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MPGI
blend of fine education

MAHARANA PRATAP GROUP OF INSTITUTIONS

Kothi, Mandhana, Kanpur

THINK CAREER ▸ THINK MAHARANA ▸

DREAM | GROW | LEAD

GIVING YOU
A PATH
TO MAKE
YOUR VISION
OUR MISSION!

SINCE
1995
Excellence
in Education

Vikalp
A success option for students

FORMULAE HANDBOOK

A success option for students

FORMULAE HANDBOOK

VISION

To provide a platform for a life paradigm shift for today's youth so they can enhance their skills to emerge as resilient, dynamic and self-motivated change agents, contributing to an empowered nation.

MISSION

- To stay committed and excel in field of technical, medical and higher education whilst making available the global perspectives to the students.
- To aim for an Intellectual transformation of students by exposing them to new ideas, new approaches and a dynamic curriculum.
- To help students develop a keen technical insight and a critical thinking mind.

OUR VALUES

- **Integrity:** Our blunt refusal to compromise on our standards.
- **Excellence:** Approaching the ordinary with an extraordinary edge.
- **Commitment:** Relentless consistency for great accomplishments.

CONTENTS

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COURSES OFFERED

ENGINEERING AND POLYTECHNIC

M.TECH
B.TECH : CS/AI&ML/IOT/DATASCIENCE/ME/EC/CIVIL/EE

MANAGEMENT AND COMPUTER APPLICATIONS

BACHELOR OF BUSINESS ADMINISTRATION (BBA)
MASTERS OF BUSINESS ADMINISTRATION (MBA)
BACHELOR OF COMPUTER APPLICATIONS (BCA)
MASTERS OF COMPUTER APPLICATION (MCA)

PHARMACEUTICAL SCIENCE

MASTER OF PHARMACY (M. PHARM)
BACHELOR OF PHARMACY (B. PHARM)
DIPLOMA OF PHARMACY (D.PHARM)

DENTAL SCIENCE

BACHELOR OF DENTAL SURGERIES (BDS)

NURSING AND PHYSIOTHERAPY

B.Sc. - Nursing • ANM*
• Bachelor of Physiotherapy (BPT)
• Diploma in Physiotherapy (DPT)

LIFE SCIENCES AND AGRICULTURE

TISS (TATA INSTITUTE OF SOCIAL SCIENCE)

COLLABORATED COURSES

EDUCATION AND ITI

B.ED. • ITI

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ABOUT MAHARANA GROUP

Maharana Pratap Group of Institutions was established way back in 1995 under the vision and guiding light of Mr. Ram Singh Bhadauria. The very first center for the delivery of education was Maharana Pratap Education Centre (MPEC) which was an English medium public school affiliated to UP Board. Since its inception, MPGI has grown into ten institutions, one university, a medical college and seven schools across Kanpur, Lucknow, New Delhi and Bhopal. We have been providing excellence in education by offering various courses in the diverse streams of Engineering, Management, Dental, Medical, Pharmacy, Information Technology and Graduation.

Our Campuses are extending over several hundred acres of lush green surroundings, possess modern infrastructure, well-equipped laboratories and enviable libraries. We work as a committed and inspired team of more than 1000 highly qualified faculty members providing vision and academic insights to more than 10,000 students. It is our conscious intent to ensure each student has an array of opportunities to showcase his/her talents for the best job prospects through campus placement drives.

MPEC **Ranked #81** Tech Enabled T-School, India 2020 by Data Quest	MPEC **Ranked #26** in Dr. Kalam Entrepreneurship League by AKTU	NPTEL recognizes **MPEC** as a valuable **NPTEL Local Chapter** with a rating of **AA Certificate**	**NETWORK INSTITUTE** of IIRS-ISRO Outreach Programme
AKTU **GOLD & SILVER** Medalist 2019-20	**19** Lacs per Annum **HIGHEST PACKAGE**	Specialisation in collaboration with **IBM & CISCO**	Only institute in the region in collaboration with **(TATA INSTITUTE OF SOCIAL SCIENCES FOR VOCATIONAL STUDIES)**

• Engineering • Pharmacy • Management • Computer Applications • Biotech • Life Science
• Dentistry • Nursing • Physiotherapy • Agriculture • Polytechnic • Vocational Education

FUNDAMENTAL PHYSICAL QUANTITIES

1.	Mass	M	Kg
2.	Length	L	Meter
3.	Time	T	Sec
4.	Electric Current	1 or A	Ampere
5.	Amount of substance	N	Mole (mol)
6.	Luminous Intensity	J	Candela (cd)
7.	Temperature	K or	Kelvin

DERIVED PHYSICAL QUANTITIES

1.	Area	ℓ X b	$[M^0L^2T^0]$	m^2
2.	Volume	ℓ X b X h	$[M^0L^3T^0]$	m^3
3.	Density	$\frac{M}{V}$	$[ML^{-3}T^0]$	kg/m^3
4.	Specific Gravity	$\frac{\text{Density of Substance}}{\text{Density of Water}}$	$[M^0L^0T^0]$	No units
5.	Frequency	$\frac{\text{Number of Vibrations}}{\text{Time}}$	$[M^0L^0T^{-1}]$	Hertz
6.	Angle	$\frac{\text{Arc}}{\text{Radius}}$	$[M^0L^0T^0]$	No units
7.	Velocity	$\frac{\text{Displacement}}{\text{Time}}$	$[M^0L^1T^{-1}]$	m/sec
8.	Speed	$\frac{\text{Distance}}{\text{Time}}$	$[M^0L^1T^{-1}]$	m/sec
9.	Areal Velocity	$\frac{\text{Area}}{\text{Time}}$	$[M^0L^2T^{-1}]$	m^2/sec^{-1}
10.	Acceleration	$\frac{\text{Changeinvelocity}}{\text{Time}}$	$[M^0L^1T^{-2}]$	m/sec^2
11.	Linear Momentum	M X V	$[M^1L^1T^{-1}]$	Kg m/sec
12.	Force	mass X acceleration	$[M^1L^1T^{-2}]$	Kg m/sec^2 or Newton
13.	Weight	W=mg	$[M^1L^1T^{-2}]$	Kg m/sec^2 or Newton
14.	Moment of force/ Torque/Couple	Force X arm length	$[M^1L^2T^{-2}]$	kgm^2sec^2
15.	Impulse	Force X time	$[M^1L^1T^{-1}]$	kgm/sec or Ns

