NEET Study Notes for Laws of Motion

NEET Study Notes for Laws of Motion - Newton's laws of motion are the three statements formulated by Isaac Newton that serve as the foundation of classical mechanics and explain the relationship between forces acting on a body and the motion of the body. Candidates can expect at least 1 question from this unit. Some of the important topics from this section include- Laws of Motion, Friction, Dynamics of Circular Motion.

- Laws of Motion is an integral chapter in **NEET Syllabus** with a weightage of 3%. Having a strong grip on the fundamentals of this topic is essential not just in clearing the exam but also to understand its wide applications in Science.
- Candidates can expect at least 1 question to be asked in **NEET 2026** from the topic Laws of Motion.
- We have described in the article Newton's Laws of Motion, Examples, applications, and the type of questions asked from this topic.

NEET Study Notes for Laws of Motion: Important Topics

Topic	Sub-topics
Laws of Motion	• Intuitive concept of force. Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications. • Equilibrium of concurrent forces. Static and Kinetic friction, laws of friction, rolling friction, lubrication. • Dynamics of uniform circular motion. Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).

NEET Study Notes for Laws of Motion: Important Formulas

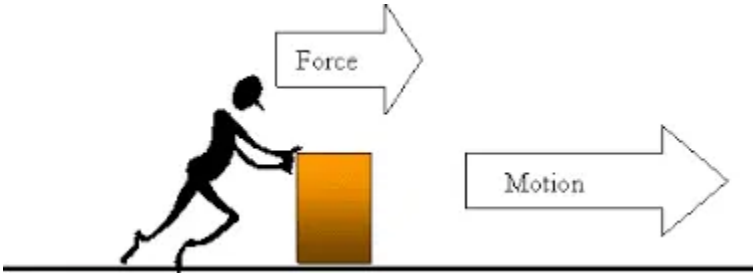
Terms	Formulas
Force	mass acceleration (F= ma)
Newtons Second Law of Motion	F= ma (mass acceleration)
Newtons Third Law of Motion	F1= -F2
Momentum	Mass Velocity i.e p=mv
Impulse	$I = F \cdot \Delta t$
Friction	$F = \mu N$
Centripetal Force	F = mv2/r

NEET Study Notes for Newton's Laws of Motion

Newtons First Law of Motion/ Law of Inertia

Newtons First Law of Motion states that a body continues to be in its state of rest or of uniform motion in a straight line unless compelled by some external force to act otherwise.

- This property of bodies due to which they cannot change their state of rest or uniform motion unless acted upon by an external force is also known as the Law of Inertia.
- The important thing to understand here is that if the net external force on a body is zero, acceleration is zero and if additional external force is applied, velocity will change due to the force.



- **Example:** A man getting down a running bus falls due to inertia of motion.
- **Explanation:** As per newton's first law of motion, a body continues to be at rest or uniform motion in a straight line unless it is acted upon by an external force. Here, a man getting down from a running bus falls forward because , the lower part of his body is in rest with the ground. However the upper oart of the body, tends to continue in motion.

Newtons Second Law of Motion -

Newtons Second Law of Motion describes the quantitative changes that a force can produce on the motion of an object.

- **The second law of motion states that the acceleration of an object as produced by a net force is directly proportional to the magnitude of the net force, in the same direction as the net force and inversely proportional to the object's mass**.
- The rate of change of momentum is directly proportional to external force applied and the change takes place in the direction of force applied

i.e., $$\vec{F} = \frac{d\vec{p}}{dt} = \frac{md\vec{v}}{dt} = m\vec{a}$$

- **Example:** Pushing an empty cart is easier than pushing a loaded shopping cart.
- **Explanation:** Pushing an empty shopping cart is easier than pushing a loaded shopping cart due to the relation between the mass of the object, force applied on it and the acceleration produced. Mass has an inverse relation with acceleration , the loaded cart tends to move slower.

What is Impulse?

Impulse is a term that quantifies the overall effect of a force acting over time. It is denoted by symbol J and expressed in Newton Seconds. We assume that force is constant over time. Impulse is a vector quantity.

