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Where Minds Pollinate

Class 9
Physics

Chapter 3

Handwritten Notes

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8-29-24 C.W Thursday

Chapter#3

Dynamics I

Differentiate b/w Contact and non Contact forces.

Contact	Non Contact
Act through physical contact b/w objects	Act without physical contact b/w objects.
Required direct touch or physical Connection.	Can act over distances even across space.
Their is no field associated with Contact forces	There is always a field associated with non contact forces.
It is a non natural force	Ibis a natural force.

Examples	Examples
• frictional force (b/w surface in Contact)	Gravetational force (b/w object with mass
• Tension force (in string)	Electromagnetic force (b/w charged particles)
• Normal force (book on table	Electro statistic force (Charged particles.

Q. Define inertia?

Property of matter due to which it resists any change it stabes rest or uniform.

Q. Define and State Newton's 1st law of Motion.

If the net external force acting on a object is zero, object will maintain it's state rest or uniform

It means that in absensence of external force, an object ~~will maintain~~ it's at rest, it will remain at rest; while an object will in motion will continue to move with constant velocity (no change in velocity or no acceleration) Mathematically

$\vec{F}_{net} = 0$ the $\Delta\vec{v} = 0$ or $\vec{a} = 0$

Q Why does a passenger move outward when a bus takes a turn?

When a bus takes a sharp turn, passenger fall in a outward direction It is due to inertia, they want to continue in their motion in a straight line, thus falll outward.

Chapter#3 cow

Dynamics I

Q State second law of Motion.

If the net force acts one body in direction of a net force. The magnitude of this acceleration is directly proportional to net force on the body and Inversly proportional to mass of Body

If the force of produce acceleration $\vec{a}$ in the body on mass "m"

Then mathematically, we write

$$\vec{a} \propto \vec{F} \quad \text{(i)}$$

$$\vec{a} \propto \frac{1}{m} \quad \text{(ii)}$$

Continue (i) and (ii)