DERIVED PHYSICAL QUANTITIES

16.	Pressure	$\frac{\text{Force}}{\text{area}}$	$[ML^{-1}T^{-2}]$	N/m^2 or Pa
17.	Work	Force X Distance	$[M^1L^2T^{-2}]$	Nm or Joule
18.	Kinetic Energy	$1/2mv^2$	$[M^1L^2T^{-2}]$	Joule
19.	Potential Energy	mgh	$[M^1L^2T^{-2}]$	Joule
20.	Gravitational Constant	$\frac{\text{Force X (Length)}^2}{(\text{mass})^2}$	$[M^{-1}L^3T^{-2}]$	$kg^{-1}m^3/sec^2$
21.	Gravitational field strength	$\frac{\text{Force}}{\text{mass}}$	$[M^0L^1T^{-2}]$	$N\ kg^{-1}$
22.	Gravitational Potential	$\frac{\text{Work}}{\text{mass}}$	$[M^0L^2T^{-2}]$	$J\ kg^{-1}$
23.	Force constant(k)	$\frac{F}{L}$	$[M^1L^0T^{-2}]$	Nm^1
24.	Power	$\frac{\text{Work}}{\text{time}}$	$[M^1L^2T^{-3}]$	W or J/Sec
25.	Moment of Inertia	Mass X Distance^2	$[M^1L^2T^0]$	Kgm^2
26.	Stress	$\frac{\text{Force}}{\text{Area}}$	$[M^1L^{-1}T^{-2}]$	N/m^2 or Pa
27.	Strain	$\frac{\text{Change in length}}{\text{Original length}}$	$[M^0L^0T^0]$	No Units
28.	Modulus of Elasticity	$\frac{\text{Stress}}{\text{Strain}}$	$[M^1L^{-1}T^{-2}]$	N/m^2 or Pa
29.	Poission's Ration (σ)	$\frac{\text{Lateral Strain}}{\text{Longitudinal Strain}}$	$[M^0L^0T^0]$	No Units
30.	Velocity gradient	$\frac{\text{Change in velocity}}{\text{Distance}}$	$[M^0L^0T^{-1}]$	sec^{-1}
31.	Coefficient of dynamic viscosity	$\frac{\text{Tangential stress}}{\text{Velocity Gradient}}$	$[M^1L^1T^{-1}]$	Poiseuille
32.	Surface Tension	$\frac{\text{Force}}{\text{Length}}$	$[M^1L^0T^{-2}]$	$kgsec^2$, N/m
33.	Angular displacement(θ)	$\frac{\text{Arc}}{\text{radius}}$	$[M^0L^0T^0]$	radian
34.	Angular velocity(ω)	$\frac{\text{Angular displacement}}{\text{Time}}$	$[M^0L^0T^{-1}]$	rad/sec
35.	Angular acceleration(α)	$\frac{\text{Change in angular velocity}}{\text{Time}}$	$[M^0L^0T^{-2}]$	rad/sec^2
36.	Angular momentum	$I\omega$	ML^2T^{-1}	$kg\text{-}m^2sec^{-1}$
37.	Angular impulse	$I\omega$	ML^2T^{-1}	$kg\text{-}m^2sec^{-1}$
38.	Temperature		θ or K	Celsius or kelvin

DERIVED PHYSICAL QUANTITIES

39.	Linear Expansion (α)	$\frac{l_2 - l_1}{l_1 X \text{ temp } (t_2-t_1)}$	$[M^0L^0T^0K^{-1}]$	/Kelvin
40.	Specific heat	$\frac{\text{Energy}}{\text{Mass X temp}}$	$[M^0L^2T^2\theta]$	J/kg^0C
41.	Latent heat	$\frac{\text{Energy}}{\text{Mass}}$	$[M^0L^2T^{-2}]$	Joule-kg^{-1}
42.	Entropy	$\frac{Q}{\theta}$	$[M^1L^2T^{-2}\theta]$	J/k
43.	Thermal Capacity	$\frac{H}{\theta}$	$[ML^2T^{-2}\theta]$	
44.	Gas constant	$\frac{PV}{mT}$	$M^0L^2T^{-2}k^1$ joule-k^{-1}	
45.	Coefficient of thermal conductivity	$\frac{Qd}{A(\theta_2-\theta_1)t}$	$[MLT^{-3}\theta^{-1}]$ $Wm^{-1}k^{-1}$	
46.	Pole strength Ampere X meter		$M^0L^1T^0A$	Am
47.	Magnetic Moment		$M^0L^2T^0A$	Amp-m^2
48.	Magnetic flux		$ML^2T^{-2}A^{-1}$	weber
49.	Magnetic field, magnetic flux, density (B)		$ML^0T^{-2}A^{-1}$	Tesla or Gauss ($1G=10^{-4}T$)

