NDA-CDS 1 2025

GS

LIVE

PHYSICS

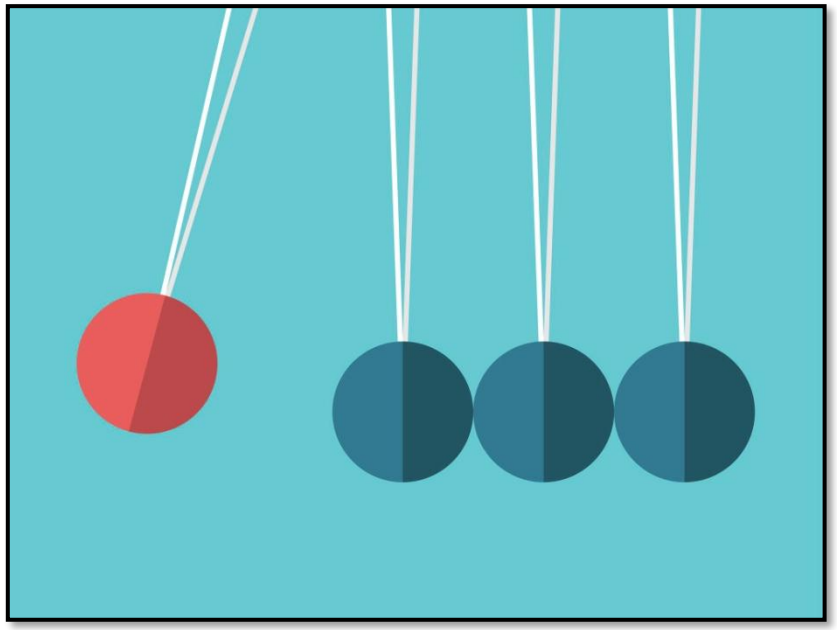
FORCE & LAWS OF MOTION

CLASS 2

NAVJYOTI SIR

SSBCrack EXAMS

LAWS OF MOTION - MCQs



SSBCrack EXAMS

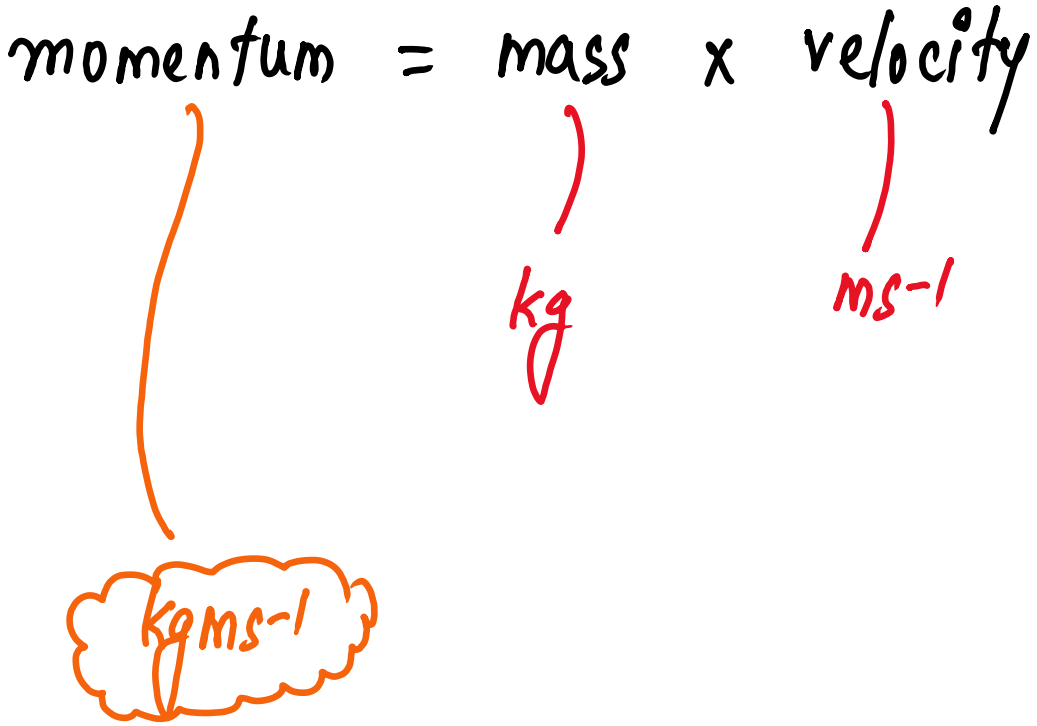
The SI Unit Of Momentum Is

A. $kgms^{-1}$

B. $kgms^{-2}$

C. $kgm^{-1}s^{-2}$

D. None of these



The SI Unit Of Momentum Is

A. $kgms^{-1}$

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D. None of these

Car A of mass 1500 kg travelling at 25 m/s collides with another car B of mass 1000 kg travelling at 15 m/s in the same direction. After collision the velocity of car A becomes 20 m/s. What is the velocity of car B after collision ?

A. 25 m/s

B. 22.5 m/s

C. 36.7 m/s

D. 16.7 m/s

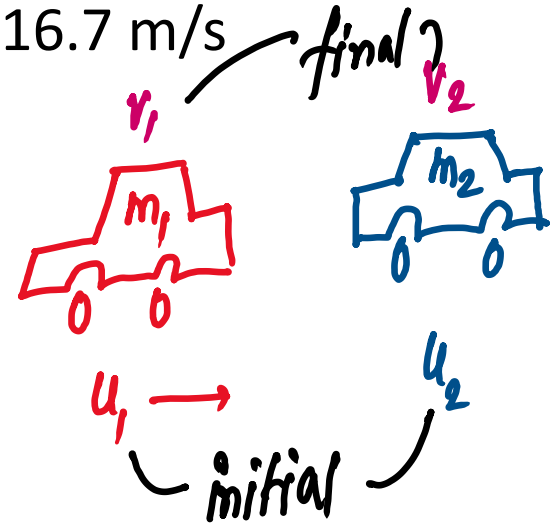
$$m_1u_1 + m_2u_2 = m_1v_1 + m_2v_2 \quad \text{(conservation of momentum)}$$

$$1500 \times 25 + 1000 \times 15 = 1500 \times 20 + 1000 \times v_2$$

$$15(3500) = 15(2000) + 1000 \times v_2$$

$$v_2 = \frac{15(3500 - 2000)}{1000} = \frac{15(1500)}{1000} = \frac{225}{10}$$

$$v_2 = 22.5 \text{ m/s}$$



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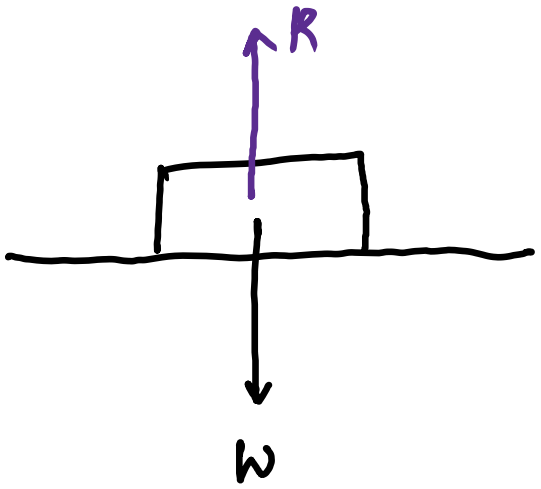
When A Body Is Stationary :

