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CHAPTER – 1 PHYSICAL WORLD → Introduction to physics

Science :

→ The word science is derived from a latin word "Scientia"

Scientia means "knowledge".

- science in sanskrit is called as "Vigyan".

Vigyan means "systematic knowledge".

Q) What is science?

Ans. It is a systematic study of knowledge.

or It is the systematic and organised study of natural phenomena by way of observation, experiments and reasoning.

NOTE:

In the beginning ie Before 1800 A.D. science was almost considered as a 'single subject' called as 'natural philosophy'.

Main Branches in science.

- science is divided into two main branches:

1. physical science 2. Biological science.

Note: One more important branch in science is "Earth science" or Geophysics.

Q: what is earth science?

→ It is the branch of science which deals with study of earth.

1. PHYSICAL SCIENCE

Q) What is physical science?

→ It is the branch of science which deals with study of behaviour and properties of non-living objects or matter.

Branches

It has 2 main branches.

1. PHYSICS 2. CHEMISTRY.

2. BIOLOGYCAL SCIENCE

Q. What is Biological science?

→ It is the branch of science which deals with study of behaviour and properties of living matter.

Branches

It has 2 main branches

1. Botany 2. Zoology

PHYSICS :

→ The word physics is derived from a Latin word "fusis",

Fusis means ⟶ Nature.

Q) What is physics?

→ It is a branch of physical science which deals with study of basic laws of nature.

and natural phenomena.

OR It is a science of measurements.

Note: " Most of the natural phenomena connected with matter, energy, space, time, motion etc, can be explained by theories, principles, and laws of physics."

Branches in physics:

→ There are 2 main branches in physics.

They are

1. classical physics 2. Quantum physics.

Classical physics

Q) What is classical physics?

→ It is the branch of physics which deals with study of "Macroscopic" phenomena occuring in nature.

Branches:

It has many branches.

1. Mechanics
2. Optics
3. Electricity
4. Magnetism
5. Heat & thermodynamics etc.

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Mechanics :

→ Q) what is mechanics ?

→ It is a branch of classical physics which deals with study of Rest and motion of the bodies.

Branches : There are three main sub branches.

1. Kinematics 2. Dynamics and 3. statics.

Kinematics

→ It is a branch of mechanics which deals with study of "description of motion" of the bodies.

Dynamics

→ It is a branch of mechanics which deals with study of " cause or reason for motion" of the bodies.

Statics

→ It is a branch of mechanics which deals with study of "Rest" of bodies or study of bodies at rest.

Note : " Gravitation, states of matter are also considered as branches of mechanics".

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OPTICS :

→ It deals with study of various phenomena related to light. For ex.: reflection, refraction, interference, diffraction, polarisation, scattering of light etc.

Branches:

2. branches. They are. (1) Geometrical optics.
(2) physical optics.

Geometrical Optics or Ray optics

→ It is the branch of optics which deals with study of rectilinear propagation of light. and Image formation based on ray concept using Geometry.

or

It is a branch of optics which deals with study of description of light propagation in terms of rays.

Physical optics

→ It is a branch of optics which deals with study of nature of light.

That is it deals with the production, propagation and reception of light.

Branches : 2 main branches

1. Wave optics 2. quantum optics.

Wave Optics :

→ It is a branch of physical optics which deals with study of wave nature of Light.

· Note : By considering light as a wave. the phenomena such as interference, diffraction and polarisation are explained.

Quantum Optics :

→ It is a branch of physical optics. which deals with study of "particle" nature of Light.

Note : By considering light as a particle. the phenomena such as photoelectric effect, raman effect, compton effect, scattering of Light etc can be. explained.

Electricity :

→ It is a branch of physics which deals with study of electric charges at rest and in motion.

Branches : 2 branches

1. Electrostatics :

→ It deals with study of electric charges at rest.

2. Electrodynamics or current electricity.

→ It deals with study of electric charges in motion.