CHEMISTRY

ATOMIC STRUCTURE

1. $r = n^2h^2/4\pi^2mZe^2 = 0.529\ (n^2Z)$Angstrom
2. E_r=KE-PE/2=-13:6 (z^2/n^2)ev
3. Heisenberg uncertainty principle $(\delta x)\ (\delta p) \geq h/4\pi$
4. Moseley 's law: $\sqrt{v}$=a(z-b)
5. Nodes (n-1) = total nodes, ℓ=angular nodes, $(\ell$-1) radial nodes
6. Photoelectric effect: $hv = hu_0+1/2mv^2$
7. Orbital angular momentum: $[\sqrt{\ell(\ell+1)}]h/2\pi$

CHEMICAL BONDING

I. Percentage % ionic character = Actual dipole moment / Calculated dipole moment *100

II. Fajan's Factors: following factors are helpful in bringing covalent character in ionic compounds.

A. Small cation B. Big anion C. High charge on cation D. High charge on anion E. Cations having pseudo inert gas configuration e.g. Cu^+, Ag^+ etc. F. Coming of colour or darkness of colour in compounds formed with colourless ions.

III. M.O. Theory : a) Bond order = 1/2 (N_B-N_A)

a) Higher the bond order higher is the bond dissociation energy greater is the stability shorter is the bound length.

IV. Relative bond strength: sp^3d^2>dsp^3>sp>p-p (co-axial)>p>s>p-p (co-lateral)

V. VSEPR theory

A. (LP-LP) repulsion > (LP-BP) > (BP-BP)

VI. Bond Angle: (a) NH_3> PH_3>AsH_3(b) H_2O>H_2 Se(c) NH_3>NF_3 (d) Cl_2O>OF_2

CHEMICAL EQUILIBRIA

1. $K_P = K_C\ (RT)^{\Delta n}$
2. Free energy change (ΔG)
   a. If $\Delta G = 0$ then reversible reaction would be in equilibrium
   b. If ΔG = (+ve) then equilibrium will displace in backward direction
   c. If ΔG = (-ve) then equilibrium will displace in forward direction
3. K_C unit - $(moles/lit)^{\Delta n}$
4. K_p unit - $(atm)^{\Delta n}$
5. Total moles at equilibrium= {total initial moles + Δn]
6. Time required to establish equilibrium $\alpha\ 1/K_C$

CHEMISTRY

THE SOLID STATE

a) No of atoms per unit cell : Simple cubic =1 Fcc=4, Bcc=2, Hcp=6

b) Packing fraction (%): Simple cubic =0.52, Bcc=0.68, Fcc=0.74, Hcp=0.74, Diamond=0.34

c) Atomic radius r of the unit cell pure elements: simple cubic r= a/2 bcc r =$\sqrt{3a/4}$ fcc r = $\frac{a}{2\sqrt{2}}$

d) Neighbour distance of the unit cell: Simple cubic d=a bcc d= $\sqrt{3a/2}$ fcc d=$\frac{a}{\sqrt{2}}$

e) Density of the unit cell d =$z^*M/N_A{}^*a^3$

SOLUTIONS

1) Molarity = no. of moles of solute/volume of solution (litre)

2) Molality=no. of moles of solute/mass of solvent (kg)

3) m= 1000M/1000d-MM_b& Molarity 1/temp

4) Mole % = mass fraction *100

5) Mass fraction of A=$W_A/ W_A+ W_B$

6) PPM= (mass of solute/mass of solution)*10^6

7) Normality = gram equivalent of solute/volume of solution (litres)

8) Raoult's law: P_o-P_s/P_s=n/n+N

9) i= normal molar mass/observed molar mass

POLYMERS : SOME COMMON POLYMERS

1. Bakelite (phenol + formaldehyde)
2. Nylon 6, 6 (hexamethylene diamine + adipic acid)
3. Nylon 6 (caprolactum)
4. Rubber (isoprene)
5. Polyvinyl chloride (vinyl chloride)
6. Polythene (ethene)

ELECTRO CHEMISTRY

I. Faraday's first law of electrolysis: mαQ.m= Z.I.t. [where z=E/96500)

ii. Faraday's second law of electrolysis: mαE & (E_1/E_2)= m_1/m_2)

iii. /Resistance: R=pl/a

iv. Conductance: G = 1/R

v. Kohlrausch's law: $\Lambda^0\pm = \lambda_+{}^0 + \lambda_-{}^0$

vi. Degree of dissociation : $\alpha = \frac{\Lambda^1}{\Lambda^0}$

vii. Nernst equation-E= (E^0-0.591/n) (products]/ [reactants]

viii.ΔG=-NFE_{cell}

viii. K_{EQ} = antilog $\frac{nE_0}{0.0591}$

CHEMISTRY

OXIDATION & REDUCTION

1. Oxidant / itself is reduced (gives O_2)

Or Oxidant-e(s) Acceptor

Reductant itself is oxidised (gives H_2)

Or reductant -e (s) Donor

2. Electrochemical series: Li, K, Ba, Sr, Ca, Na, Mg, Al, Mn, Zn, Cr, Fe, Cd, Co, Ni, Sn, Pb, H2, Cu, Ag, Pt, Au

As we move from top to bottom in this series:

A. Standard reduction potential increases

B. Standard oxidation potential decreases

C. Reducing capacity decreases

D. Ionization potential increases

E. Reactivity decreases

3. Formal charge = Group no. -[No. of bonds+ No. of non bonded e(s)

4. At Anode-Oxidation, Cathode-Reduction

CHEMICAL KINETICS

a). Unit of rate constant :- $K=mol^{1-\Delta n} lit^{\Delta n-1} sec^{-1}$

b). Zero order reaction :$K=x/t$ and $t_{1/2} = a/2k$

c). First order reaction : $K = (2.303/t)^* \log [a/a-x]$ and $t_{1/2} = 0.693K$

d). Second order reaction : $k=1/t(x/a[a-x])$

$k=\{2.303/t(a-b)\}\log [b(a-x)/a(b-x)\}$ and $t_{1/2}= 1/Ka.$

e). Arrhenius equation : $k=Ae^{-Ea/R.T.}$

f). Energy of activation = Threshold energy- energy of reactant.