$$\vec{a} \propto \frac{\vec{f}}{m}$$

$$\vec{F} \propto m\vec{a}$$

Putting k as proportionality constant

$$\vec{F} = kma$$

In SI units, the value of $k = 1$

$$\vec{f} = m\vec{a}$$

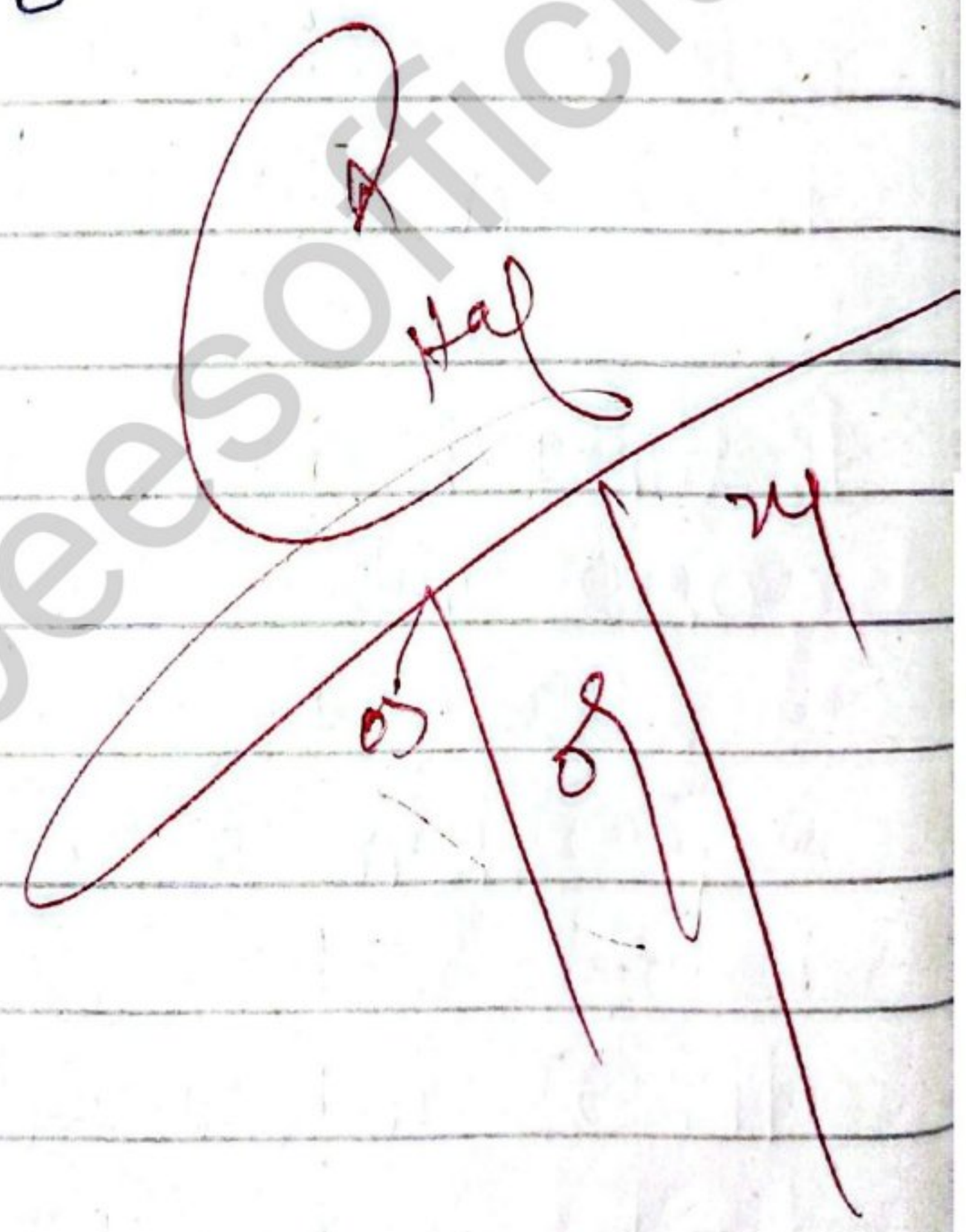
SI unit of force is newton

one newton is a force that produces on acceleration of $1 m/s^2$ in a body of mass 1kg

$1n = 1kg \times 1m/s^2$

OR

$1N = 1Kgm/s^2$



9-5-24 classwork Thursd

Chapter#3

Dynamics I

Q/ Write and explain Newta 3rd law of Motion-

Explaination:- Action and reactio are equal in magnitude but opposite in direction-

When an object 'A' exert force on object 'B' written as, $\vec{F}_{AB}$, object 'B' also exert equal force on object 'A' written as, $\vec{F}_{BA}$ in opposite direction

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

Here negative sign shows that force, $\vec{F}_{BA}$ is opposite force, $\vec{F}_{AB}$.

9-5-24 classwork Thursday

Q/ Write limitations of Newton's law of motion.

Although Newton's law of motion are a fundamental set of principles and are applicable in variety of situations, there are some limitations to there applicability:-

Newtons law are not applicable on microscopic level, As one on goes extremely low energies on atomic scale, position and acceleration are not well defined, where concepts of quantum mechanics take over.

Newton's law are not applied for objects moving at high speed, they are not applicable at speed of light (3×10^8 m/s) In such sibuation's we would require relativistic mechanics,-

9-6-24 classwork Fri

Chapter: 3

Dynamics I

Q/ Differentiate b/w mass and weight.-

Mass	Weight
• Mass is a quantity of matter in a body	Weight is force with which Earth attrats a body towards it's cente
• Mass can never be zero	Weight can be zero if no ~~quantity~~ gravity acts upon an object, as in space
• Mass is a scaler Quantity It has	Weight is a vector It has magnitude

magnitude	and direction
It canbe measured by ordinary babance	It canbe measured by spring babance
It does not change according to location	It ~~ca~~ changes according to location
It is usaully measured in grams and kgs-	It is measured in newton, unit g force
Formuba $m = \frac{W}{g}$	Formuba $W = mg$-

9-13-24 classwork

Chapter#3

Dynamics I

Q/ Explain fundamental forces in nature and role of Dr Abdus Salam in unifying two fundamental forces.

Ans/ The four fundamental forces in nature are Gravitational force, electromagnetic force, strong nuclear force, and weack nuclear force, Physicist have classified all forces that exist as one of these fundamental force.

Strong Nucler force

1. It is strongest of all fundamental force

2. It keeps protons tightly packed in nucleas.

3. It has very short range nearly

equal to diameter of Proton (10^{-15}m)

The exchange particles of strong nuclear force is pions.

