

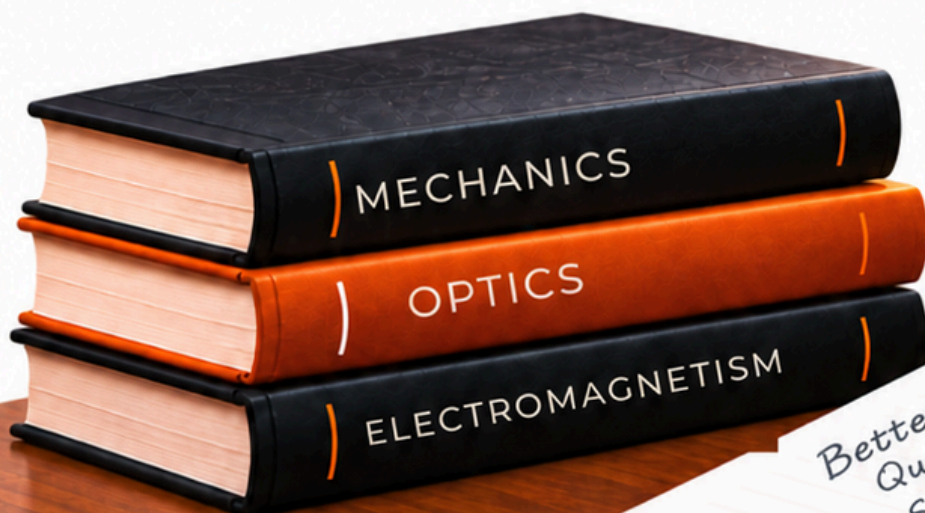
JEE Main Physics

Momentum and impulse PYQ

$$F = ma$$



$$v = u + at$$



Momentum and impulse JEE Main PYQ



Previous Year Questions - Topic-wise Collection

Subject: Physics

Years: 2024-2004

Total Questions: 25

About this PYQ collection

What is inside

A complete topic-wise set of **25 previous year questions** on **Momentum and impulse** from **JEE Main (2024-2013)** and its predecessor **AIEEE (2010-2004)**, across **11 exam years**. **19 questions** are from 2019 onwards, so most of the set reflects the recent NTA pattern.

Questions are arranged to reduce unused page space, with newest-first priority and continuous numbering from 1. Each carries an exam date and shift tag to trace the original paper.

Topic-wise questions

TOPIC	QS	%
Momentum and impulse	25	100%

Question types

TYPE	QS	%
Single-correct MCQ	23	92%
Numerical value	2	8%

Numerical-value questions have no options; all 2 are from 2022 onwards.

How these questions help you

- **Know where the marks are:** momentum and impulse make up **25 of 25 questions (about 100%)**.
- **Build speed and accuracy:** practice the concepts and question styles used in previous papers.
- **Learn the patterns:** the same question styles return year after year.
- **Strengthen other chapters:** these concepts support further study in Physics.

Questions – Momentum and impulse

1. An artillery piece of mass M_1 fires a shell of mass M_2 horizontally. Instantaneously after the firing, the ratio of kinetic energy of the artillery and that of the shell is: (31 Jan 2024 | Shift 1)
- (A) $M_1 / (M_1 + M_2)$ (B) $\frac{M_2}{M_1}$
(C) $\frac{M_1}{M_2}$ (D) $M_2 / (M_1 + M_2)$
-
2. A spherical body of mass 100 g is dropped from a height of 10 m from the ground. After hitting the ground, the body rebounds to a height of 5 m. The impulse of force imparted by the ground to the body is given by : (given, $g = 9.8 \text{ m/s}^2$) (30 Jan 2024 | Shift 1)
- (A) 43.2 kg ms^{-1} (B) 2.39 kg ms^{-1}
(C) 4.32 kg ms^{-1} (D) 23.9 kg ms^{-1}
-
3. A body of mass 1000 kg is moving horizontally with a velocity 6 m/s. If 200 kg extra mass is added, the final velocity (in m/s) is: (27 Jan 2024 | Shift 1)
- (A) 6 (B) 2
(C) 3 (D) 5
-
4. A bullet of 10 g leaves the barrel of gun with a velocity of 600 m/s. If the barrel of gun is 50 cm long and mass of gun is 3 kg, then value of impulse supplied to the gun will be : (13 Apr 2023 | Shift 1)
- (A) 12 Ns (B) 3 Ns
(C) 6 Ns (D) 36 Ns
-
5. An average force of 125 N is applied on a machine gun firing bullets each of mass 10 g at the speed of 250 m/s to keep it in position. The number of bullets fired per second by the machine gun is : (11 Apr 2023 | Shift 1)
- (A) 25 (B) 50
(C) 5 (D) 100
-
6. A batsman hits back a ball of mass 0.4 kg straight in the direction of the bowler without changing its initial speed of 15 ms^{-1} . The impulse imparted to the ball is _____ Ns. (26 Jun 2022 | Shift 2)