VOLUMETRIC ANALYSIS

1).Equivalent weight of Element = Atomic Wt. of The Element/Valence Factor

2).Equivalent Weight of Compound = Formula Wt. of Compound/Valence Factor

3).Equivalent Weight of An Ion= Formula Wt. (at. Wt.) of Ion/ Its Valency

4).Law of Dulong And Petit: Atomic Wt. X Specific Heat = 6.4

5).Normality (n) = No. of gm Equivalents/ Volume of The Solution in Litres

6).Molarity (m)= No. of Moles/ Volume of The Solution in Litres

7).When A Solution is Diluted: $N_{14}v_1$ (before Dilution) = N_2v_2 (after Dilution)

CHEMISTRY

MOLE CONCEPT

I. Mole concept: GAM 1 gm atom 6.02×10^{23} atom

GMM = 1gm mole 6.02×10^{23} molecules

$N_A = 6.02\ 10^{23}$

II. Moles (gases) at NTP = volume (L)/22.4

III. Molecular mass = 2X vapour density

NUCLEAR CHEMISTRY

1.Radius of nucleus: $R = R_0 A^{1/2}$

2.The amount N of the radioactive substance left after 'n' half-lives = No. (initial amount)/2^n

3.Half- period $t_{1/2} = 0.693/\lambda$

4.Rate of disintegration: $dN/dt = \lambda.N$ & $\lambda = (2.303/t) \log_{10} N_0/N = N_0 e^{-\lambda t}$

5.Average life (t_{AV})= total life time of all the atoms/ total number of atoms = 1.44 $t_{1/2}$.

SURFACE CHEMISTRY & COLLOIDAL STATE

1. Higher is the valency of active ion, the greater is its coagulating power.
2. Emulsion: Colloidal solution of two immiscible liquids [O/W emulsion, W/O emulsion]
3. Emulsifier: Long chain hydrocarbons are added to stabilize emulsion.
4. Lyophilic colloid: Starchy gum, gelatin havegreater affinity for solvent, Sol, Can be easily prepared by bringing in contact with solvent and warming.
5. Lyophobic colloid: No affinity for solvent special methods are used to prepare Sol. [e.g.As_2S_3, $Fe(OH)_3$ Sol].
6. Properties of colloidal solution:
   - •Dispersion method •Condensation method.
7. Properties of colloidal solution.
   - •Tyndall effect •Brownian movement •Coagulation •Filtrability

COORDINATION COMPOUNDS

1. Coordination number is the number of the nearest atoms or groups in the coordination sphere.
2. Ligand is a lewis base donor of electrons that bonds to a central metal atom in a coordination compound.
3. Paramagnetic substance is one that is attracted to the magnetic field this results on account of unpaired electrons present in the atom/molecule/ion.
4. Effective atomic number EAN= (Z-Oxidation number) + (2Coordination number)
5. Factors affecting stability of complex.

- Greater the charge on the central metallion, greater is the stability.
- Greater the ability of the ligand to donate electron pair (basic strength) Greater is the stability.
- Formation of chelate rings increases the stability.

MAIN USES OF SOME COMPOUNDS

Alkane- fuel, Alkene- polymer, Alkyne solvent making westron, Westrosol, General alkyl holide- as solvents, $CHC\ell_3$-Anaesthetic, Germicide, $Ch_2C\ell_2$ antiseptic and deodarant, $CC\ell_4$-pyrene and fire distinguisher, CH_3OH- antifreeze, defarming of alcohol, C_2H_5OH- tonic, wine preparation, Ch_3CHO- antiseptic CH_3NH_2- refrigerating agent $C_2H_5H_2$ -photography.

IDENTIFICATION TESTS

a) Unsaturated compound (Bayer's reagent) -Decolorising the reagent

b) Alcohols (Ceric ammonium nitrate solution) Red coloration

c) Phenols (Neutral $FeCl_3$ solution)- Violet/deep blue coloration

d) Aldehydes and ketones (2-4 D.N.P.) Orange precipitate

e) Acids ($NaHCO_3$) Brisk effervescence (CO_2 is evolved)

f) 1^0 amine ($CHCl_3$+ KOH)- foul smell

g) 2^0 amine ($NaNO_2$+$HC\ell$) -Yellow oily liquid (Nitrosoamine)

GENERAL ORGANIC CHEMISTRY

1. The order of decreasing electro negativiy of hybrid orbitals is $sp > sP^2 > sp^3$
2. Conformational isomers are those isomers which arise due to rotation around a single bond.
3. A meso compound is optically inactive, even though it has asymmetric centres (due to internal compensation of rotation of plane polarised light).
4. An equimolar mixture of enantiomers is called racemic mixture which is optically inactive.
5. Tautomerism is the type of isomerism arising by the migration of hydrogen.
6. Reaction intermediates and reagents: homolytic fission- Free radicals heterolytic fission-lons (Carbonium, Carbanion, ioncarbonium etc.)
7. Nucleophiles- electron rich.
8. Electrophiles - electron deficient
9. Inductive effect is due to sigma electron displacement along a chain and is permanent effect.
10. +I(inductive effect)- increases basicity-I (inductive effect) increases acidity of compounds.
11. Resonance is a phenomenon in which two or more structures can be written for the same compound but none of them actually exists.

ARENES

1) All ortho and para directing groups are ring activation groups (except-X).