For a constant force, $\mathbf{J}=\mathbf{F}\cdot\Delta t$

NEET Study Notes for Equilibrium of Concurrent Forces

In order to understand equilibrium of concurrent forces, we must first understand what equilibrium means. Equilibrium is defined as a position of " no acceleration". This means that the total of all forces acting on a body is zero

- From Newton's second law of motion, we know that, F= m * a
- Thus if the net force on a body is zero, we can infer that the net acceleration on the body is zero.

Types of Equilibrium of Concurrent Forces

There are two main types of equilibrium :

- Static Equilibrium- **In static equilibrium, the resultant of all forces acting on a body is zero(net acceleration of the body as well as the velocity is also zero).** This means that the body is at rest .

- If a body is at rest and net acceleration is zero, the body is said to be in a position of static equilibrium.

Example- If a block is resting on a floor and two forces of 5N each are acting on the side. In this situation, the forces would cancel each other out resulting in the net force on the block being zero. The block here is at rest due, thus it would in static equilibrium.

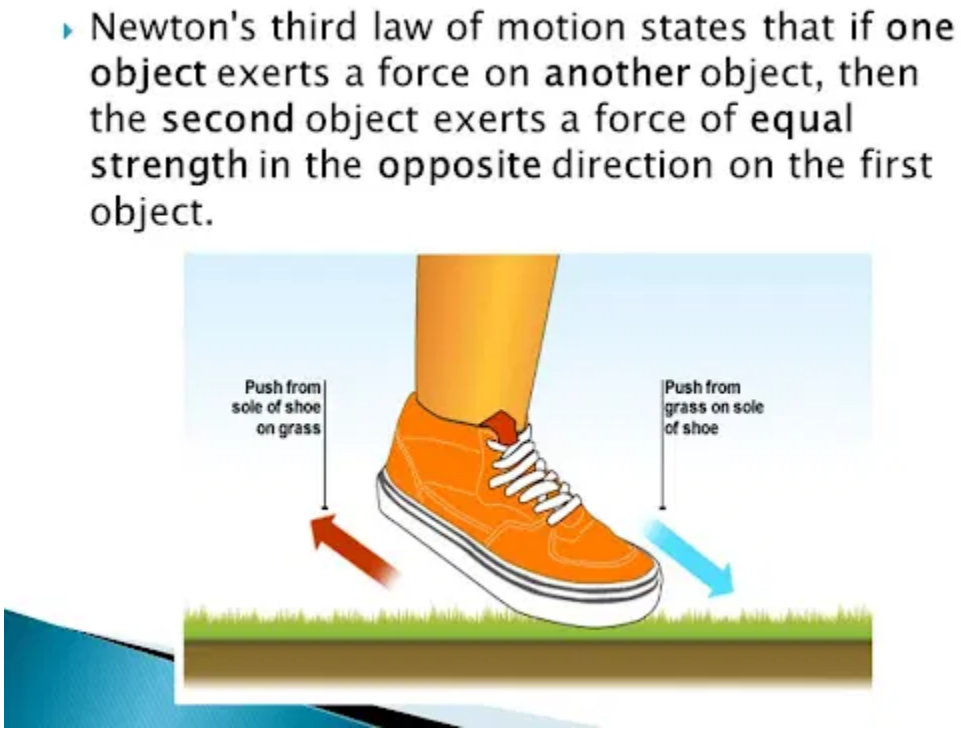
- Dynamic Equilibrium- **In a position of Dynamic Equilibirum, the resultant of all forces acting on the body is zero, however the velocity is not zero**.This means that body is moving in constant velocity. When a body moves with constant velocity despite the net force acting on the body beig zero, the body is said to be in dynamic equilibrium

Example- A common example for Dynamic Equilibirum is when a block is attecahed to a spring under the influence of Simple Harmonic Motion (S.H.M.). Here the net force acting on the body is zero, but the velocityof the body is maximum, this will result in a state of Dynamic Equilibrium.

Newtons Third Law of Motion

Newtons Third Law of Motion states that there is an equal and opposite reaction, for every action.