Gravitational force :-

1. It is force of attraction b/w the all of the universe.

2. It is weakest of all fundamental forces.

3. The exchange particles of Gravitational force is Gravitons.

4. The massless nature of Gravitons allows gravity to be Infinite range.

Electro Magnetic force :-

It acts b/w electric charge

2 It includes both electric or magnetic forces

3 It can either be attractive or repulsive-

4. It's exchange particle is photon

5. Due to massless nature of photon, it has infinite range

Weak Nuclear force:-

1. It is 10,000 times weaker than strong nuclear force

2. It is mediated by exchange of three different particles called vector bosons.

3 Weak nuclear force is responsible for radioactive Decay

When this process occurs, a neutron in a nucleas transform in proton.

Role of Dr Abdus Salam in Unifiying fundamental forces:-

Abdus Salam (a pakistani theorical physisit) playeda crucial role in unificiying two fundamental forces, electromagnetic and weak nuclear force, which earned hima 1979, Nobel prize in for physics. His Hypothetical equation demostra-ted and underlined the relationship blw electromagnetic and weak nuclear force, Proposing the existen-se of vector Bosons. This work contributed to electro weak unification theory, later the experimently conf-irmened,

18/08/24

classwork

Chapter# 3

Dynamics I

2. State and prove N'second law of motion in terms of Momentum.

A force $\vec{F}$ produces acceleration $\vec{a}$ in a body of mass 'm', By second law of Motion it is written as

$$\vec{F}_{net} = m\vec{a}$$

The acceleration produces change the velocity of Body of initial velocity $\vec{v_i}$ and final velocity $\vec{v_f}$ during time interval Δt then by definition of acceleration

$$a = \frac{\vec{v_f} - \vec{v_i}}{\Delta t}$$

Putting 2 equation in 1 equation

$$\vec{F}net = m\frac{\vec{V_f} - \vec{V_i}}{\Delta t} \quad \text{or} \quad fnet = \frac{mv - mi}{\Delta t}$$

Hence $\vec{fnet} = \frac{\vec{P_f} - \vec{P_i}}{\Delta t} = \frac{\Delta \vec{P}}{\Delta t}$

the time rate of change of linear momentum of a body is equal to net force acting on body this means that for sudden change in momentum force is large and vice versa.

13 7

Isolated system

An Isolated system is a collection of bodies that can interact with each other but whose interations with envoirenment have no effect on their properties is termed as isolated system.

Law of conservation of momentum

For an Isolated system there is no net force acting = $\vec{F} = 0$, therefore $\vec{N}$ second laws in terms of momentum can be written as

$$0 = \frac{\vec{P_f} - \vec{P_i}}{\Delta t}$$

$$m_f \vec{v_f} = m_i \vec{v_i}$$

In the absence of external force the final momentem of system is equal to initial momentam, If no net external force acts on system of particles, the total momentum cannot be changed.

Q How rockets ... pushed forward.

In rockets hot gases produced by burning of fuel rush out with large momentum & it gains equal opposite momentum thereby causing them to accelerate.

Example

→ After firing a bullet moves with velocity v_B in one direction and rifle recoils with velocity v_G in other direction such that total final momentum [$P_f = 0$] is again zero

By conversation of Momentum

$$\vec{P_f} = \vec{P_i} = 0 \qquad m_B v_B + m_G v_G = 0$$

$$v_G = \frac{m_B v_B}{m_G} \qquad m_G v_G = -m_B v_B$$

$$v_G = \frac{-m_B v_B}{m_G}$$

Q/4 Deduce Newton's 1st law of motion and form 2nd law?

According to Newtons Second law

$$\vec{F} = m\vec{a}$$

$$\vec{F} = m\left(\frac{\vec{v_f} - \vec{v_i}}{t}\right)$$

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- If $\vec{F}=0$ then $\vec{U}_i=\vec{U}_f$ ie the objects continue to move with uniform velocity if no no net force is applied

- If $\vec{F}=0$ and $\bar{V}_i=\bar{U}_f$, then $U_f=0$ the object is at rest

So According Newton's 1st law of Motion, an object at rest or uniform motion tends to remain at rest or uniform motion unless an external force acts on it.

Numerical Response Question

Solve

A boy is holding a book of mass 2kg. How much force he is applying on book.