A. There Is No Force Acting On It ✗

B. The Forces Acting On It Are Not In Contact With It ✗

C. The Combination Of Forces Acting On It Balances Each Other ✓

D. The Body Is In Vacuum ✗



When A Body Is Stationary :

A. There Is No Force Acting On It

B. The Forces Acting On It Are Not In Contact With It

C. The Combination Of Forces Acting On It Balances Each Other

D. The Body Is In Vacuum

A cricket player catches A ball of mass 10^{-1} kg moving with A velocity of $25\ ms^{-1}$. If the ball is caught in 0.1 s , the force of the blow exerted on the hand of the player is

A. 4 N

B. 25 N ✓

C. 40 N

D. 250 N

Impulse = Force x contact time (short) = change in momentum

$$F \times 0.1 = 10^{-1} \times 0 - 10^{-1} \times (25)$$

$$F = \frac{0 - \frac{1}{10}(25)}{0.1} = -\frac{2.5}{0.1} = -25\ N$$

magnitude = 25 N

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A. 4 N

B. 25 N

C. 40 N

D. 250 N

SSBCrack EXAMS

A Football And A Stone Has Same Mass,

A. Both Have Same Inertia ✓

B. Both Have Same Momentum ✗

C. Both Have Different Inertia

D. Both Have Different Momentum ✗

Momentum = mass x velocity

Inertia is directly related to mass.

