

Elementary Maths U-1.PHYSICS - XI

Science: It is the organised, systematic and formulated knowledge obtained by observation, experimentation and verification.

Physics: It is the branch of science which deals with nature and natural phenomenon.

BRANCHES OF PHYSICS:-

1. Mechanics:— branch of physics which deals with orderly motion of bodies <sup>in nature</sup>.
2. Thermodynamics:— branch of physics <sup>which</sup> deals with disorderly motion of bodies.
3. Electro-magnetism:— branch of physics <sup>which</sup> deals with electricity, magnetism and electromagnetic waves.
4. Sound or Acoustics:— branch of physics <sup>which</sup> deals with propagation of sound waves.

Speed of Sound waves:-

(i) In air  $\rightarrow 332 \text{ m s}^{-1}$

(ii) In water  $\rightarrow 1400 \text{ m s}^{-1}$

(iii) In iron  $\rightarrow 5000 \text{ m s}^{-1}$



(2)

5) Optics (lights): branch of physics <sup>which</sup> deals with the phenomena of propagation of light, formation of images, reflection, refraction, dispersion, diffraction, interference, polarisation.

6) Relativity: Branch of physics which deals with the theory of invariance and the speed of an object comparable to the speed of light.

Theory of invariance: It states that the magnitude of charge on a body does not change whether the body is at rest or in motion.  
i.e.  $\Rightarrow q = q_0$   
rest motion

7) Rest mass = ( $m_0$ ): It is the mass of body at rest. The mass of a body at any instant (time) moving with a speed comparable to the speed of light is:-

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}} \quad \text{i.e., } m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$$

where  $v$  = speed of body at any instant  
 $c$  = speed of light.

$$c = 3 \times 10^8 \text{ m/s}$$

Speed of rocket = 21 Km/s  
 $v = 21 \times 1000 \text{ m/s}$   
 $= 2.1 \times 10^4 \text{ m/s}$



Let  $m_0 = 1 \text{ Kg}$   
then  $m = \frac{1}{\sqrt{1 - \left(\frac{2.14 \times 10^4}{3 \times 10^8}\right)^2}} = \frac{1}{\sqrt{1 - \left(\frac{2.1 \times 10^{-4}}{30}\right)^2}}$

$$\frac{1}{1 - (7 \times 10^{-5})^2} = \frac{1}{\sqrt{1 - 49 \times 10^{-10}}} = \frac{1}{\sqrt{1 - \left(\frac{2.1 \times 10^{-4}}{30}\right)^2}}$$

$\Rightarrow \frac{1}{\sqrt{10^2 - 49}}$

Here 49 is much less than  $10^{10}$

Assumption

$$49 \ll 10^{10}$$

So that 49 = neglected.

$$\therefore m = 1 \text{ Kg}$$

Alternatively

If the body is moving with the speed equal to speed of light.  $\therefore v = c$

Then  $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$

$$\frac{m_0}{\sqrt{1 - 1}} = \frac{m_0}{\sqrt{1 - 1}}$$

$$m = m_0 = \infty$$

This shows that mass of body becomes infinite when ~~it~~ <sup>body moves</sup> with the speed, comparable to speed of light.

(9)

DATE: / /

8. Particle physics: It is the branch of physics which deals with ultimate particles of which atoms are made of in nature.

9. Quantum physics: Quantization is the process of restricting all the possible values of a physical quantity to certain discrete values.  
Nuclide  ${}^A_Z X$  where  $A$  = atomic mass  
 $Z$  = atomic no.

$$1.66 \times 10^{-27} \text{ Kg}$$
$$N_p = \text{no. of } p = \text{no. of } e$$

$e^+$  = proton: It is antiparticle of  $e^-$ .  
i.e. it has same properties as that of  $e^-$  but is positively charged.

Quantization of  $e^-$  charge states that the total charge on a body is an integral multiple of the smallest unit of charge i.e. electron or proton.

i.e.  $q = \pm n e$   
 $q =$  total charge on body.  
 $n =$  integer  
 $e =$  fundamental charge.



Physics is the study of nature and natural phenomena.

Branches of physics: the various branches of physics are:

- 1) Mechanics: It deals with the study of motion of bodies on macroscopic level in a particular direction.
- 2) Thermodynamics: It deals with the study of motion of tiny particles like gas molecules.
- 3) Electromagnetism: It deals with electricity, magnetism and electro-magnetic waves.
- 4) Sound or Acoustics: It deals with the propagation of sound waves and vibrations produced in a medium.
- 5) Light or Optics: It deals with the propagation of light, reflection, refraction, interference, dispersion, polarization etc.
- 6) Nuclear physics: It deals with the properties of atomic nuclei.
- 7) Relativity: It deals with the laws of mechanics in nature and the comparison of velocity of light with the velocity of light.
- 8) Particle physics: It deals with the ultimate particles of which matter is made up.
- 9) Quantum mechanics: It deals with the mechanical behaviour of particles of sub-microscopic world.

Scope of Excitement:

There are large number of physical phenomena which are most exciting e.g:

- 1) Formation of rainbows in the sky after rain.
- 2) Formation of rain drops which is spherical.
- 3) Beating of drums produces sound waves.
- 4) Heat energy of steam runs railway engines and so on.

On the other hand, there is enormous scope of physics as well e.g:

- 1) Mass of an electron =  $9.1 \times 10^{-31}$  kg
- 2) Charge of an electron =  $-1.6 \times 10^{-19}$  C.
- 3) Mass of universe =  $10^{55}$  kg.
- 4)  $1 \text{ fermi} = 10^{-15} \text{ m}$  is the size of nucleus and so on.

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Physics in relation to Society & Technology:

Technological development is closely related to the application of physics because properties of matter are measured and the results are examined by physics, e.g:

- 1) Study of heat and thermodynamics has helped us to design heat engines e.g. steam engine, diesel engine, petrol engine. Refrigerator and air-conditioner are the wonders of technology.

2) Study of electromagnetic waves has helped