Magnetism :

→ It is a branch of physics which deals with study of attracting properties of materials with respect to iron, nickel, cobalt etc.

Heat and Thermodynamics.

→ It is the branch of physics which deals with study of Heat energy, temperature, internal energy etc and also interconversion of heat & mechanical energy.

(2) Quantum Physics

Q. What is quantum physics ?

→ The branch of physics which deals with study of submicroscopic particles and their phenomena.

This branch of physics helps in minute study of atoms, nucleus, protons, electrons & neutrons.

Branches : 2 Branches

(i) Atomic physics (ii) Nuclear physics.

1. Atomic Physics :

→ It is a branch of physics which deals with study of atom and their properties

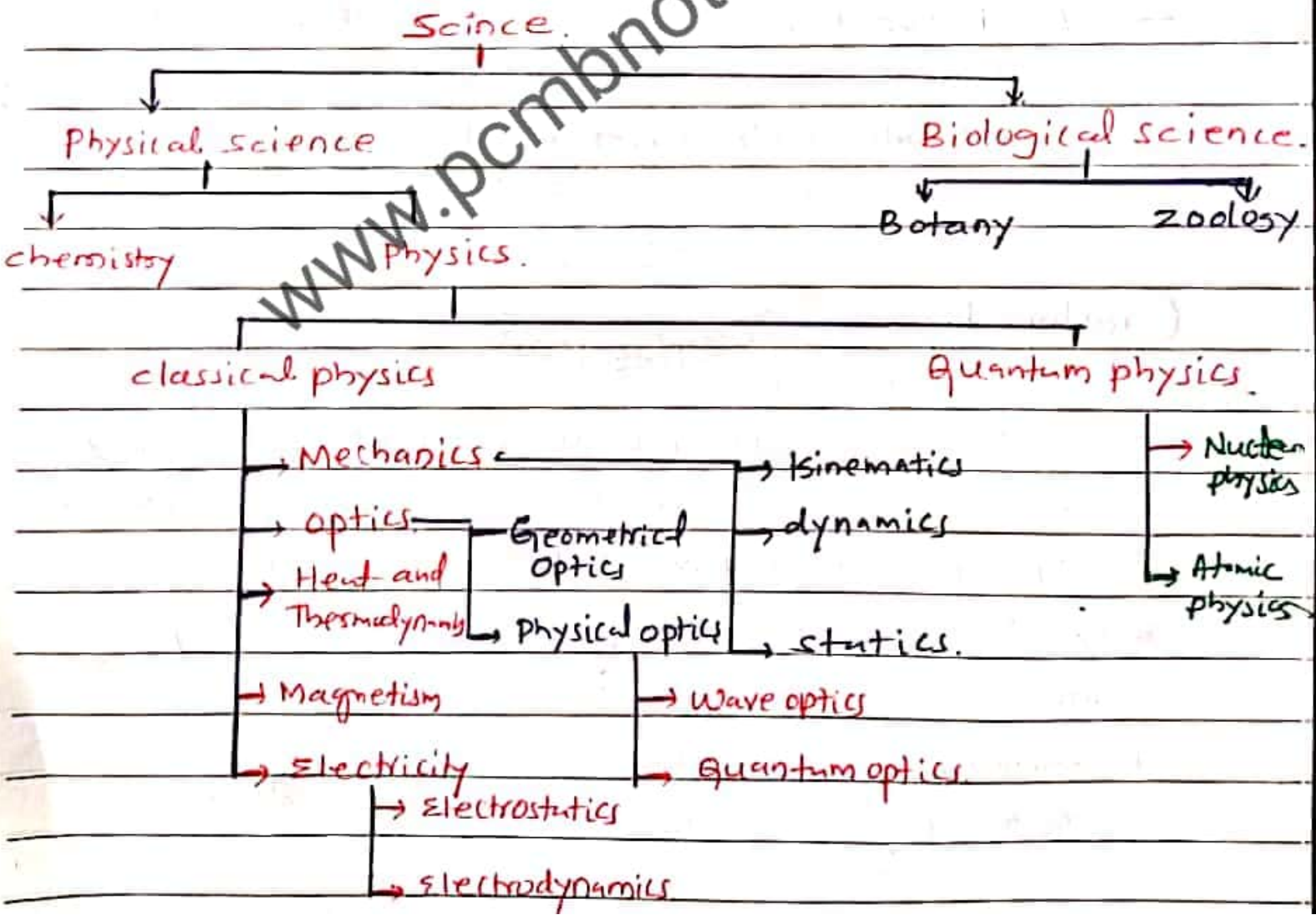
2. Nuclear physics :

