QUESTIONS FROM COMPETITIVE EXAMS

4.1 Introduction
4.2 Aristotle's Fallacy
4.3 Newton's Laws of Motion

(MHT-CET 2016)

1. Swimming is possible on account of

a) first law of motion
b) second law of motion
c) third law of motion
d) Newton's law of gravitation

(MHT-CET 2019)

2. The kinetic energy acquired by a body of mass 'M' in travelling a certain distance 'd', starting from rest, under the action of constant force is

a) directly proportional to $\sqrt{M}$
b) inversely proportional to $\sqrt{M}$
c) independent of M
d) directly proportional to $-M^2$

(MHT-CET 2020)

3. A mass of 1 kg is suspended by a string. It is first lifted up with an acceleration of 4.9 m/s^2 and then lowered down with same acceleration. The ratio of tensions in the string in the two cases, respectively is

a) 1 : 3 b) 2 : 1 c) 3 : 1 d) 1 : 2

4. A metal wire has cross-sectional area 'A' and elastic limit 'E'. The maximum upward acceleration (a) is given to a mass 'm' of elevator supported by the cable of metal wire, so that stress does not exceed half the elastic limit. The mass of the elevator is

a) $\frac{2(g+a)}{EA}$ b) $\frac{EA}{2(g+a)}$ c) $\frac{EA}{2(g-a)}$ d) $\frac{2(g-a)}{EA}$

5. Two masses of 1 gram and 4 gram are moving with equal kinetic energy. The ratio of the magnitudes of their momenta is

a) 1 : 16 b) 1 : 2 c) $\sqrt{2}$: 1 d) 4 : 1

6. A mass of $2\sqrt{3}$ kg is acted upon by two forces which are inclined to each other at 60° and each of magnitude 1 N. The acceleration of that mass in SI system is

a) 0.9 m/s^2 b) 0.7 m/s^2 c) 0.5 m/s^2 d) 0.3 m/s^2

7. A cricket ball of mass 150 g moving with a velocity of 12 m/s is turned back with a velocity of 20 m/s on hitting the bat. The force of the blow lasts for 0.01 s. The force exerted on the ball by the bat is

a) 480 N b) 240 N c) 120 N d) 360 N

8. Five objects of different masses are simultaneously released vertically downwards from height 'h' (in air). Which physical quantity associated with the objects will change at the instant they strike the ground ? (neglect the air resistance.)

a) Time b) Momentum c) Velocity d) Acceleration

(MHT-CET 2018)

16. Newton's laws of motion are not valid in
a) non inertial frame of reference
b) inertial frame of reference
c) both inertial and non inertial frames of reference
d) none of the frames of reference

4.5 Types of Forces

(MHT-CET 2018)

17. The gravitational force between two bodies depends upon
a) masses of the two bodies
b) separation between two bodies
c) (a) and (b)
d) presence of media between two bodies

(MHT-CET 2020)

18. Out of the fundamental forces in nature, maximum and minimum range are respectively for
a) electromagnetic force, gravitational force
b) strong nuclear force, electromagnetic force
c) gravitational force, weak nuclear force
d) gravitational force, electromagnetic force

(MHT-CET 2022)

19. Weakest force in the universe is
a) weak nuclear force
b) electromagnetic force
c) gravitational force
d) strong nuclear force

4.6 Work-Energy Theorem

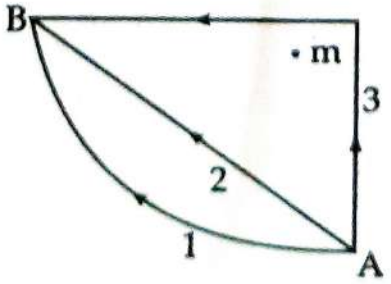
(MHT-CET 2018)

20. If force $\vec{F} = 4\vec{i} + 5\vec{j}$ and displacement $\vec{s} = 3\vec{i} + 6\vec{k}$, then the work done is
a) 12 J
b) 30 J
c) 18 J
d) 24 J

(MHT-CET 2019)

21. When a suitcase of mass 20 kg is lifted to the first floor of a building of height 3 m, the work done is
a) 58 J
b) 60 J
c) 588 J
d) 560 J

22. W_1, W_2 and W_3 represent the work done in moving a particle from A to B along three different paths 1, 2 and 3 (as shown in figure) in the gravitational field of the point mass 'm'. Find the correct relation between 'W_1', 'W_2' and 'W_3'.



a) $W_1 < W_3 < W_2$
b) $W_1 > W_3 > W_2$
c) $W_1 = W_2 = W_3$
d) $W_1 < W_2 < W_3$

4.7 Principle of Conservation of Linear Momentum

(MHT-CET 2014)

32. The principle of conservation of momentum is valid for the collisions of
a) heavy bodies
b) light bodies
c) both heavy and light bodies
d) neither a nor b

(MHT-CET 2016)

33. Firing of bullet from the gun works on the principle of
a) conservation of energy
b) conservation of momentum
c) both the conservation of momentum and of energy
d) Newton's third law of motion

(MHT-CET 2018)