They are:- OH,-NH_2, -X-R, -OR, etc.

2) All meta directing groups are ring deactivating group.

They are:- CHO, -COOH,- NO_2,- CN, -CN, -N^+R_3, etc.

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UNPANELLED PLACEMENT STATISTICS

75+
campus drives in 2019-20

92%
of eligible students got job offers

54%
students got multiple offers

HIRING
by Amazon, TCS, Mindtree, Wipro & Globallogic

19
Lacs p.a. Highest salary offered by Amazon

CORE
Best core industry placement in the region

AFFILIATIONS & APPROVALS

All India Council for Technical Education

Dental Council of India

Pharmacy Council of India

Indian Nursing Council

Abdul Kalam Technical University

ChatrapatiSahu Ji Maharaj University

Tata Institute of Social Sciences

State Medical Faculty

Board of Technical Education

ASSOCIATIONS

NASSCOM FOUNDATION

CII Confederation of Indian Industry

FICCI

NPTEL

TISS Tata Institute Of Social Sciences

Jio

IBM

CISCO

JBM Group Our milestones are touchstones

ICRI

MAHSA UNIVERSITY

UNIVERSITAS AIRLANGGA SURABAYA

UNIVERSITI SAINS MALAYSIA

AMAS ACADEMY

PHYSICS

ELECTROSTATICS

1. Coulombs law : $F=(1/4\pi\epsilon_o)q_1q_2/r^2$
2. Electric field : $E=(1/4\pi\epsilon_o)q/r^2$
3. Potential energy(work done by external agency): $U=\frac{1}{4\pi\epsilon_o}\frac{q_1q_2}{\gamma}$
4. Electric flux : $\Phi_E=\oint_s \vec{E}\cdot\vec{ds}$
5. Capacitance : $C=Q/V$
6. Capacitance for parallel placte capacitor: $C=\epsilon_0 A/d$
7. Capacitance of a sphere: $C=4\pi\epsilon_o R$ {where R = radius of the sphere)
8. Energy stored in a capacitor: $U=(1/2)\,QV=(1/2)\,CV^2=\frac{Q^2}{2C}$
9. For capacitors in series: $1/C=1/C_1+1/C_2+1/C_3+$.....
10. For capacitors in parallel combination: $C=C_1+C_2+C_3+$.....

CURRENT ELECTRICITY

1. Current flowing through a wire : $I=dq/dt$
2. Ohm's law: $V\alpha I \Rightarrow V=IR$
3. Resistance: $R=\rho\frac{\ell}{A}$
4. For resistance in series: $R=R_1+R_2+R_3+$.....
5. For resistance in parallel: $1/R=1/R_1+1/R_2+1/R_3+$.....
6. Drift velocity: $V_d=eE\tau/m$
7. Current in terms of drift velocity: $I=neAv_d$
8. Current density : $J=I/A=nev_d$
9. Mobility: $\mu=V_\alpha/E=e\tau/m$
10. Primary cell : Leclanche cell, Daniel cell
11. Secondary cell : Lead accumulator, Alkali cell
12. Kirchhoff's Current law: $i_1+i_2+i_3+.....i_n=0$
13. Kirchhoff's Voltage or loop law: $iR=mf$
14. Terminal voltage :$V=E-IR$
15. Internal resistance:$\gamma=E-V/I$
16. Maximum power transfer theorem: $P=E^2/4R$
17. Power dissipation in electric circuit: $P=VI=I^2R=V^2/R$ watt

PHYSICS

MAGNETISM

- Magnetic moment : $M = (e/2m)L = -n(eh/2\pi m)$
- For a bar magnet : $M = m \times 2L$ {where m = pole strength}
- Field due to bar magnet (on axial point) : $B = (\mu_0/4\pi)\ 2M/r^3$
- Field due to bar magnet (on equitorial point) : $B = (\mu_0/4\pi)M/r^3$
- Intensity of magetization : I = M/V or I = m/A {where m=pole strength, A=area of cross sec.}
- Magnetic susceptibility : $X_m = \frac{I}{H}$
- Magnetic permeability : $\mu = B/H$
- Relative permeability : $\mu_r = \mu/\mu_0$ {where μ_0 = permeability of free space}
- Relation b/w B and μH : $B = \mu_0(H+I)$
- Relation b/w X_m and μ_r: $\mu_r = 1+X_m$
- Curie law and Curie temperature : $X_m = C/(T-T_c)$ where {T_c=curie's temp.)

ELECTRO MAGNETIC INDUCTION

I. Magnetic flux: $\Phi_b = \int \vec{B}.\vec{dS}$

II. Faraday's law: $e\ \alpha\ \frac{d\Phi}{dt}$

III. Lenz's law: $e = -L\ \frac{di}{dt}$

IV. Emf induced due to linear motion of a conducting rod: e = Bvl volt

V. Emf induced due to rotation of a conducting rod: $e = \frac{1}{2} Bwl^2 = B\pi nl^2$

VI. Self inductance: $L = \Phi_b/I = e/-(dI/dt)$

VII. Self inductance of a solenoid: $L = \mu_0 N^2A/l$ {where l = length

VIII. Mutual inductance: $M = \mu_0 N_1 N_2 A/l$.

IX. For inductors in series: $L = L_1 + L_2 + 1/L_3 + ...$

X. For inductors in parallel: $1/L = 1/L_1 + 1/L_2 \div 1/L_3 + ...$

XI. Energy stored in an inductor: $U_3 = (1/2)LI^2$

ALTERNATING CURRENT (A.C.)