Given Data

$m = 2\,kg$

$a = 3\,m/s^2$

To find

total force $= F_T = ?$

$F = w = mg$

$= 2kg \times 9.8\,m/s^2$

$w = 19.6\,N$

$F = ma$

$F = 2kg \times 3\,m/s^2$

$F = 6N$

$F_T = w + f$

$$19.6N + 6N$$
$$F_T = 25.6N$$

2. A girl has mass 30 kg is running with velocity of 4 m/s, find momentum.

Given Data

$$m = 30kg$$
$$U = 4m/s$$

to find

$$\vec{p} = ?$$

Solution:-

$$\vec{p} = m\vec{v}$$
$$\vec{p} = 30kg \times 4m/s$$
$$P = 120kgm/s \text{ or } Ns$$

A 2 kg steel ball is moving with speed of 15 m/s. It hits bulk of sand and comes to rest in 0.2 seconds find applied force.

given data

$m = 2kg$

$v_i = 15 m/s$

$v_f = 0$

$t = 0.2 sec$

To find

$F = ?$

Solution:-

$\vec{F} = m\vec{a}$

$\vec{F} = m\left(\frac{v_f - v_i}{t}\right)$

$\vec{F} = 2kg\left(\frac{0 - 15 m/s}{0.2 sec}\right)$

$\vec{F} = 2kg(-15)$

classwork

$\vec{F} = -150\,N$

4./ A 100 gram bullet if fired from 5kg gun Muzzle velocity of bullet is 20 m/s Find recoil velocity of gun.

Given Data :-

$m_B = 100g = 0.1\,kg$

$m_G = 5kg$

$V_B = 20\,m/s$

To find

$V_G = ?$

Solution

We know that

$$V_G = -\frac{m_B V_B}{m_G}$$

$$V_G = -\frac{(0.1kg)\ (20\,m/s)}{(5kg)}$$

robotic car 15kg moving 25m/s
Brakes are applied to stop it.
Brakes apply constant force 50
N. How long does car take to
stop.

Given Data

$$\vec{F} = m\vec{a}$$

$$\vec{F} = m\left(\frac{\bar{v}_f - v_f}{t}\right)$$

$$t = \frac{m(v_f - v_i)}{F}$$

$$t = \frac{15\ kg\ (0 - 25\ m/s)}{50\ N}$$

$$t = -7.5\ sec$$

Sign shows deceleration.

6-6-2024 classwork Sunday

Chapter#3 Ex Q1Ans

Dynamics I

1. When a motor cycle ---- Explain?

When a motorcyclist hits a stationary car then he cannot stop himself due to Inertia and Continue his state of motion, So he may fly off the cycle while driver is at rest, When motor cyclist hits the car driver wants to at rest due to inertia, but his lower part moves with car with a force produced by collision so driver in car may have a risk to get neck injury.

2. In autumn ---... why?

In Autumn when we shake the brank the leaves gets dealtache Because when a tree is forcefully shaken, The branches come in motion, but leaves tend to continue at state of rest due to inertia, As leaves gets seperated from branches of tree and hence fall down.

3. Why It is -...- bycyle

If we apply brakes only on front of wheel of a bicycle, Then the bicycle lifts the rear wheel, which may cause an accident, It is due to inertia, rear wheels want to continue motion but when we apply brakes our wheight is shifted towards front wheel, The Inertia coupled with gravity puts our weight and More weight means more friction.

with ground. So the front wheel stops immediatly but rear wheel lifts up which may cause an accident.

5. Action-.... reaction pair?

Action and reation forces a equal in magnitude but in opposite direction and always act in pairs, They do not neccessaily babance each other out as they act on different bodies) **For Example:** When you push on wall, the wall exerts equal force but opposite force on you, resulting in no net force on wall How ever you might feel a force propelling you back ward depending on frictional force acting on your feet,. Bodies can Indeed move under action reaction pair as forces acts on different objects resulting in a net force That can cause motion.

for Example: When a car acceberates forward, the car's engine applies a force to ground which exerts equal forces and opposite reaction on carpropelling forward, car move forward due to net force acting uponit-

6. Aman---- why itisso?

When a man slips on oily floor then he has minimum friction b/w floor and his feet, He throws his bag to move aut of slippery area in one direction, this is an action according to third law of motion as reation he will move in opposite direction due to bess friction, This helps him get out of oily surface-

How would .... rocket?

Newtons third baw of motion states that to every force there is a equal or opposite direction similarly when a rocket moves, it exerts the action force on gases expel them backward which in turn expel them backward which in term excerts an equal but opposite direction to move rocket forward.

Rockets work on Principle of conuersation of momentum, Rocet eject gases backward and thus by conversation of momentum, rocket gets momentum in forward diriection making it move forward.