A Football And A Stone Has Same Mass,

A. **Both Have Same Inertia**
B. Both Have Same Momentum
C. Both Have Different Inertia
D. Both Have Different Momentum

What is responsible for the change in magnitude of speed ?

A. Momentum

B. Force ✓

C. Speed

D. Kinetic Energy

change in speed ⇒ acceleration
(can be generated only by force)

What is responsible for the change in magnitude of speed ?

A. Momentum

B. Force

C. Speed

D. Kinetic Energy

SSBCrack EXAMS

Which one of the following has maximum inertia ?

(a) An atom

(b) A molecule

(c) A one-rupee coin

(d) A cricket ball

max. Inertia $\Rightarrow$ max. mass

SSBCrack EXAMS

Which one of the following has maximum inertia ?

(a) An atom

(b) A molecule

(c) A one-rupee coin

(d) A cricket ball

Answer: D

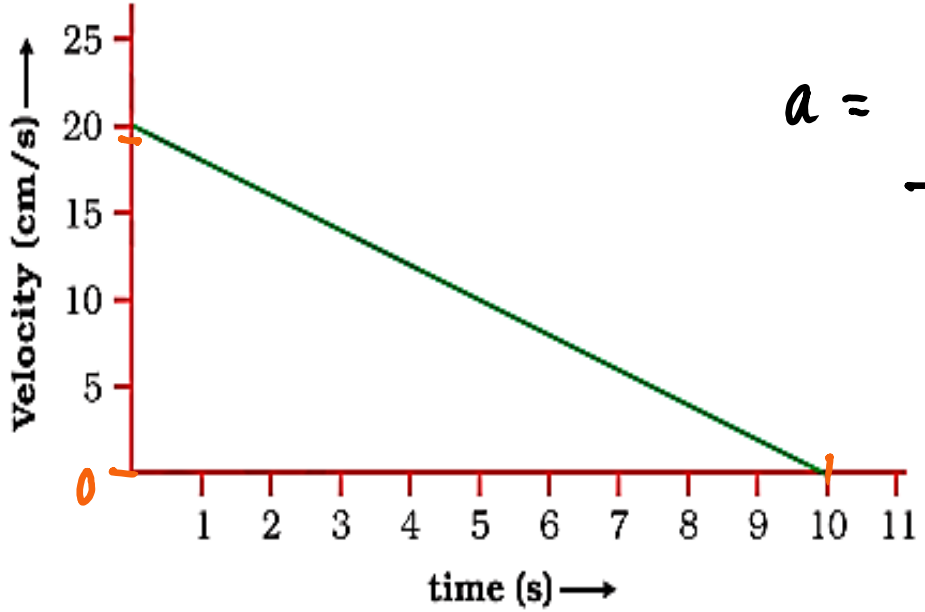
The velocity-time graph of a ball of mass 20 g moving along a straight line on a long table is shown. How much force does the table exert on the ball to bring it to rest ?

A. 0.0002 N

B. - 0.0002 N

C. 0.004 N

D. - 0.0004 N



$F = ma$

$a = \frac{v_{final} - v_{initial}}{\text{Time taken}}$

$= \frac{0 \text{ cm/s} - 20 \text{ cm/s}}{10}$

$= -2 \text{ cm/s}^2 = -0.02 \text{ m/s}^2$

$F = 0.02 \text{ kg} \times -0.02 \text{ m/s}^2 = -0.0004 \text{ N}$ (kg m/s²)

