.8 = 78.4\text{ N}\), as calculated in the text.

B. Less Important / Secondary Topics

26. The mass of a body is 8 kg. Its weight on the Moon is: (Take $g_m = 1.625\text{ m/s}^2$)

(A) 13 N
(B) 78.4 N
(C) 8 N
(D) 1.625 N

Correct Answer: A

Explanation: $W_m = m \times g_m = 8 \times 1.625 = 13\text{ N}$, as calculated in the text.

27. A box weighs 400 N on Earth and 150 N on an unknown planet. The gravitational field strength on that planet is: (Take $g_e = 9.8\text{ N/kg}$)

(A) 36.75 N/kg
(B) 3.675 N/kg
(C) 0.3675 N/kg
(D) 367.5 N/kg

Correct Answer: B

Explanation: $g_N = (W_N / W_E) \times g_E = (150/400) \times 9.8 = 3.675\text{ N/kg}$, as calculated in the text.

28. A car of mass 1200 kg moving at 8 m/s is stopped in 5 s. The force required is:

(A) 1920 N
(B) -960 N
(C) -1920 N
(D) 960 N

Correct Answer: C

Explanation: $F = (mv_f - mv_i)/t = (0 - 1200 \times 8)/5 = -1920\text{ N}$, as calculated in the text.

29. A truck of mass 10,000 kg moving at 8 m/s is stopped in 5 s. The force required is:

(A) $16,000\text{ N}$
(B) $-1,600\text{ N}$
(C) $1,600\text{ N}$
(D) $-16,000\text{ N}$

Correct Answer: D

Explanation: A truck of mass 10,000 kg moving at 8 m/s is stopped in 5 s. The force required is $-16,000\text{ N}$.

30. The impulse is defined as the product of:

(A) Force and time
(B) Mass and velocity
(C) Force and distance
(D) Mass and acceleration

Correct Answer: A

Explanation: Impulse is the product of the force exerted on an object and the time interval over which the force acts ($J = F \times \Delta t$).

31. A rocket accelerates in space because:

(A) It pushes against the air
(B) The hot gases it expels have momentum, and the rocket gains equal and opposite momentum
(C) Gravity pulls it forward
(D) It has no mass

Correct Answer: B

Explanation: The text states that rockets accelerate in space due to conservation of momentum. The hot gases expelled have momentum, and the rocket gains an equal and opposite momentum.

32. A gun of mass 3 kg fires a bullet of mass 17 g at 350 m/s. The recoil velocity of the gun is:

(A) 1.98 m/s

(B) -19.8 m/s
(C) -1.98 m/s
(D) 19.8 m/s

Correct Answer: C

Explanation: By conservation of momentum: $m_g v_g + m_b v_b = 0$. $v_g = -(0.017 \times 350)/3 = -1.98\text{ m/s}$, as calculated in the text.

33. Which of the following is a non-contact force?

(A) Normal force
(B) Tension
(C) Friction
(D) Gravitational force

Correct Answer: D

Explanation: Gravitational force acts at a distance without physical contact. The others are contact forces.

34. The force that propels a flying machine in the direction of motion is called:

(A) Thrust
(B) Friction
(C) Tension
(D) Normal force

Correct Answer: A

Explanation: The text defines thrust as the force that propels a flying machine in the direction of motion.

35. The exchange particle for the electromagnetic force is the:

(A) Pion
(B) Photon
(C) Graviton
(D) Vector boson

Correct Answer: B

Explanation: The text states that the electromagnetic force is mediated by a massless particle known as a photon.

36. A boy is holding a book of mass 2 kg. The force he applies on the book is: (Take $g = 9.8\text{ m/s}^2$)

(A) 2 N
(B) 9.8 N
(C) 19.6 N
(D) 0 N

Correct Answer: C

Explanation: The force applied must balance the weight of the book: $F = mg = 2 \times 9.8 = 19.6\text{ N}$, as given in the numerical answers.

37. For the boy in MCQ 36, if he moves the book up with an acceleration of 3 m/s^2, the total force he applies is:

(A) 19.6 N
(B) 6 N
(C) 3 N
(D) 25.6 N

Correct Answer: D

Explanation: Total force = weight + ma = $19.6 + 2 \times 3 = 25.6\text{ N}$, as given in the numerical answers.

38. A girl of mass 30 kg is running with a velocity of 4 m/s. Her momentum is:

(A) 120 kg·m/s
(B) 34 kg·m/s
(C) 7.5 kg·m/s
(D) 0 kg·m/s

Correct Answer: A

Explanation: $p = mv = 30 \times 4 = 120\text{ kg·m/s}$, as given in the numerical answers.

39. A 2 kg steel ball moving at 15 m/s hits a bulk of sand and comes to rest in 0.2 s. The force applied by the sand on the ball is:

(A) 150 N
(B) -150 N
(C) -30 N
(D) 30 N

Correct Answer: B

Explanation: $F = (mv_f - mv_i)/t = (0 - 2 \times 15)/0.2 = -150\text{ N}$, as given in the numerical answers.