A. Alternating emf: $E = E_0 \sin\omega t$

B. Alternating current : $I = I_0 \sin\omega t$

C. Reactance : $X = E/I = E_0/I_0$

D. Inductive reactance: $X_L = \omega L = 2\pi fL$

E. Capacitive reactance : $X_c = 1/\omega C = 1/2\pi fC$

F. Impedence: $Z = E_{rms}/d_{rms}$

PHYSICS

ALTERNATING CURRENT (A.C.)

G. Susceptance:S=1/X mho

H. Conductance: G=1/R mho

I. Admittance : Y = 1/Z mho

J. Power in a.c. Circuit : P = I x E $P_{INST}=E_{INS}I_{ins}$ $P_{AV}=E_{RMS}I_{RMS}\ Cos\Phi$

K. Power factor : $Cos\Phi = R/Z$

MOTION IN A STRAIGHT LINE

1. The area under the velocity-time curve b/w times t_1 and t_2 is equal to the displacement of the object during that interval of time.
2. If a body falls freely, the distance covered by it in each subsequent second starting from first second will be in the ratio l:3:5:7 etc.
3. If a body is thrown vertically up with an initial velocity u, it takes u/g second to reach maximum height and u/g second to return, if air resistance is negligible.
4. If air resistance acting on a body is considered, the time taken by the body to reach maximum height is less than the time to fall back the same height.
5. Kinematic equations: $v=u+at,\ s=ut+\frac{1}{2}at^2$ $v^2=u^2-2as$

$\vec{u}$=initial velocity $\vec{v}$ = final velocity $\vec{a}$=acceleration = const $\vec{s}$=displacement

6. If acceleration is variable use calculus approach.
7. Relative velocity: $v_{BA}=u_B-v_A$

WORK, ENERGY AND POWER

1) If a light body and a heavy body have equal kinetic energy, then heavy body has greater momentum.

2) Work due to static force of friction on system as whole is always zero.

3) If a body moves with constant power, its velocity (v) is related to distance travelled (x) by the formula $v \propto x^{3/2}$.

4) Work due to kinetic force of friction between two contact surfaces is always negative. It depends on relative displacement between contact surfaces. $W_{FK}=-F_K(S_{rel})$,

5).W = ΔK total work due to all kinds of forces, ΔK= total change in kinetic energy.

6). $W_{CONSERVATIVE}=-\Delta U$ total work due to all kinds of conservative forces, ΔU= total change in all kinds of potential energy.

7). Coefficient of restitution $(e)=\frac{-(v_2-v_1)}{u_2-u_1}$ $\frac{\text{-velocity of seperation}}{\text{velocity of approach}}$

8). The total momentum of a system of particles is a constant in the absence of external forces.

PHYSICS

MODERN PHYSICS

1. Einstein's photoelectric equation is $\frac{1}{2} mv^2_{mvx} = eV_0 = hu - \Phi_0 = h(u - u_0)$
2. The nuclear mass M is always less than the total mass Σm, of its constituents. The difference in mass of a nucleus and its constituents is called the mass defect. $\Delta M = \{Zm_p + (A-Z)m_n\} - M$; $\Delta E_0 = \Delta Mc^2$; 1amu = 931 MeV
3. $E_n = -13.6 \left(\frac{Z^2}{n^2}\right)$ eV For hydrogen like atom
4. Bragg's law: $2d \sin\Theta = n\lambda$
5. Law of radioactive decay: $N = N_0 e^{-\lambda t}$
6. Activity = $dN/N = -\lambda N$ (unit is Becquerel)
7. Half time period, $T_{1/2} = 0.693/\lambda$
8. X-rays: $\lambda_{min} = \frac{12400}{V} A^0$
9. Mosley law : $\gamma = a(Z-b)^2$

KINETIC THEORY

1) Kinetic theory of an ideal gas gives the relation $P = 1/3\ nmv^{-2}$, where n is number density of molecules, m the mass of the molecule and $\bar{v}^2$ is the mean of square speed. Combined with the ideal gas equation it yields a kinetic interpretation of temperature, $1/2nmv^2 = 3/2\ k_B T$.

2) The law of equipartition of energy is stated as : the energy for each degree of freedom in thermal equilibrium is $\frac{1}{2}(K_B T)$.

3) The translational kinetic energy $E = 3/2\ K_B NT$. This leads to a relation $PV \frac{2}{3} E$.

4) Speed of sound in a gas $v_s = \sqrt{RT/M}$, $v/v_{rms} = \sqrt{\gamma/3}$ where $v_s = V_{rms}$

MECHANICAL PROPERTIES OF SOLID

1. If S is the stress and Y is young's modulus, the energy density of the wire E is equal to $S^2/2Y$
2. If $\propto$ is the longitudinal strain and E is the energy density of a stretched wire Y, Young's modulus of wire, when E is equal to $1/2\ Y\alpha^2$.

MECHANICAL PROPERTIES OF FLUIDS

1. PASCALS'S LAW : a change in pressure applied to an enclosed fluid is transmitted undiminished to every point of the fluid and the walls of the containing vessel.
2. Bernoulli's principle states that during streamlined flow, the sum of the pressure energy (P), the kinetic energy per unit volume ($pv^2/2$) and the potential energy per unit volume (pgh) remains constant. $\{P + \frac{1}{2} Pv^2 + pgh = \text{constant.}\}$
3. Surface tension is a force per unit length (or surface energy per unit area) acting in the plane of interface b/w the liquid and the bounding surface.
4. Stokes's law states that the viscous drag force F on a sphere of radius γ a moving with velocity v through a fluid of viscosity is, $F = -6\pi\gamma v\eta$.

MECHANICAL PROPERTIES OF FLUIDS

5. The surface tension of a liquid is zero at boiling point. The surface tension is zero at critical temperature.

6. If a drop of water of radius R is broken into n identical drops, the work done in the process is $4\pi R^2 S(n^{2/3}-1)$.