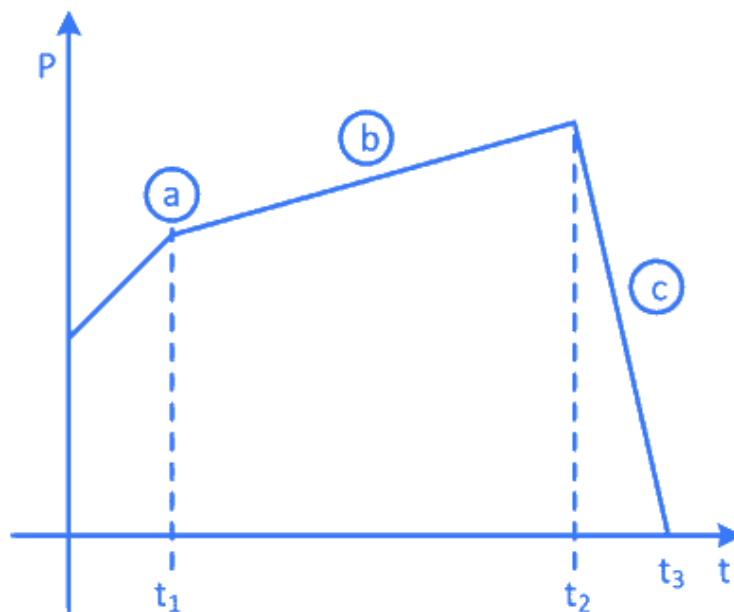
7. 100 balls each of mass m moving with speed v simultaneously strike a wall normally and reflected back with same speed, in time t s. The total force exerted by the balls on the wall is

(31 Jan 2023 | Shift 1)

- (A) $\frac{200mv}{t}$ (B) $\frac{100mv}{t}$
(C) $\frac{mv}{100t}$ (D) $200mvt$

8. The figure represents the momentum time ($p - t$) curve for a particle moving along an axis under the influence of the force. Identify the regions on the graph where the magnitude of the force is maximum and minimum respectively?

If $(t_3 - t_2) < t_1$



(30 Jan 2023 | Shift 1)

- (A) b and c (B) c and a
(C) a and b (D) c and b

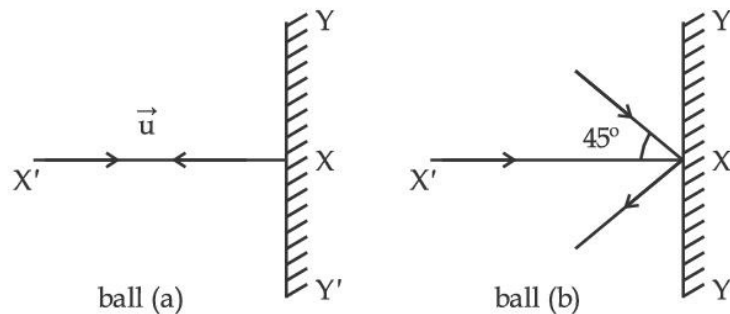
9. A ball of mass 200 g rests on a vertical post of height 20 m. A bullet of mass 10 g, travelling in horizontal direction, hits the centre of the ball. After collision both travel independently. The ball hits the ground at a distance 30 m and the bullet at a distance of 120 m from the foot of the post. The value of initial velocity of the bullet will be (if $g = 10 \text{ m/s}^2$) :

(30 Jan 2023 | Shift 1)