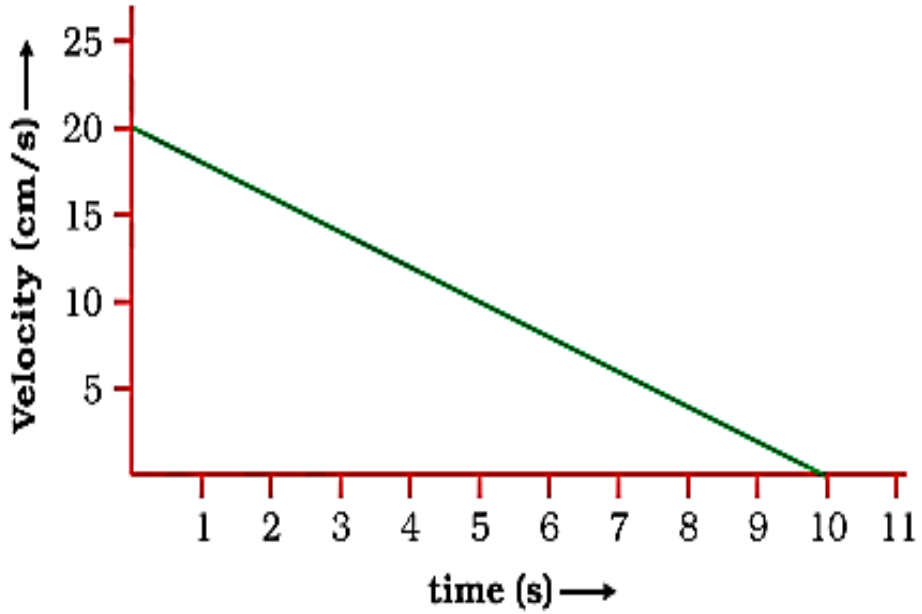
The velocity-time graph of a ball of mass 20 g moving along a straight line on a long table is shown. How much force does the table exert on the ball to bring it to rest ?

A. 0.0002 N

B. - 0.0002 N

C. 0.004 N

D. - 0.0004 N



SSBCrack EXAMS

The statement "friction force is a contact force while magnetic force is a non-contact force" is

(a) always true. ✓

(b) true only at 0°C.

(c) a false statement.

(d) either true or false depending upon the temperature of the surroundings.

SSBCrack EXAMS

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Answer: A

SSBCrack EXAMS

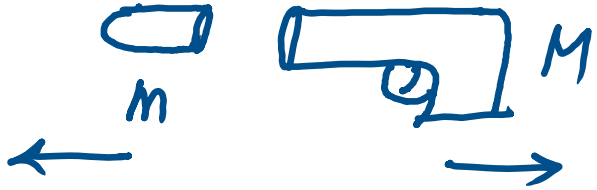
A bullet of mass 10 g is horizontally fired with velocity 300 m s^{-1} from a pistol of mass 1 kg. What is the recoil velocity of the pistol?

(a) 0·3 m s^{-1}

(b) 3 m s^{-1}

(c) –3 m s^{-1}

(d) –0·3 m s^{-1}



$$(M+m)u = mv_1 + M(-v_2)$$

$$(M+m)(0) = (0.01\ kg)(300\ ms^{-1}) + (1\ kg)(-v_2)$$

$$0 = 3 + (-v_2)$$

$$v_2 = 3\ m/s$$

$-3\ m/s$

recoil velocity is considered 'negative'.

A bullet of mass 10 g is horizontally fired with velocity 300 m s^{-1} from a pistol of mass 1 kg. What is the recoil velocity of the pistol?

(a) 0·3 m s^{-1}

(b) 3 m s^{-1}

(c) –3 m s^{-1}

(d) –0·3 m s^{-1}

Answer: C

An object of mass 2 kg is sliding with a constant velocity of 4 m/s on a frictionless horizontal table. The force required to keep the object moving with the same velocity is

A. 32 N

B. 0 N ✓

(First Law of Newton)

C. 2 N

D. 8 N

An object of mass 2 kg is sliding with a constant velocity of 4 m/s on a frictionless horizontal table. The force required to keep the object moving with the same velocity is