7. Two capillary tubes each of radius ɤ are joined in a parallel. The rate of flow is Q. if they are replaced by single capillary tube of radius R for the same rate of flow, then $R=2^{1/2}$ r.

8. If radius of a drop is doubled its terminal velocity increases to 4 times.

OSCILLATIONS

1. The particle velocity and acceleration during SHM as functions of time are given by : $v(t) = \omega A\cos(\omega t+\Phi)$ $a(t)=-\omega^2 A\sin(\omega t+\Phi)$ velocity amplitude $V_m = \omega A$ and acceleration amplitude $a_m = \omega^2 A$.

2. A particle of mass m oscillating under the influence of a Hooke's law restoring force given by F=-kx exhibits simple harmonic motion with $\omega=\sqrt{k/m}$ (angular frequency), $T=2\pi\sqrt{m/k}$ (time period). Such a system is also called linear harmonic oscillator.

3. A body of mass M is suspended from a spring whose force constant is K and mass is m. The time period of this system will be $T=2\pi\sqrt{(M+\frac{m}{3})K}$.

4. Time period for conical pendulum $T=2\pi\sqrt{(l\cos\theta/g)}$ where θ angle between string and vertical.

THERMAL PROPERTIES OF MATTER

1. The coefficient of linear expansion (α_l) is defined by the relations : $\frac{\Delta l}{l}=1+\alpha.\Delta T$
Coefficient of surface expansion (β) is defined by the relation $\frac{\Delta A}{A}=1+\beta.\Delta T$
& Coefficient of volume expansion (γ) is defined by the relation $\frac{\Delta V}{V}=1+\gamma.\Delta T$
The relation among α, β & γ is ($\gamma=2\beta=3\alpha$)

2. In conduction, heat is transferred between neighbouring parts of a body through molecular collisions, without any flow of matter. For a bar of length L and uniform cross section A with its ends maintained at temperatures T_c and T_0 the rate of flow of heat H is $H = KA(T_c-T_0/L)$. where K is the thermal conductivity of the material of the bar.

3. Convection involves flow of matter within a fluid due to unequal temperatures of its parts.

4. Radiation is the transmission of heat as electromagnetic waves. Radiant heat travels with the speed of light.

5. Stefan's law of radiation : $E\alpha T^4$.

6. Newton's law of Cooling: the rate of cooling of a body is proportional to the excess temperature of the body over the surroundings : $dQ/dt = -k(T_2 - T_1)$; where T_1 is the temp. of the surrounding medium and T_2 is the temperature of the body.

OUR CAMPUSES


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Bithoor Campus


Bhopal Campus

Mandhana Campus, Kanpur


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Maharana Pratap Education Centre, Keshavpuram, Kanpur

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MATHEMATICS

LIMITS : SOME STANDARD EXPANSION FOR SOLVING LIMITS

1. $e^x=1+x+x^2/2!+x^3/3!+.....$
2. $e^{-x}=1-x+\frac{x^2}{|2}-\frac{x^3}{|3}+.....+\frac{(-1)^r.x^r}{|r}+.....\infty$
3. $\log(1+x)=x-x^2/2+x^3/3-.....$
4. $\log_e(1-x)=-x-\frac{x^2}{2}-\frac{x^3}{3}-\frac{x^4}{4}-.....\infty$
5. $a^x=1+x(\log_e a)+\frac{x^2(\log_e a)^2}{|2}+\frac{x^3(\log_e a)^3}{|3}+.....\infty$
6. $\sin(x)= x-\frac{x^3}{|3}+\frac{x^5}{|5}-.....$
7. $\cos(x) = 1=\frac{x^2}{|2}+\frac{x^4}{|4}-.....$
8. $\tan(x) = x+\frac{x^3}{|3}+\frac{2x^5}{|5}+.....$