- (A) 120 m/s (B) 360 m/s
(C) 400 m/s (D) 60 m/s

10. A machine gun of mass 10 kg fires 20 g bullets at the rate of 180 bullets per minute with a speed of 100 m s^{-1} each. The recoil velocity of the gun is (30 Jan 2023 | Shift 2)
- (A) 0.02 m/s (B) 1.5 m/s
(C) 2.5 m/s (D) 0.6 m/s
-
11. In two different experiments, an object of mass 5 kg moving with a speed of 25 ms^{-1} hits two different walls and comes to rest within (i) 3 second, (ii) 5 seconds, respectively. Choose the correct option out of the following : (28 Jul 2022 | Shift 1)
- (A) Impulse and average force acting on the object will be same for both the cases. (B) Impulse will be same for both the cases but the average force will be different.
(C) Average force will be same for both the cases but the impulse will be different. (D) Average force and impulse will be different for both the cases.
-
12. A ball of mass 0.15 kg hits the wall with its initial speed of 12 ms^{-1} and bounces back without changing its initial speed. If the force applied by the wall on the ball during the contact is 100 N, calculate the time duration of the contact of ball with the wall. (26 Jul 2022 | Shift 2)
- (A) 0.018 s (B) 0.036 s
(C) 0.009 s (D) 0.072 s
-
13. Two billiard balls of mass 0.05 kg each moving in opposite directions with 10 ms^{-1} collide and rebound with the same speed. If the time duration of contact is $t = 0.005 \text{ s}$, then what is the force exerted on the ball due to each other? (25 Jul 2022 | Shift 2)
- (A) 100 N (B) 200 N
(C) 300 N (D) 400 N
-
14. A man of 60 kg is running on the road and suddenly jumps into a stationary trolley car of mass 120 kg. Then, the trolley car starts moving with velocity 2 ms^{-1} . The velocity of the running man was _____ ms^{-1} , when he jumps into the car. (28 Jun 2022 | Shift 1)

15. Two billiard balls of equal mass 30g strike a rigid wall with same speed of 108 kmph (as shown) but at different angles. If the balls get reflected with the same speed then the ratio of the magnitude of impulses imparted to ball 'a' and ball 'b' by the wall along 'X' direction is :



(25 Jul 2021 | Shift 1)

- (A) 1 : 1
(B) $\sqrt{2} : 1$
(C) 2 : 1
(D) $1 : \sqrt{2}$

16. A bullet of '4 g' mass is fired from a gun of mass 4 kg. If the bullet moves with the muzzle speed of 50 ms^{-1} , the impulse imparted to the gun and velocity of recoil of gun are :

(22 Jul 2021 | Shift 2)

- (A) 0.2 kg ms^{-1} , 0.1 ms^{-1}
(B) 0.4 kg ms^{-1} , 0.05 ms^{-1}
(C) 0.2 kg ms^{-1} , 0.05 ms^{-1}
(D) 0.4 kg ms^{-1} , 0.1 ms^{-1}

17. Particle A of mass m_1 moving with velocity $(\sqrt{3}\hat{i} + \hat{j}) \text{ ms}^{-1}$ collides with another particle B of mass m_2 which is at rest initially. Let $\vec{V}_1$ and $\vec{V}_2$ be the velocities of particles A and B after collision respectively. If $m_1 = 2m_2$ and after collision $\vec{V}_1 = (\hat{i} + \sqrt{3}\hat{j})$, the angle between $\vec{V}_1$ and $\vec{V}_2$ is :

(6 Sept 2020 | Shift 2)

- (A) 105°
(B) 15°
(C) -45°
(D) 60°

18. A projectile of mass M is fired so that the horizontal range is 4 km. At the highest point the projectile explodes in two parts of masses $M/4$ and $3M/4$ respectively and the heavier part starts falling down vertically with zero initial speed. The horizontal range (distance from point of firing) of the lighter part is

(23 Apr 2013 | Single slot)

- (A) 16 km
(B) 1 km
(C) 10 km
(D) $2 \text{ km} \rightarrow$

19. A man (mass = 50 kg) and his son (mass = 20 kg) are standing on a frictionless surface facing each other. The man pushes his son so that he starts moving at a speed of 0.70 ms^{-1} with respect to the man. The speed of the man with respect to the surface is :