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B. 0 N

C. 2 N

D. 8 N

With reference to the third law of motion, Action and Reaction happens at

A. Same Time

B. Different Time

C. Action happens first and then Reaction

D. Reaction happens first and then Action

With reference to the third law of motion, Action and Reaction happens at

A. **Same Time**

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SSBCrack EXAMS

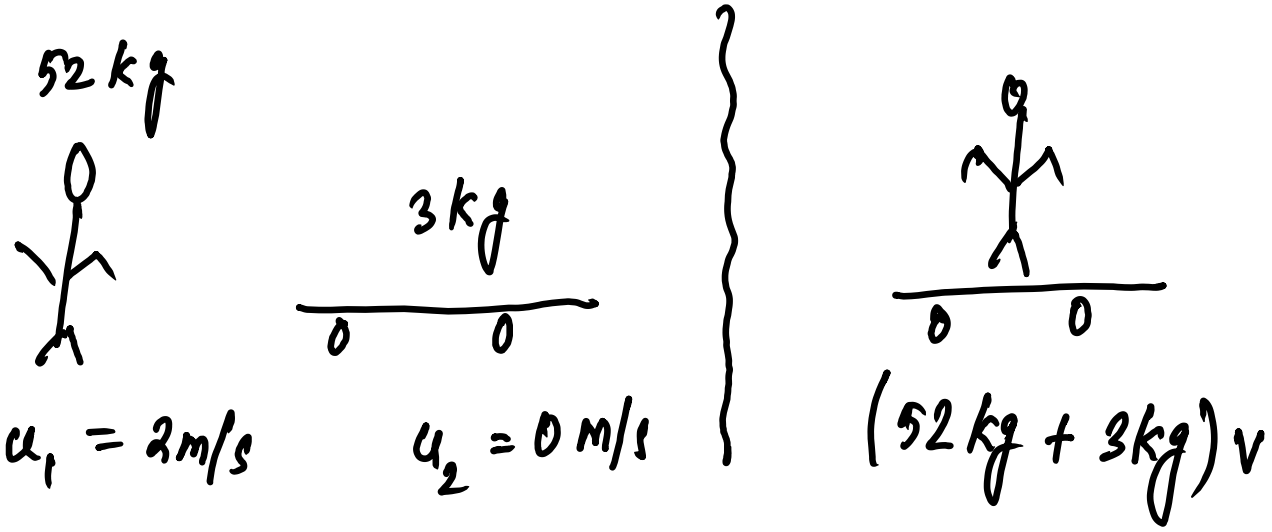
A boy of mass 52 kg jumps with a horizontal velocity of 2 m/s onto a stationary cart of mass 3 kg. The cart is fixed with frictionless wheels. Which one of the following would be the speed of the cart?

(a) 2·15 m/s ✗

(b) 1·89 m/s ✓

(c) 1·51 m/s

(d) 2·51 m/s ✗



$$52 u_1 + 3u_2 = (52+3) v$$

$$52 \times 2 + 3(0) = 55 v$$

$$v = \frac{52 \times 2}{55} = \frac{104}{55} \approx 1.89 \text{ m/s}$$

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(a) 2·15 m/s

(b) 1·89 m/s

(c) 1·51 m/s

(d) 2·51 m/s

Answer: B

SSBCrack EXAMS

Sand falls vertically on a conveyor belt at a rate of 0·1 kg/s. In order to keep the belt moving at a uniform speed of 2 m/s, the force required to be applied on the belt is :

(a) 0 N

(b) 0·2 N ✓

(c) 1·0 N

(d) 2·0 N

0·1 kg/s × 2 m/s = 0·2 kgm/s²

= 0·2 N

mass / time — speed

SSBCrack EXAMS

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(c) 1·0 N

(d) 2·0 N

Answer: B

SSBCrack EXAMS

≠ The motion of a particle of mass m is described by the relation, $y = ut - \frac{1}{2}gt^2$, where u is the initial velocity of the particle. The force acting on the particle is

(a) $F = m\left(\frac{du}{dt}\right)$

(b) $F = mg$

(c) $F = m\left(\frac{dy}{dt}\right)$

(d) $F = -mg$

$y \rightarrow$ displacement

$u \rightarrow$ initial velocity,

$F = ma$

$= m\left(\frac{du}{dt}\right)$

SSBCrack EXAMS

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(a) $F = m\left(\frac{du}{dt}\right)$

(b) $F = mg$

(c) $F = m\left(\frac{dy}{dt}\right)$

(d) $F = -mg$

Answer: D

SSBCrack EXAMS

A driver accelerates his car first at the rate of 4 m/s^2 and then at the rate of 8 m/s^2. Calculate the ratio of forces exerted by the engine.

