Class 11 Chapter 1: Physical World.

What is physics?

Physics (Sanskrit: Bhautiki) → Study of physical world

↓

From Greek word "φύση" (15th Century)

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Meaning Nature

→ Study of basic laws of nature

→ Ahhhhhhh!.... It's not possible to define in few lines what physics is

⇓

The Repititions of Day & Night, the annual cycle of seasons, the eclipses, the tides, the volcanoes, the rainbows, ~~have~~ the motion of Sun to the motion of electron, the heating up of glass of water to the cooling of stars, the flow of river, the depth of sea, the _____ NO!!!!

→ All are understood through Physics

Umm.... Umm.... Physics is ♥.

"Physics is the King of Science and Mathematics is the Queen"

the hearing of sound, vision of light & colours, the glowing of bulb, the rotation of wheels, the image on T.V. or the cooling of A.C. _____ NO!!!

Unification & Reductionism

Unification

Laws of Gravitation

$F = \frac{Gm_1m_2}{r^2}$

↓

Universal Law

→ Fall of apple on ground

→ motion of moon around earth

→ motion of planets around sun

→ Unification is an attempt to explain various phenomenon by few or some basic laws

→ Unification is an attempt to see physical world through some universal laws which can be applied to different domains.

→ Maxwell's 4 equation → Complete Electrostatics
→ Electrodynamics
→ Magnetism
→ ElectroMagnetic wave

Reductionism.

Properties of a bigger, More Complex System → from → Properties of constituent particles

ex: Thermodynamics from → Kinetic Theory

Scope & Excitement of Physics

Scope

- Macroscopic (Classical physics)
- Microscopic (Quantam physics)
  - Atoms
  - Sub Atomic particles

- Mechanics
  - Motion of particles
  - Propulsion of rocket
  - water waves
  - Sand waves
  - Bending of rod
  - Floatation of ship
  - etc, etc, etc
- Electrodynamics
  - charge
  - current
  - Magnetism
  - A.C.
  - Transformer
- optics
  - lenses
  - mirrors
  - eye
  - Telescope
  - Raibbow
- Thermodynamics
  - Heat
  - Temperature
  - Heat Engine
  - Spontaneity of Process
  - Conduction Radiation Convection

Scope of physics is from 10^{-30} kg to 10^{55} kg

Mass of e^- — Mass of Known Universe

Scope is from "vacuum" to "infinity"
Scope is from 10^{-14}m (radius of nucleus) to 10^{26}m (Length of galaxies)

Excitement of Physics

Excitement comes from

1. Few basic Concepts and laws can explain many phenomean
2. imaginative new experiments
3. Application to make useful devices
4. Applicable in daily life
5. Prediction of Future events

Physics, Technology & Society.

Physics → Thermodynamics → Improve Effeciency of Heat Engine → Industrial Revolution

#1) Technology gives Rise to New Physics

How To Improve Steam Engine → Let's study Physics (Thermodynamics)

#2) Physics gives rise to New Technologies

Silicon Chip (Semiconductor) (Modern Physics) → Computer Revolution

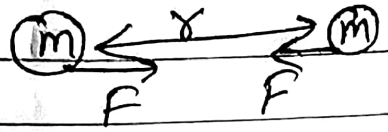
Electricity & Magnetism (EMW) → Wireless Communication Technologies

Physicists	Major Contribution/ Discovery	Country of Origin

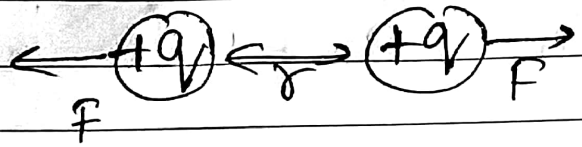
(Table from NERT)

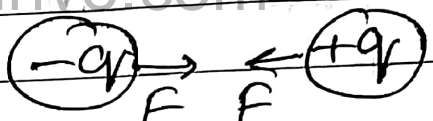
Fundamental Forces In Nature.

(1) Gravitational Force → Long Range Force
→ Do not require medium
→ "weakest force of nature"



(2) ElectroMagnetic Force.





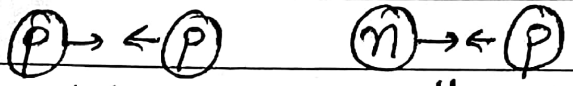
→ Long Range Force
→ Do not require medium
→ Strong Force

"electric force between 2 protons is 10^{36} times the gravitational force between them"

(3) Strong Nuclear Force

Nucleus

→ Strongest Force
→ Short Range Force (10^{-15} m)
→ Do not depend on charge
→ $F_{n-n} = F_{n-p} = F_{p-p}$



Attract Attract

100 times Stronger than ElectroMagnetic Force

→ Binds the p-p, p-n, n-n inside nucleus
→ Do not act between p-e. (only Nucleus)

(4) Weak Nuclear Force

Appears only in certain nuclear process such as the β^- decay.

Arises due to interaction of neutrino with other particles

→ Short Range Force (10^{-15}m)

→ Stronger than gravitational force but weaker than ElectroMagnetic

$F_{strong\ Nuclear} > F_{electromagnetic} > F_{weak\ nuclear} > F_{gravitational}$

$1 : 10^{-2} : 10^{-13} : 10^{-38}$

Range: short (10^{-15}m) | long (∞) | short (10^{-15}m) | long (∞)