(12 Apr 2019 | Shift 1)

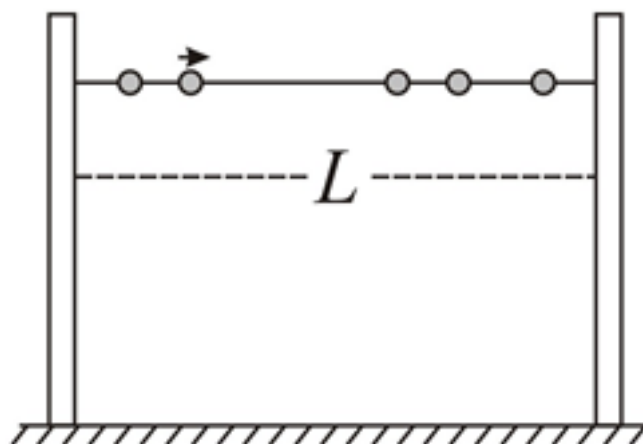
- (A) 0.28 ms^{-1} (B) 0.47 ms^{-1}
(C) 0.20 ms^{-1} (D) 0.14 ms^{-1}

20. A particle of mass m is moving in a straight line with momentum p . Starting at time $t = 0$, a force $F = kt$ acts in the same direction on the moving particle during time interval T so that its momentum changes from p to $3p$. Here k is a constant. The value of T is :

(11 Jan 2019 | Shift 2)

- (A) $2\sqrt{\frac{k}{p}}$ (B) $2\sqrt{\frac{p}{k}}$
(C) $\sqrt{\frac{2p}{2}}$ (D) $\sqrt{\frac{2k}{p}}$

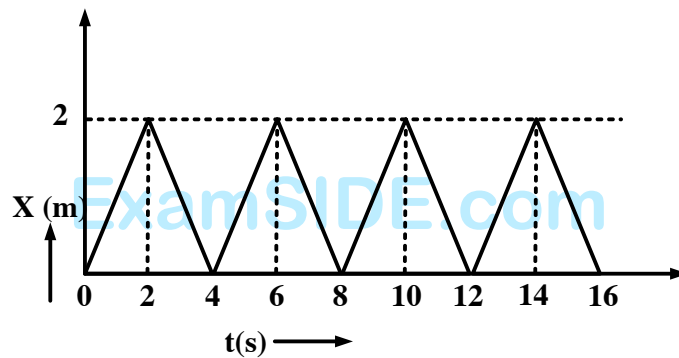
21. A large number (n) of identical beads, each of mass m and radius r are strung on a thin smooth rigid horizontal rod of length L ($L \gg r$) and are at rest at random positions. The rod is mounted between two rigid supports (see figure). If one of the beads is now given a speed v , the average force experienced by each support after a long time is (assume all collisions are elastic):



(11 Apr 2015 | Single slot)

- (A) $(mv^2)/(L - nr)$ (B) $(mv^2)/(L - 2nr)$
(C) $(mv^2)/(2(L - nr))$ (D) Zero

22. The figure shows the position–time ($x - t$) graph of one-dimensional motion of body of mass 0.4 kg . The magnitude of each impulse is



(25 Apr 2010 | Single sitting)

- (A) 0.4 N s (B) 0.8 N s
(C) 1.6 N s (D) 0.2 N s

23. A bomb of mass 16 kg at rest explodes into two pieces of masses 4 kg and 12 kg . The velocity of the 12 kg mass is 4 m s^{-1} . The kinetic energy of the other mass is

(30 Apr 2006 | Single sitting)

- (A) 144 J (B) 288 J
(C) 192 J (D) 96 J

24. A player caught a cricket ball of mass 150 g moving at a rate of 20 m/s . If the catching process is completed in 0.1 s , the force of the blow exerted by the ball on the hand of the player is equal to

(30 Apr 2006 | Single sitting)

- (A) 150 N (B) 3 N
(C) 30 N (D) 300 N

25. A machine gun fires a bullet of mass 40 g with a velocity 1200 m s^{-1} . The man holding it can exert a maximum force of 144 N on the gun. How many bullets can he fire per second at the most?

(23 May 2004 | Single sitting)

- (A) Two (B) Four
(C) One (D) Three