A. 2 : 3

B. 3 : 4

C. 2 : 1

D. 1 : 2

$$F = ma$$

$$\frac{F_1}{F_2} = \frac{m_1 a_1}{m_2 a_2} = \frac{m}{m}\left(\frac{a_1}{a_2}\right) = \frac{4\ m/s^2}{8\ m/s^2} = 1:2$$

(Both are mass of car only)

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A. 2 : 3

B. 3 : 4

C. 2 : 1

D. 1 : 2

A goalkeeper in A game of football pulls his hands backwards after holding

The ball shot at goal. This enables the goalkeeper to

A. Exert large force on the ball

B. Increase the force exerted by the ball on hands

C. Increase the rate of change of momentum

D. Decrease the rate of change of momentum

$F = \frac{\text{Constant}}{\text{time}}$

$F \times t$ = Change in momentum

$= 0 - mv = -mv = \text{constant}$

$F = \text{rate of change of momentum}$

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Type of inertia that tends to resist the change in case of an athlete often jumps before taking a long jump

A. Inertia of rest

B. Inertia of motion

C. Inertia of direction

D. Uniformly accelerated motion

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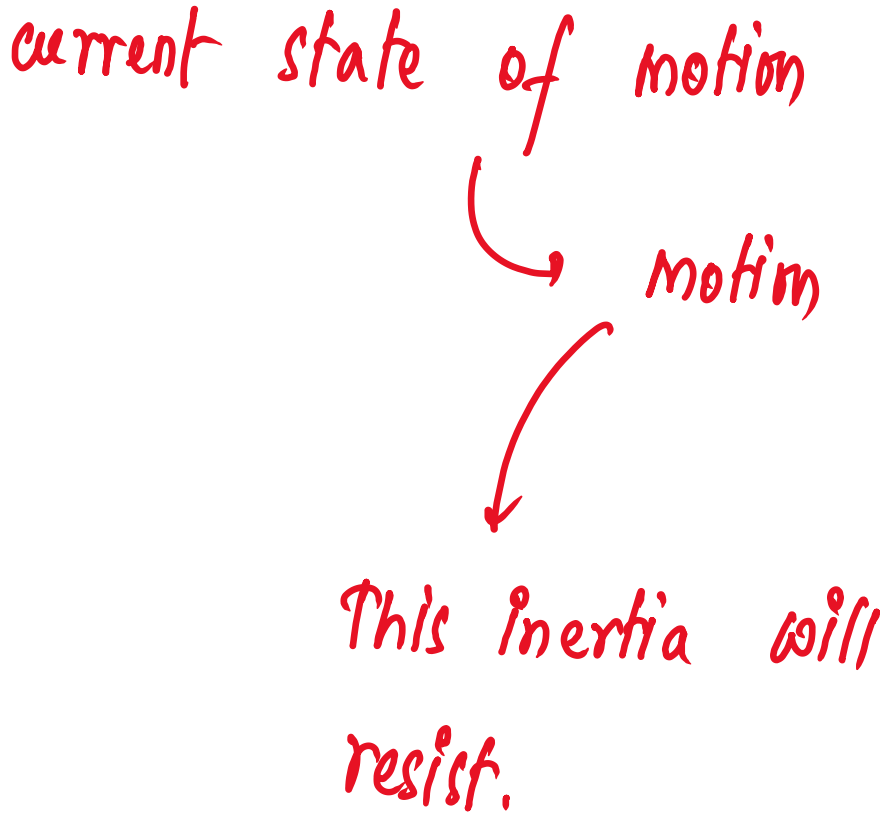

SSBCrack EXAMS

A sedan car of mass 200 kg is moving with A certain velocity. It is brought to rest by the application of brakes , within a distance of 20 m when the average resistance being offered to it is 500 N. What was the velocity of the motor car ?

A. 40 m/s

B. 30 m/s

C. 20 m/s

D. 10 m/s ✓

$$a = \frac{F}{m} = \frac{-500\ N}{200\ kg} = -2.5\ m/s^2$$

$$v^2 - u^2 = 2as$$

$$0^2 - u^2 = 2 \times -2.5 \times 20$$

$$-u^2 = -100$$

$$u = 10\ m/s$$

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B. 30 m/s

C. 20 m/s

D. 10 m/s

In the absence of External force , the velocity

A. Remains constant

B. Vanishes

C. Changes continously

D. None of the Above

In the absence of External force , the velocity

A. **Remains constant**

B. Vanishes

C. Changes continously

D. None of the Above

PYQ – 24 - I

Which of the following forces is/are fundamental in nature ?

