Physics

Name Symbol Value

Number $\pi = 3.141$
Number e = 2.718
Elementary Charge e = 1.602
Gravitational Constant G = 6.672
Fine Structure Constant $\alpha = e^2 / 2hc\varepsilon_0$
Speed of ligth in vaccum C = 2.997 def
Permittivity of the vaccum $\varepsilon_0 = 8.854$
Planck's Constant h = 6.626
Bohr Megneton $\pi B = eh / 2me = 9.2741$
Bohr Radius a = 0.5291
Rydberg's Constant Ry = 13.595 eV
Electron Compton Wavelength $\lambda_{ce} = h / mec = 2.2463$
Proton Campton wavelength $\lambda_{ce} = h / mpc = 1.3214$

Ectrostatics

Ocloumbs law

1. $F = \frac{1}{4\pi\varepsilon_0} \cdot \frac{Q_1 Q_2}{R^2}$
2. Torque = P E $\sin\theta$
3. Workdone = PE (1- $\cos\theta$)
   P = Dipole moment
   E = electric field
4. flux $\phi = \iint \vec{E}.ds$
5. Electric field around a point charge
   $E = \frac{KO}{R^2}$
6. Capacitor Q = CV
   C = capacitance
   V = Voltage
7. Capacitor combination
   Parallel $C_{eq} = C_1 + C_2 + C_3 + ...$
   Series $\frac{1}{C_{eq}} = \frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + ... + \frac{1}{C_n}$
8. common potential $V = \frac{C_1 V_1 + C_2 V_2}{C_1 + C_2}$

9 Loss in energy $U = \frac{C_1 C_2}{2(C_1 + C_2)}.(V_1 - V_2)^2$

10. Potential Energy of a conductor $U = \frac{1}{2}QV$

Current Electricity

1. Kirchhoff's law :

   Loop rule $\sum A$ roundany loop $\Delta v_1 = 0$

   Node rule $\sum$ At an y node $l_1 = 0$

2. Resistor Combination :

   Series = $R_{es} = R_1 + R_2 + R_3 + ...$

   Parallel = $\frac{1}{R_{es}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ... + \frac{1}{R_n}$

3. Electric power

   $P = I^2 R$

4. Ohms law

   V = IR

   V = Voltage

   I = Current

   R = resistance

5. Current

   $I = \frac{Q}{T}$

6. Work = F.D.Cos θ

7. Current density $j = \frac{T}{A}$

8. Resistance of conductor $R = \frac{V}{I} = \frac{\text{Potential difference between two conductor}}{\text{Current flowing in conductor}}$

9. Ratio of emf of two cells

   $\frac{E_1}{E_2} = \frac{L_1}{L_2}$

Magnetic effect of current and magnetism

Coulomb's inverse square law.

$$F = (\mu_0 / 4\pi) * (m_1 m_2) / r^2 = \frac{\mu_0}{4\pi} \times \frac{M_1 M_2}{r^2}$$

1. Intesity of magnetic field.
   $B = m / r^2$ m = magnetic pole strength's = radius
2. Magnetic moment due to revolving electron
   M = evr/2
3. Bio-savert law $dB = \frac{\mu_0}{4\pi} \times \frac{Idl \sin\theta}{r^2}$
4. Intensity magnetic field
   (a) due long straight current wire = B $= \frac{\mu_0}{4\pi} \times \frac{2!}{r}$
   (b) due to circular coil = B $= \left(\frac{\mu_0}{4\pi}\right) \times \frac{2\pi r!}{r}$
5. Lorentz transformation factor
   B = $\sqrt{1 - V^2 C^2}$
6. Lorentz force
   $F = qvB \sin\theta$
7. Force between parallel current carrying conductor :
   $F = \frac{\mu}{4\pi} \cdot \frac{l_1 l_2}{r}$
8. Glavanometere shunt
   $I_G = \frac{S}{S + G}$

Electromagnetic Induction and alternating current

1. Magnetic fulx $\phi = AB \cos\theta$
   $\vec{B}.\vec{A}$ in vector form
2. Enduced e.m.f. $E = \frac{Nd\phi}{dt}$ N = turn's
3. Magnetic flux of coil when current is passing through them ϕ=LI I = Current
4. Transformer ratio $r = \frac{n_s}{n_p} = \frac{e_s}{e_p}$
5. Resonant frequency $= 1 / 2\pi\sqrt{LC}$

6. R.C. Circuit

Power factor :-

$$\cos\phi = \frac{R}{\sqrt{R^2 + \frac{1}{W^2C^2}}}$$

$$\text{Impedance} = = \sqrt{R^2 + \frac{1}{W^2C^2}}$$

7. LCR Circuit :-

Power factor $\cos\phi = \frac{R}{\sqrt{R^2 + \left[WL - (1/WC)^2\right]}}$

$$\text{Impedance I} = \sqrt{R^2 + \left[WL - \left(\frac{1}{WC}\right)\right]^2}$$