- The law states that when two bodies interact, they apply forces to one another that are equal in magnitude and opposite in direction.
- In order to understand this lets consider an example, a book when resting on a table , applies a downward force equal to the weight to its weight in the table.



As per the third law, the table also applies an equal and opposite force to the book. This explains that when there is no net force acting on a body or if the forces are precisely balanced by contrary forces, the body does not accelerate and is said to be in equilibrium.

$$\vec{F}_{AB} = -\vec{F}_{BA}$$

Example: Car accelerates forward because the ground pushes forward on the drive wheels, in reaction to the drive wheels pushing backward on the ground.

Laws of Conservation of Linear Momentum

A system is said to be isolated when no external force acts on it. For such isolated systems, (P=mv) is constant i.e. conserved.

The linear momentum is defined as

.....(1)

$$\vec{P} = m\vec{v}$$

Where v= velocity of the body, whose mass is m. The direction of P is same as the direction of velocity of the body as it is a vector quantity. From Netwons Second Law

$$\vec{F}_{ext.} = \frac{d}{dt}(m\vec{v}) = \frac{d}{dt}\vec{P} \quad .....(2)$$

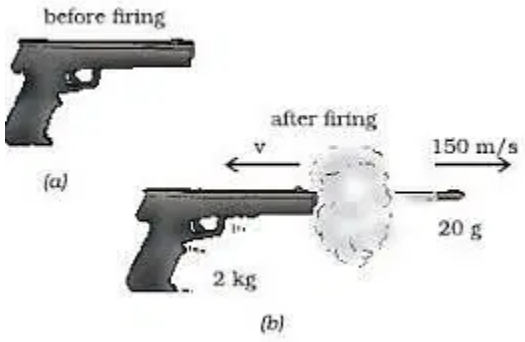
I.e time rate of change in the momentum of the body is equal to total external force applied to the body

If $\vec{F}_{ext.} = 0 \Rightarrow \frac{d}{dt}(\vec{P}) = 0$ or $\vec{P}$ = constant .....(3)

This is called Law of Conservation of Momentum.

Applications of Law of Conservation of Momentum

- **Recoil of Gun-** We can explain the Law of Conservation of Momentum with the workings of a gun and bullet. Before firing, the gun and bullet are at rest and also the momentum of the system is zero. However when the bullet is fired, while the movement of bullet is forward, the movement of recoil is backward. However since the mass of gun is more in comparison to the mass of bullet, the recoil is small as compared to the velocity of the bullet.

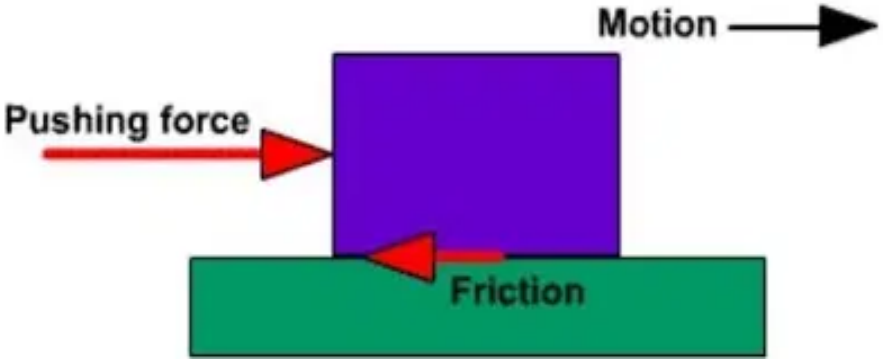


NEET Study Notes for Friction

Friction is defined as an opposing force which comes into existence when two surfaces are in contact with each other and try to move relative to one another.

- Friction Force acts along the common surface between two bodies in such a direction so as to oppose the relative movement of two bodies.
- **For example-** Let us consider that the force F is applied on an object and the object is place on a plane surface. Then the friction force is f=μN where N is the normal force and μ is the coefficient of friction

force.