1. Gravitational force
2. Electromagnetic forces
3. Strong and weak nuclear forces

Select the correct answer using the code given below :

(a) 1 only
(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

PYQ – 24 - I

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Select the correct answer using the code given below :

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(b) 1 and 2 only
(c) 2 and 3 only
(d) 1, 2 and 3

Answer: D

SSBCrack EXAMS

PYQ – 24 - I

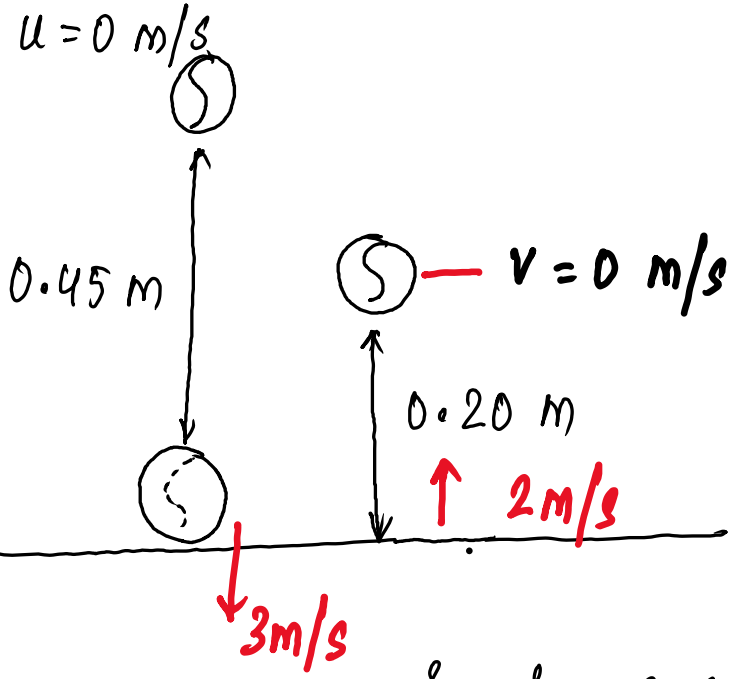
A ball of 0·1 kg mass is dropped on a hard floor from a height of 0·45 m and rises to a height of 0·20 m. If it was in touch with the floor for 0·1 s, the net force it applied on the floor while bouncing is : (take the gravitational acceleration g = 10 m s^{-2})

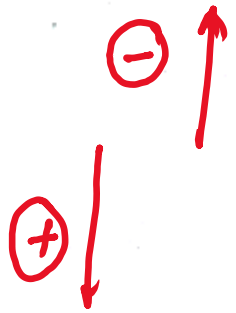
(a) 1·0 N

(b) 6·0 N

(c) 3·0 N

(d) 5·0 N





✓ $v^2 - u^2 = 2as$

$v^2 - u^2 = 2(+g)(s)$

$v^2 - 0^2 = 2(10)(0.45)$

$v^2 = 9$

$v = 3$

$v^2 - u^2 = 2as$

$0^2 - u^2 = 2(-10)(0.2)$

$-u^2 = -4$

$u = 2$ m/s

$a = \frac{\text{change in velocity}}{\text{Time}}$

$= \frac{(-2) - 3}{0.1}$

$a = \frac{-5}{0.1} = -50$ m/s^2

$F = 0.1 \times -50$ m/s^2

$= -5$ N (magnitude)

PYQ – 24 - I

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(a) 1·0 N

(b) 6·0 N

(c) 3·0 N

(d) 5·0 N

Answer: D

PYQ – 24 - I

Which one of the following about different frictional forces is correct ?

(a) Kinetic friction > Static friction > Rolling friction

(b) Static friction > Rolling friction > Kinetic friction

(c) Static friction > Kinetic friction > Rolling friction

(d) Static friction > Kinetic friction = Rolling friction

PYQ – 24 - I

Which one of the following about different frictional forces is correct ?

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(b) Static friction > Rolling friction > Kinetic friction

(c) Static friction > Kinetic friction > Rolling friction

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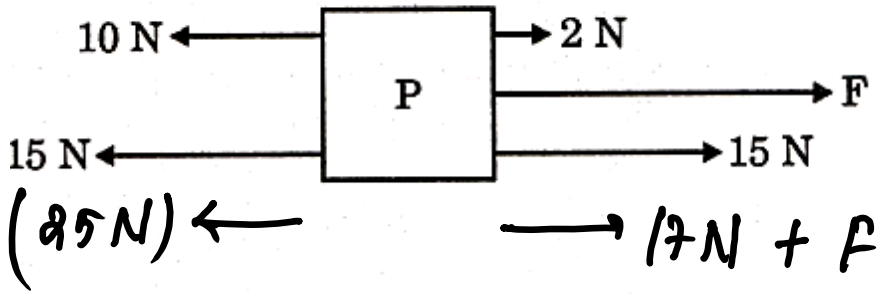
Answer: C

SSBCrack EXAMS

PYQ – 24 - I

If the block P as shown in the figure below were to be at rest, what should the magnitude of force F be ?



