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Unit :- I

PHYSICAL WORLD and MEASUREMENT :-

Chapter :- 1(a)

Q What is Science?

Ans This knowledge which man has gained through observations and experiments, when organised systematically is called 'Science'.

Q What is Physics?

Ans :- The word 'Physics' comes from the Greek word 'fusis' meaning Nature. This word was introduced by ancient scientist Aristotle in the year 350 B.C.

The Branch of Science which is devoted to the Study of nature and natural phenomena is called 'Physics'.

Q Branch of physics?

Ans :- 1) Mechanics :- which deals with the theory of motion of material objects at low speeds.

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2.) Thermodynamics :- which deals with heat, temperature and the behaviour of a system of very large number of particles.

3) Electromagnetism :- which deals with the study of electricity, magnetism and electromagnetic Radiations.

Q Physics in Relation to other Sciences :-

Ans a) Physics in Relation to chemistry :-

The study of structure of atoms, Radioactivity X-ray diffraction etc. in Physics have enabled Chemists to rearrange elements in periodic table on the basis of atomic number.

b) Physics in Relation to Biological sciences :-

The optical microscope developed in physics are extensively used in the study of biological samples.

electron microscope :- Study of biological cells

X-ray :- Help in many branches of Biological physics.

c) Physics in Relation to Astronomy :-

The giant astronomical telescopes developed

in physics are used for observing planets and other heavenly bodies.

d) Physics Related to the Mathematics:-

Theories in physics often make use of mathematical concepts. Mathmatics has infact served as a powerful tool in the development of modern theoretical physics.

e) Physics Related to other science:-

The other sciences like Biophysics, Geology, Meteorology etc. also use some of the laws of physics.

Q: Physics Related to Society:-

Ans 1) The development of telephone, telegraph, telex impact on society to Improve messages instantly.

2) The development of Radio, television, satellites have revolutionised the means of communication.

3) Advances in electronics, computers, lasers have greatly enriched the society.

4) Rapid mean of transport are no less important for the society.

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Q Forces in Nature :

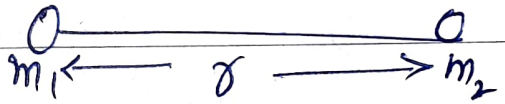
Ans:- There are four kind of forces :-

a) Gravitational forces.
b) weak forces.
c) Electromagnetic forces.
d) Nuclear forces.

a) Gravitational forces :- The gravitational force is the force of attraction between two bodies depend upon their and masses and Inversely proportional to square of distance between them.

Let m_1 and m_2 be the masses of the two bodies and r is the distance between them.

Here acc. to defination



$$F \propto m_1 m_2$$

and $$F \propto \frac{1}{r^2}$$

$$F \propto \frac{m_1 m_2}{r^2}$$

$$F = G\frac{m_1 m_2}{r^2}$$

Here G is gravitational Constant

$$[G = 6.67 \times 10^{-11}\ Nm^2/kg^2]$$

Important properties of gravitational force are:-

i) It is universal attractive forces.
ii) These are weakest forces in nature.
iii) They operate over very large distance.
iv) Gravitational force obey inverse square law.
(v) It is central forces.
(vi) It is conservative forces.
(vii) The field particle of gravitational forces is Called "graviton".

⇒ Weak forces :- The weak forces are the forces of interaction between elementary particles of short life times.

(These forces discovered during the study of the phenomenon of β-decay, in radioactivity.

Important properties of weak forces

1) The weak forces are 10^{25} times stronger than the gravitational forces.
2) The weak forces exist between leptons and leptons; leptons and mesons etc.

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⇒ **Electromagnetic forces** :- Electromagnetic force is Represented by Coulomb's law

Acc. to this law the magnitude of force of attraction and Repulsion between any two Charges and invesely proportional to the square of distance between them.

$$F \propto \frac{q_1 q_2}{r^2}$$

$$F = \frac{1}{4\pi\varepsilon_0} \frac{q_1 q_2}{r^2}$$

$$\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \, N m^2/c^2$$

$$\varepsilon_0 = 8.85 \times 10^{-12} \, c^2 N^{-1} m^{-2}$$

Important properties :-

(1) These forces may be attractive or repulsive.
(2) These forces are governed by Coulomb's laws which are similar to Newton's law of gravitation.
3) They obey inverse square law.
(4) This force is 10^{36} time stronger than gravitational forces and 10^{11} stronger than the weak forces.

5) They operate over distances which are not very large.
6) They are central force.
7) They are also Conservative force.

=> Nuclear force: The force that bind the neutrons and protons together in a nucleus is called the strong nuclear force.

=> Salient features of nuclear forces.

1) Nuclear forces are the strongest forces in nature. (Range 10^{38} time stronger than gravitational)
(10^{2} time stronger than electromagnetic
(10^{13} stronger than the weak force.)

2) It is a short Range force.
3) Nuclear forces do not depend on Charge on the nucleon.
4) It is not obey inverse square law.
5) Nuclear forces are non Central forces
6) They are also non-Conservative forces
7) The field particle of nuclear forces is π meson.

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Conservation laws:-

The quantity In physics donot change we say it is Constant or it is Conserved.

In Classical physic, we often deal with the following Conservation laws.

i) Law of Conservation of linear momentum
ii) law of Conservation of energy
iii) law of Conservation of Mass
(iv) law of Conservation of charge.
(v) law of Conservation of angular momentum.

⇒ Law of Conservation of Linear momentum:-

According to this law, "In the absence of an External force, the linear momentum of the system remains Unchanged.

eg:- When a gun is fired, force on the bullet inside the gun barrel is equal and opposite to the force on the gun.

⇒ Law of Conservation of energy:-

The law of Conservation of energy is one of the generalization of physics.

According to this law "energy cannot be created or destroyed. It can be transformed from one form into another, but total amount of energy Remain same.

eg:- The sun shine because some of its nuclear energy converted into Radiation (Radiant energy)

law of Conservation of Mass:-

According to this law of Conservation of mass is neither created nor destroyed in ordinary chicaly and physicaly changes.

eg Chemical changes

Carbon + oxygen → Carbondioxide

$C + 2O \rightarrow CO_2$

$12 + 2 \times 16 = 32 = 12 + 16(2)$

$44 = 44$

law of Conservation of Charge:-

According to this law the charge neigther be created nor be destroyed it can only transfered from one body to another body.

eg:- When a glass reed is rubbeed with a piece of sille cloth. glass Rod become (+ve) and silk Cloth

become (-Ve).

law of Conservation of ~~linear~~ angular momentum:-

According to this Conservation of law of the external torque acting on a system is zero, angular momentum of the system remains Constant.

Angular momentum (L) = moment of Inertia (I) × Angular speed (ω)

eg:- planets Revolving around the sun in elliptical orbits maintain their orbital plane and angular momentum in this plane.