8. LC Circuit

Impedance = $x_I - x_c$

Magnetic field around a wire

$$B = \frac{\pi L}{2\pi r}$$

9. Force caused by a magnetic field on a moving change

$F = q.v.\sin\theta$

Electromagnetic Waves and wave optics

1. Young's experiment

Bright f ringe = $y_n = (D/2d) * n\lambda$

Distance un

$Y^n = (D/2d) * \{2n - 1/2.\}\lambda$

2. Fringe shift = $D/2d.(\mu - 1)t$
3. The frequency of electromagnetic oscillation

$F = 1/2\pi\sqrt{LC}$

4. Vacuum tube speed of electromagnetic waves

$C = 1/\sqrt{\mu\varepsilon}$ $= 3*10^8 MS^{-1}$

5. Distance up to which Tv transmission

$D = \sqrt{2hR}$ R = Radius of earth

Ray Optics

1. Focal length of spherical mirror
   F = ½ R (R = Radius of curvature)
2. In spherical mirror
   U, v and f releated as
   1/u + 1/v = 1/f
3. Anlge of deviation = $100^{o} - 2i$ I = angle of incidence
4. Refractive index =

$$\frac{\sin i}{\sin r} = \mu_2 \text{ (constant)}$$

5. For a refraction of a spherical surface $\frac{\mu}{v} - \frac{1}{\mu} = \frac{u-1}{R}$

   First focal lenght $F_1 = -\left[\frac{R_1}{\mu - 1}\right]$

   Second focal length $F_2 = -\left[\frac{\mu R}{\mu - 1}\right]$
6. Refraction through thin lense

$$\frac{1}{v} - \frac{1}{u} = \frac{1}{f}$$

7. Refraction index g material of a prism

$$\mu = \frac{\sin\left[\frac{(A + S_m)}{2}\right]}{\sin\frac{A}{2}}$$

8. Dispersive power of material of prism

$$\omega = \frac{(sv - sR)}{sv}$$

9. Lense equation :-
10. $$\frac{1}{f} = \frac{1}{D_0} + \frac{1}{Di} - \frac{1}{O} + \frac{1}{l}$$

    F = Focal length
    l = image distance
    O = object distance

$$M = -\frac{D_1}{D_0} = -\frac{i}{O} = \frac{H_1}{H_0}$$

Optical Instrument

1. Magnifying power of microscope = visual angle at the eye by the imae formed by microscope/ visual angle at the eye by the object by it is at least distance of distinct vision = D/f.

2. Magnifying power of compound microscope $M = -\left(\frac{v_0}{\mu_0}\right)\left(1+\frac{D}{f_e}\right)$

   $V_0 + u_e$ = length of microscope tube

3. Magnifyin power of collinear telescope

   $$M = \left(\frac{f_0}{f_e}\right)\left(1-\frac{f_e}{D}\right)$$

4. Resolving unit = 1/Resolving limit

5. Resolving limit * min = $\frac{1.22}{2}\mu \sin\phi$

Electron and photon

Milliken's experiment

charge on drop

$$Q = 9\pi r^{3/2}\left[2/g\left(p-\sigma\right)\right]^{1/2}\left[v_1^{1/2}/\in\left(v_1+v_2\right)\right]$$

1. Momentum of each photon

   = hv/c h = 6.6 * 10^{-34}

2. Energy of photon hv = hc/ λ

3. The maximum kinetic energy of photo electron is $E_k = \frac{1}{2}MV^2$

   M = Mass of electron

   V = velocity of electron

4. The kinetic energy of electron accelerated by a potential difference of v volt $V = \sqrt{2ev/m}$

Solid state and semi conductor devices

Current in semi conductor

$$I = I_e + I_n$$

$$= A_e\left[n_e v_e + n_v v_n\right]$$

1. Conductivity of SEM: conductor

   $$\sigma = e\left(n_e u_e + n_v\ v_n\right)$$

Resistivity $= \frac{1}{e}\left(n_e u_e + n_n u_n\right)$

2. Frequency of oscillator $F = \frac{1}{2}\pi\sqrt{LC}$

3. In a transistor the emitter current I_e base current I_b and collector current I_e then

$I_E = I_B + I_C$

4. A and B are related

$$B = \frac{\alpha}{1-\alpha} \qquad \alpha = \frac{\beta}{\beta+1}$$

Unit - 10

Principle of communication

Modulation index $= \in_{man} - \in_{\min} / \in_{man} + \in_{\min}$

1. Frequency modulated wave

$\left(e_c\right) f_m = \in_c \cos\left[w_c + \left(\Delta f / m\right)\sin\omega_m t\right] t$

2. Frequency deviation :- Type equation here.

$\Delta F = f_{\max} - f_c$

$\Delta F = f_c - f_{\min}$

3. For the core cladding boundary surface, critical angle $i_c = \sin^{-1}\left(\mu_2 / \mu_1\right)$

4. The angle of incidence $i_a = \sin^{-1}\sqrt{\mu_1^2 - \mu_2^2}$