8 Why are ..... foam?

Batsmans gloves are padded with foam for protection and it provides better friction blw gloves and bat, It helps to absorb the impact of fast moving cricket ball when struck by bat, It acts as shock absorber, minimizing impact, felt by batsman's hands.

9. Where will your ..... What about mass

Weight is force exerted on an object by gravity and it depends on gravitational field, The earths field is much stronger than moons so you would feel more weight on earth, However mass remains same every where in universe, Mass is a measure of amount of matter in an object and it does not change.

When Ronaldo..... Earth?
So even through forces are
equal in, the ball moves towards
earth because of their huge differe-
-nce in mass, the earth measure
size and inertia mean it doesn't
budge appreciatly, white balls
smallar mass and inertia allows
it to accelerate toward earth.

Abdu

07/10/24

Long Q/Ans

2/Define inertia ..... examples.

Inertia of a body is It's property due to which it resists any change in it's resis in state of rest or motion

Mass is measure of Inertia of body i-e greater mass, greater will be inertia, Inertia of body depends on mass.

Knowledge of Inertia is important in our daily life, It help us to understand and navigate, physical world around us, The Inertia of an object enables us to maintain patterns of functioning, Ith as many uses

The design of safety devices for vehicles, Including seat belts that can provide external force to stop motion of body in sudden change -

3. Deduce ..... law?

According to first bow of motion a body continues it's ~~mod~~ motion, it's state of rest or uniform, motion in a straight line provided no net force act on it.

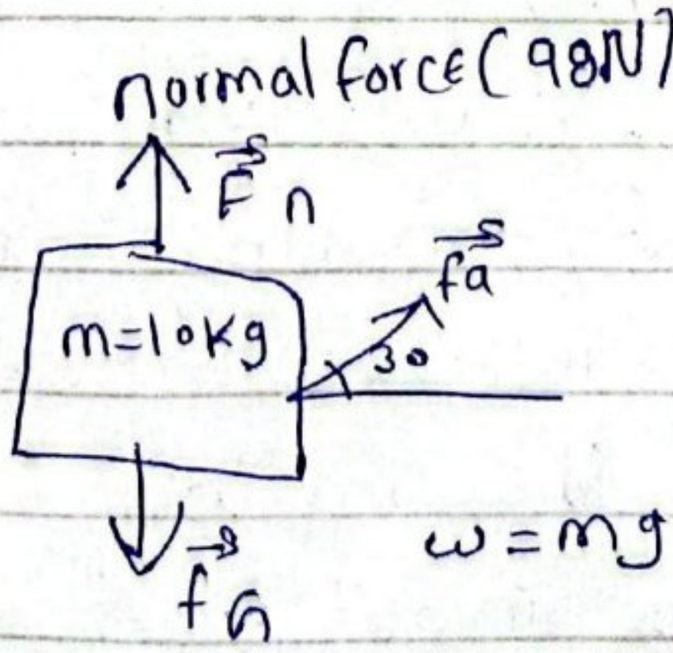
If an external force ($\vec{F}$) is p applied to object, it will cause object to accelerate, the larger the force applied greater the acceleration and vice versa, N second law of motion suggest that an object is directly proportional to net external force acting on it and inversely proportional to it's mass

Mathematically

$$\vec{F} = m\vec{a}$$

Q7/ Sa Represent ..... diagrams

Suppose we have a block of mass 10kg resting on horizontal surface with force = 20N applied at an angle of 30° to horizontal The free body given as



Gforce = (10kg x 9.8m/s²

= 98N

Define momentum..... areequal?

~~Represent..... diagrams~~

Momentum

Momentum of body is quantity of motion it posseses due to it's mass and velocity-

OR

Product of object's mass 'm' and velocity 'v' is called momentum denoted by $\vec{P}$

Mathrmatically

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

Q bdu

05/10/24

Completed

Unit

SI unit of momentum is [kgm/s]

on n 2 law (NS)

Quantity

Momentum is vector

MS=Kgm/s

$Ns = kgm/s^2 \times s$

$= kgms^2 \times s$

$kgms^{-2+1}$

Chapter 1

Q/10/ Why do we need to consider significant digits in measurment?

Significant digit's help us to understand how precise a measurment is to they tell us which mnumber's we have sure about and which one are more uncertain, This is important for accuratly conveying the precision of measurments. The helps to understand how accuratedy our measurement are-

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