Types of Friction

- Static Friction

is friction which is experienced when there is no relative motion between the object and the surface.The coefficient of static friction is a scalar quantity and is denoted as μs

μs = F /N

Where

μs = coefficient of static fiction

F=static frictional force

- Kinetic Friction

Kinetic Friction is the friction present between two or more objects that are in motion with respect to each other. The Kinetic Friction equation can be written as :

Force of Kinetic Friction =(coefficient of Kinetic Friction)(normal force)

***Fk*= μk η**

Where ,

Fk =force of Kinetic Friction

μk = coefficient of Kinetic Friction

η= normal force

- Rolling Fiction

The force which resist the motion of a rolling body on a surface is known as rolling friction. With the increase in smoothness, the force of rolling friction decreases .

Rolling Friction can be expressed as a product of load and constant to a fractional power

F = kLn

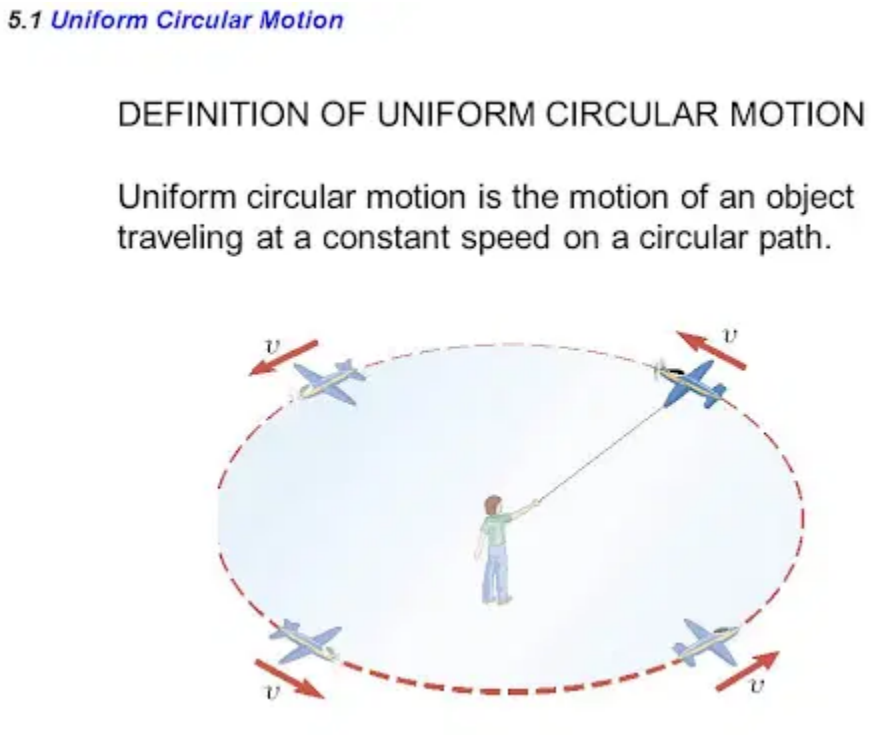
Laws of Friction

The five laws of friction are:

- Friction of a moving object is proportional and perpendicular to the normal force.
- Friction experienced by the object is dependent on the nature of the surface it is in contact with.
- Friction is independent of the area of contact as long as there is an area of contact.
- Coefficient of static friction is greater than the coefficient of kinetic fiction.

NEET Study Notes for Dynamics of Circular Motion

Circular motion can be uniform as well as non uniform. The main difference between both of them is the tangential component of acceleration. If tangential component of acceleration is present, it will be non uniform circular motion whereas if the tangential component of acceleration is absent, it will be uniform circular motion



Centripetal Force

Any motion in a curved path, represents accelerated motion and requires force directed towards the center of curvature of the path. Thus we can infer from the second law of motion that

F= ma or F=

$$\frac{mv^2}{r}$$

$$Fs = M\frac{v^2}{r}$$

Since, there is a limit to the maximum value of fraction , for a safe turn

$$m\frac{v^2}{r} \leq \mu_s N$$

where μs = Coefficient of static friction

Circular Turnings on Road

When vehicles turn on the road, they travel along a circular arc. The forces acting on vehicle are: Weight Mg, Normal reaction force N, Friction

If the road is horizontal, the first two forces are in vertical direction. Therefore the only force that provides acceleration for turning is friction. In this case, the force of fiction acts as centripetal force.