34. A bomb at rest explodes into 3 parts of same mass. The momentum of two parts is $-3P\hat{i}$ and $2P\hat{j}$ respectively. The magnitude of momentum of the third part is
a) P
b) $\sqrt{5}$ P
c) $\sqrt{11}$ P
d) $\sqrt{13}$ P

(MHT-CET 2019)

35. If bullet of mass 'm_1' is fired from a gun of mass 'm_2' with a speed of 'v_1', then the recoil velocity of gun is
a) $-\frac{m_1v_1}{m_2}$
b) $-\frac{m_2}{m_1v_1}$
c) $\frac{m_2}{m_1v_1}$
d) $\frac{m_1v_1}{m_2}$

(MHT-CET 2020)

36. A body of mass 'm' begins to move under the action of time dependent force $\vec{F} = (t\hat{i} + 2t^2\hat{j})$ N where $\hat{i}$ and $\hat{j}$ are unit vectors along X and Y axis respectively. The power developed by the force in watt at time 't' is
a) $\left(\frac{t^3}{3m}+\frac{3t^3}{2m}\right)$
b) $\left(\frac{t^3}{m}+\frac{4t^5}{3m}\right)$
c) $\left(\frac{t^3}{2m}+\frac{3t^4}{2m}\right)$
d) $\left(\frac{t^3}{2m}+\frac{4t^5}{3m}\right)$

37. A bullet of mass 20 gram is fired from a gun of mass 2.5 kg with a speed of 750 m/s. The magnitude of recoil velocity of the gun is
a) 6 m/s
b) 18 m/s
c) 12 m/s
d) 3 m/s

38. 'n' number of balls each having mass 'm' and velocity 'u' hit a wall elastically and normally in 2 seconds. The force exerted by them on the wall is
a) num
b) $\frac{1}{2}$ num
c) –num
d) $-\frac{1}{2}$ num

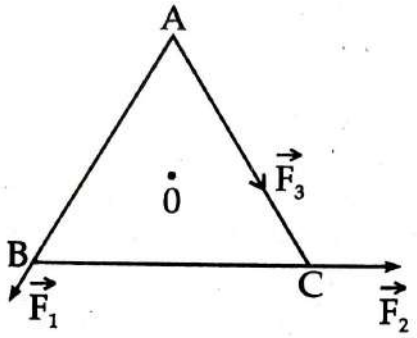
39. A metal ball of mass 2 kg moving with a speed of 10 ms^{-1} had a head-on collision with a stationary ball of mass 3 kg. If after collision, both the balls move together, then the loss in kinetic energy due to collision is
a) 100 J
b) 60 J
c) 40 J
d) 140 J

40. The motion of a rocket in upward direction with high speed is based on the principle of conservation of
a) angular momentum
b) kinetic energy
c) linear momentum
d) mass

4.12 Mechanical Equilibrium

(MHT-CET 2020)

64. Figure shows three force $\vec{F}_1$, $\vec{F}_2$ and $\vec{F}_3$ acting along the sides of an equilateral triangle. If the total torque acting at point 'O' (centre of the triangle) is zero then the magnitude of $\vec{F}_3$ is



a) $F_1 + F_2$ b) $F_1 - F_2$ c) $\frac{F_1 - F_2}{2}$ d) $\frac{F_1}{F_2}$

65. In a system of two particles of masses 'm_1' and 'm_2', the first particle is moved by a distance 'd' towards the centre of mass. To keep the centre of mass unchanged, the second particle will have to be moved by a distance

a) $\frac{m_1}{m_2}$ d, away from the centre of mass b) $\frac{m_1}{m_2}$ d, towards the centre of mass

c) $\frac{m_2}{m_1}$ d, away from the centre of mass d) $\frac{m_2}{m_1}$ d, towards the centre of mass

(MHT-CET 2021)

66. Two spheres of masses 2 kg and 4 kg are situated at the opposite ends of a wooden bar of length 9 m. Where will centre of mass of the system be ?

a) 3 m from 2 kg sphere b) 6 m from 2 kg sphere

c) 6 m from 4 kg sphere d) 2 m from 4 kg sphere

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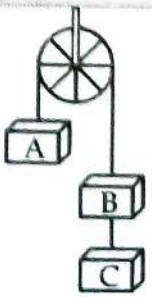
67. A bullet of mass 5 g is shot from a gun of mass 5 kg. If muzzle velocity of the bullet is 500 m/s, then the recoil velocity of the gun will be

a) 0.5 m/s b) 0.25 m/s c) 1 m/s d) data is insufficient

68. A railway wagon of mass 2000 kg moving with a velocity of 18 km/h collides head-on with a stationary wagon of mass 3000 kg. If the two wagons move together after collision, their common velocity will be

a) 3 m/s b) 4 m/s c) 2 m/s d) 1 m/s

69. Three equal weights A, B and C of mass 2 kg each are hanging on a string passing over a fixed frictionless pulley as shown in the figure. The tension in the string connecting weights B and C is



a) zero

b) 13 N

c) 3.3 N

d) 19.6 N