→ It is a branch of physics which deals with study of Nucleus & its properties.

Scope of physics :

→ It covers many of the following branches.

TREE DIAGRAM



- It explains both atomic phenomena as well as astronomical phenomena.
  ie length of range from 10^{-15} m [radius of nucleus] to 10^{26} m. [radius of universe]

- It deals with mass of range 10^{-31} kg [mass of electron] to 10^{55} kgs [mass of universe]

- It deals with time range 10^{-22} s to 10^{18} s [age of universe]
  [life time of fundamental particle]

Excitement of physics:

The study of physics is exciting in many ways. b'coz it provides answers to the following exciting questions.

1. Why sky appears blue?
2. Why sun appears red during sunrise & sunset.?
3. Why colours are seen on the soap bubble when exposed to sunlight. ?
4. What are electrons ?
5: What are atoms?, molecules? etc.

Physics for society :

→ Most of the developments in physics made our society very flexible.

1. We can travel faster in aeroplane
2. We enjoy TV. Radio etc
3. We use electricity to operate electrical appliances.
4. We use computers to solve complex problems
5. We use satellites for communication.

Physics for Technology :

Technology is the application of the principles of physics for practical purposes.

1. The laws of thermodynamics leads to discovery of "steam engine" which made a the revolution in Industries
2. The laws of electricity and magnetism leads to wireless communication.
3. Newtons law of gravitation helped us to launch. Artificial Satellites
4. The study of heat & thermodynamics helped us to design engines like petrol engine diesel engine, refrigerator. air conditions etc.

Scientific Method :

Q.1 What is scientific method ?

→ The systematic and organised way to study natural phenomena, step by step adopted by scientist is called as scientific method.

Steps Involved in scientific method.

→ The following are the steps involved in scientific method.

1. Systematic Observation
2. Logical reasoning
3. Model making
4. Theoratical prediction.
5. Verification & falsification of theories.

1. systematic observation & Logical reasoning

Example I: In rainy season both Lightening and thunder occure.

- systematic observation → Lightening is seen first and then we hear thunder.
- Logical reason → speed of light is greater than speed of sound.

Example 2 : Apple fall towards earth.

systematic observation → why apple fall towards earth?
by newton
why not earth move towards apple.

logical reasoning → Newton after studying gravity says that "every object in the universe attracts every other object towards it"
ie He gave a "law of gravitation".

Here in this example apple is smaller than earth so it falls towards it.

Model Making :

→ It is a simplified concept or physical structure given or used by a physicist to explain a phenomena under study.

For example :

1. systematic observation of Rutherford's α-ray scattering experiment leads to "Atomic model".

Similary

2. Invension of thermometer, manometer etc helped many great scientists like Boyle, Charles and Gay Lussac to give most popular laws of gases.

These laws gives an equation ie $PV = nRT$.

Theoratical prediction :

→ scientific models and theories are interlinked.
ie Theories generate models and models generate theories.

Example :

(i) α-ray scattering expt [~~model~~ Theory] gives Atomic model.

(ii) "paul Dirac" gave theory regarding antiparticle.
Two years later Another physicist "Anderson" performed an experiment and discovered "positron".

Role of predictions :

1. Discovery of planet "Neptune"
   → It is discovered due to mathematical predictions.
2. Discovery of planetary motion.
3. Discovery of Halley comet.