- **NEET Study Notes for Thermodynamics**

NEET Previous Year Solved Sample Questions on Laws of Motion

Question: When a bus starts suddenly, the passengers are pused back. This is an example of which of the following?

1. Newtons First law
2. Newtons Second Law
3. Newtons Third Law
4. None of Newtons Law

Answer: When a bus starts suddenly, the passengers fall backwards due to the law of inertia of rest (Newtons first law of Motion). This is so as the body was at rest and as the bus moves abruptly , the lower body is at rest while the upper body remains in a state of rest due to which the passengers fall backward.

Question: What is the mass of an object that requires a force of 90 N to accelerate at a rate of 2.6 m/s

1. 44.6kg
2. 34.6kg
3. 54.6kg
4. None of these

Answer: Force= mass x acceleration

90= m 2.6

m= 90/2.6

m= 34.6 kg

Question: Due to an acceleration of 2m/s², the velocity of body increases from 20m/s to 30 m/s in a certain period. Find the displacement (in m) of the body in that period.

1. 650
2. 125
3. 250
4. 325

Answer : 125

Given accerleration (a)= 2m/s², Final Velocity (v)= 30m/sand initial velocity (u) =20 m/s

Displacement =s

We know,

$v^2-u^2= 2as$(Equation of Motion)

$s=(v^2-u^2)/(2\times a)$

$s=(30^2-20^2)/2\times2$

$s=500/4$

$s=125$ cm

Question: The work to be done to increase the speed of a 0.5kg ball from 4m/s to 8m/s is:

1. 8J
2. 12J
3. 16J
4. 4J

Answer: 12J

Given that, Initial velocity (u)= 4m/s, final velocity (v)= 8m/s and

Mass(m)= 0.5 kg

Applying the work energy theorem,

Work done= Change in kinetic energy

$\Delta K.E= (K.E)^2- (K.E)1$

$\frac{1}{2}m (v^2-u^2)$

$\frac{1}{2}\times0.5\times (8^2-4^2)$

therefore

$\Delta K.E$ is 12J

Question: A car is running with a velocity of 20m/s and suddenly the brakes is applied to stop the car. Find the total work done to stop the car if the mass of the car is 200 kg

1. 20 K J
2. 40 K J
3. -40 K J
4. 0

Answer : 40 K J

Given that, Mass of the car (m) =200 kg

Initial velocity of the car (u)= 20m/s

Final velocity of the car (v)= 0

Change in KE = Final K E- Initial K E

$\frac{1}{2}m V^2 -\frac{1}{2}- m u^2 =\frac{1}{2}\times200\times(0-20)^2 = 40000J$

Therefore -40 K J

Work done by all forces = -40 K J

Question: “When a hanging carpet is beaten with a stick, dust particles start coming out of it.”This phenomenon is best example of :

1. Newtons First Law of Motion

2. Newtons Second Law of Motion
3. Newtons Third Law of Motion
4. Newtons Law of Gravitation

Answer: Newtons First Law of Motion

Since an object's inertia tends to resist any change in its state of rest or motion. When the carpet is beaten with a stick, it tends to move, however, the particles of dust are trying to resist their state of rest. This exerts a backward force on the dust particles and sets them in motion in the opposite direction. This is why the dust particles come out of the carpet.

Question: A ball of mass 2kg was initially in the hand og a girl. The girl throws the ball with 20 m/sthen find the impulse imparted to the ball

1. 10 kg m/s
2. 20 kg m/s
3. 40 kg m/s
4. -40 kg m/s

Answer : 40 kg m/s

Given that, Mass of the ball (m)= 2kg

Initial velocity of the ball

(V1) =0 and final velocity of the ball (V2)= 20 m/s

Impulse (J) imparted to the ball = P2- P1= 2×20-2×0= 40 kg m/s