(a) 5 N

(b) 6 N

(c) 8 N

(d) 10 N

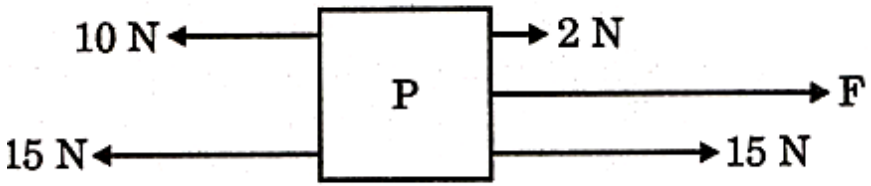
forces should be balanced.

$17 + F = 25$

$F = 8\ N$

PYQ – 24 - I

If the block P as shown in the figure below were to be at rest, what should the magnitude of force F be ?



(a) 5 N

(b) 6 N

(c) 8 N

(d) 10 N

Answer: C

SSBCrack EXAMS

PYQ – 24 - II

Which of the following statements give characteristics of contact forces ?

1. It appears between an object when it is in contact with some other object

2. It satisfies the third law of motion

3. It may appear between a pair of solid and fluid

Select the answer using the code given below :

(a) 1 and 3 only

(b) 2 and 3 only

(c) 1 and 2 only

(d) 1, 2 and 3

SSBCrack EXAMS

PYQ – 24 - II

Which of the following statements give characteristics of contact forces ?

1. It appears between an object when it is in contact with some other object

2. It satisfies the third law of motion

3. It may appear between a pair of solid and fluid

Select the answer using the code given below :

(a) 1 and 3 only

(b) 2 and 3 only

(c) 1 and 2 only

(d) 1, 2 and 3

Answer: D

SSBCrack EXAMS

A car weighs 1000 kg. It is moving with a uniform velocity of 72 km/h towards a straight road. The driver suddenly presses the brakes. The car stops in 0·2 s. The retarding force applied on the car to stop it is

(a) 100 N

(b) 1000 N

(c) 10 kN

(d) 100 kN

PYQ – 24 - I

$72 \times \frac{5}{18} = 20$ m/s

km/h $\xrightarrow{\times 5/18}$ m/s $\xleftarrow{\times 18/5}$

$$a = \frac{0 - 20}{0.2}$$

$$a = \frac{-20}{0.2} = -100 \text{ m/s}^2$$

$$F = ma$$

$$= 1000 \text{ kg} \times -100 \text{ m/s}$$

$$= -100000 = 100 \text{ kN (magnitude)}$$

PYQ – 24 - I

A car weighs 1000 kg. It is moving with a uniform velocity of 72 km/h towards a straight road. The driver suddenly presses the brakes. The car stops in 0·2 s. The retarding force applied on the car to stop it is

(a) 100 N

(b) 1000 N

(c) 10 kN

(d) 100 kN

Answer: D

SSBCrack EXAMS

PYQ – 24 - I

A block of mass 2·0 kg slides on a rough horizontal plane surface. Let the speed of the block at a particular instant is 10 m/s. It comes to rest after travelling a distance of 20 m. Which one of the following could be the magnitude of the frictional force ?

$u = 10$ m/s ; $v = 0$ m/s ; $s = 20$ m

$v^2 - u^2 = 2as$

$0^2 - 10^2 = 2 \times a \times 20$

$a = \frac{-100}{40} = -\frac{5}{2} = -2.5$ m/s^2

Magnitude of frictional force = Magnitude of force to stop,

$= 2.0$ kg $\times -2.5$ m/s^2

$= 5.0$ N (magnitude)

5.0 N

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PHYSICS

WORK ENERGY POWER

CLASS 1

NAVJYOTI SIR

SSBCrack EXAMS