40. A 100 g bullet is fired from a 5 kg gun with a muzzle velocity of 20 m/s. The recoil velocity of the gun is:

(A) 0.4 m/s
(B) -4 m/s
(C) -0.4 m/s
(D) 4 m/s

Correct Answer: C

Explanation: By conservation of momentum: $v_g = -(0.1 \times 20)/5 = -0.4\text{ m/s}$, as given in the numerical answers.

41. A robotic car of 15 kg is moving at 25 m/s. Brakes apply a constant force of 50 N to stop it. The time taken to stop is:

(A) 0.75 s
(B) 75 s
(C) 1.5 s
(D) 7.5 s

Correct Answer: D

Explanation: Time = change in momentum / force = $(15 \times 25)/50 = 7.5\text{ s}$, as given in the numerical answers.

42. A force of 10 N is applied to a body of mass 2 kg for 3 s. The change in velocity is:

(A) 15 m/s
(B) 5 m/s
(C) 6 m/s
(D) 30 m/s

Correct Answer: A

Explanation: A force of 10 N is applied to a body of mass 2 kg for 3 s. The change in velocity is 15 m/s.

43. Two objects of masses m_1 and m_2 are moving with velocities v_1 and v_2. If they collide and stick together, the final velocity is:

(A) $\frac{m_1 v_1 - m_2 v_2}{m_1 + m_2}$
(B) $\frac{m_1 v_1 + m_2 v_2}{m_1 + m_2}$
(C) $\frac{m_1 v_1}{m_2}$
(D) $v_1 + v_2$

Correct Answer: B

Explanation: By conservation of momentum, the total initial momentum equals the total final momentum: $m_1 v_1 + m_2 v_2 = (m_1 + m_2)v_f$. Solving for v_f gives the expression in option A.

44. A rocket of mass 1000 kg expels 100 kg of gas at 500 m/s. The velocity gained by the rocket is:

(A) 5 m/s
(B) 500 m/s

(C) 50 m/s
(D) 0.5 m/s

Correct Answer: C

Explanation: By conservation of momentum: $m_r v_r + m_g v_g = 0$. $v_r = -(100 \times 500)/1000 = -50\text{ m/s}$. The magnitude is 50 m/s.

45. A person is standing in a bus. When the bus starts moving, the person tends to fall backward because:

(A) The bus pushes the person backward
(B) Gravity pulls the person backward
(C) The person is pushed by the air
(D) The lower part of the body moves with the bus, but the upper part tends to remain at rest due to inertia

Correct Answer: D

Explanation: The text explains this using the concept of inertia. When the bus starts, the lower body moves with the bus, but the upper body tends to remain at rest due to inertia, causing the person to feel pushed backward.

46. A ball of mass 0.5 kg is dropped from a height of 10 m. The force acting on the ball during the fall is: (Take $g = 9.8\text{ m/s}^2$)

(A) 4.9 N
(B) 0.5 N
(C) 9.8 N
(D) 5 N

Correct Answer: A

Explanation: The force acting on the ball is its weight: $W = mg = 0.5 \times 9.8 = 4.9\text{ N}$.

47. In a tug of war, team A pulls with 500 N and team B pulls with 600 N. The net force on the rope is:

(A) 100 N towards team A
(B) 100 N towards team B
(C) 1100 N towards team B
(D) 0 N

Correct Answer: B

Explanation: The net force is the difference between the forces: $600 - 500 = 100\text{ N}$, in the direction of the larger force (team B).

48. A body of mass 5 kg is moving with a velocity of 10 m/s. A force of 50 N is applied in the direction of motion for 2 s. The final velocity is:

(A) 20 m/s
(B) 10 m/s
(C) 30 m/s
(D) 40 m/s

Correct Answer: C

Explanation: A body of mass 5 kg is moving with a velocity of 10 m/s. A force of 50 N is applied in the direction of motion for 2 s. The final velocity is 30 m/s.

49. A body of mass 4 kg is at rest. A force of 8 N is applied for 3 s. The distance traveled is:

(A) 18 m
(B) 36 m
(C) 12 m
(D) 9 m

Correct Answer: D

Explanation: A body of mass 4 kg is at rest. A force of 8 N is applied for 3 s. The distance traveled is 9 m.

50. A body of mass 2 kg is moving at 6 m/s. It collides with a stationary body of mass 4 kg and sticks to it. The final velocity of the combined mass is:

(A) 2 m/s
(B) 3 m/s

(C) \(6\text{ m/s}\)
(D) \(1\text{ m/s}\)

Correct Answer: A

Explanation: A body of mass 2 kg is moving at \(6\text{ m/s}\). It collides with a stationary body of mass 4 kg and sticks to it. The final velocity of the combined mass is \(2\text{ m/s}\).