DIFFERENTIATION : DERIVATIVE OF SOME STANDARD FUNCTIONS

A. $d/dx(\text{constant}) = 0$

B. $d/dx(ax)= a$

C. $d/dx(x^n)=nx^{n-1}$

D. $d/dx(e^x)=e^x$

E. $d/dx(a^x) = a^x\log_e a$

F. $\frac{d}{dx}(\log_e x)=\frac{1}{x}$

G. $\frac{d}{dx}(\log_a x)=\frac{1}{x.\log_e a}$

H. $d/dx(\sin x) = \cos x$

I. $d/dx(\cos x) =-\sin x$

J. $d/dx(\tan x)=\sec^2 x$

K. $d/dx(\cot x) =-\text{cosec}^2 x$

L. $d/dx(\sec x) = \sec x \tan x$

M. $\frac{d}{dx}(\text{cosec}(x))=-\text{cosec}(x)\cot(x)$

N. $d/dx(\sin^{-1}x)= 1/\sqrt{1-x^2}$

O. $d/dx(\cos^{-1}x) = -1/\sqrt{1-x^2}$

P. $\frac{d}{dx}(\tan^{-1}(x)) =\frac{1}{1+x^2}$

Q. $\frac{d}{dx}(\sinh(x)) =\cosh(x)$

R. $d/dx(\cosh x) =\sinh x$

S. $d/dx(\tanh x) =\text{sec h}^2 x$

MATHEMATICS

INDEFINITE INTEGRATION
STANDARD INTEGRALS

I. $\int 0.dx = c$

II. $\int 1.dx = x+c$

III. $\int K.dx = kx+c$

IV. $\int x^n dx = \frac{x^{n+1}}{n+1}$

V. $\int \frac{1}{x} dx = \log_e |x| + c$

VI. $\int e^x dx = e^x + c$

VII. $\int a^x dx = a^x/\log_e a + c = a^x \log_a e + c$

VIII. $\int \sin x \, dx = -\cos x + c$

IX. $\int \cos x \, dx = \sin x + c$

X. $\int \tan x \, dx = \log \sec x + c = -\log |\cos x| + c$

XI. $\int \cot x \, dx = \log |\sin x| + c$

XII. $\int \text{Sec } x \, dx = \log |(\sec x + \tan x)| + c = -\log (\sec x - \tan x) + c$

XIII. $\int \text{cosec } x \, dx = \log |\text{cosec } x - \cot x| + c$

XIV. $\int \sec x \tan x \, dx = \sec x + c$

XV. $\int \text{cosec } x \cot x \, dx = -\text{ cosec } x + c$

XVI. $\int \sec^2 x \, dx = \tan x + c$

XVII. $\int \text{cosec}^2 (x) \, dx = -\cot x + c$

XVIII. $\int \frac{1}{x^2+a^2} dx = \frac{1}{a} \tan^{-1} \left(\frac{x}{a}\right) + c$

XIX. $\int \frac{1}{x^2-a^2} dx = \frac{1}{2a} \log \left| \frac{x-a}{x+a} \right| + c$

XX. $\int \frac{1}{a^2-x^2} dx = \frac{1}{2a} \log \left| \frac{a+x}{a-x} \right| + c$

XXI. $\int \frac{1}{\sqrt{a^2-x^2}} dx = \text{Sin}^{-1} \frac{x}{a} + c$

XXII. $\int \frac{1}{\sqrt{x^2+a^2}} dx = \sinh^{-1} \left(\frac{x}{a}\right) + c = \log |x + \sqrt{x^2+a^2}| + c$

XXIII. $\int \frac{1}{\sqrt{x^2-a^2}} dx = \cosh^{-1} \left(\frac{x}{a}\right) + c = \log |x + \sqrt{x^2+a^2}| + c$

XXIV. $\int \sqrt{a^2 - x^2} \, dx = \frac{1}{2} [x\sqrt{a^2 - x^2} + a^2 \text{ Sin}^{-1} \left(\frac{x}{a}\right)] + c$

XXV. $\int \sqrt{x^2 + a^2} \, dx = \frac{1}{2} [x\sqrt{x^2 + a^2} + a^2 \log |x + \sqrt{x^2+a^2}|] + c$

XXVI. $\int \sqrt{x^2 - a^2} dx = \frac{1}{2} [x\sqrt{x^2 - a^2} - a^2 \log |x + \sqrt{x^2-a^2}|] + c$

XXVII. $\frac{e^{ax}}{a^2 + b^2} [a\text{Sin } (bx) - b \text{ Cos } (bx)]$

XXVIII. $\frac{e^{ax}}{a^2 + b^2} [a\text{Cos } (bx) + b \text{ Sin } (bx)] + c$

MATHEMATICS

3-D COORDINATE GEOMETRY

1). Distance between two points: PQ $=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2+(z_1-z_2)}$

2). Direction cosines of a line : I= cosα m = cosβ n = cosγ {$l^2+m^2+n^2=1$}

3). Direction ratios of a line : a/I = b/m = c/n $I = \pm a/\sqrt{a^2+b^2+c^2}$

$m = \pm b/\sqrt{a^2+b^2+c^2}$

$n = \pm c/\sqrt{a^2+b^2+c^2}$

4). Conditions for parallel lines : if AB II CD - $\frac{I_1}{I_2}=\frac{m_1}{m_2}=\frac{n_1}{n_2}$

b_1

5). Conditions for perpendicular lines : if AB⊥CD-$l_1l_2+m_1m_2+n_1n_2=0$

6). Cartesian eq. of a line through two points: $\frac{x=x_1}{x_2-x_1}=\frac{Y-Y_1}{Y_2-Y_1}=\frac{z-z_1}{z_2-z_1}$

7). Cordinates of a mid point : ($x_1+x_2/2$; $y_1+y_2/2$; $z_1+z_2/2$)

8). Centroid of a triangle: ($x_1+x_2+x_3/3$: $y_1+y_2+y_3/3$; $z_1+z_2+z/_3 3$)

VECTORS : TYPES OF VECTORS

I. Zero vector or null vector: a vector whose magnitude is zero

ii. Unit vector: a vector of unit magnitude (û= vector u/I u I)

iii. Equal vector : I $\bar{a}$ I= I $\bar{b}$ I and having same direction

iv. Co-initial vectors: vectors having same initial point

v. Free vectors: the vector whose location is not fixed

vi. Position vector: a vector which give position of one point with respect to another.

vii. Addition of vectors: $\bar{c}=\bar{a}+\bar{b}$

viii. Subtraction of vectors: $\bar{a}-\bar{b}=\bar{a}+(-\bar{b})$

ix. Scalar or dot product: $\bar{a}.\bar{b}$ = I a I I b I cosΘ {$\hat{i}.\hat{i}=1$, $\hat{j}.\hat{j}=1$, $\hat{k}.\hat{k}=1$

$\hat{i}.\hat{j}=0$, $\hat{j}.\hat{k}=0$, $\hat{k}.\hat{i}=0$}

x. Vector or cross product: axb = I a I I b I sinΘn

xi. Area of triangle : $\frac{1}{2}$ I AB x AC I

xii. Area of parallelogram: I $\bar{a}x\bar{b}$ I

xiii. Volume of Parallelopided: [$\bar{a}$ $\bar{b}$ $\bar{c}$] {scalar triple product}

xiv. Vector triple product: ax (bxc) = $(\bar{a}.\bar{c})\bar{b}-(\bar{a}.\bar{b})\bar{c}$

PROBABILITY

A. P (A) = no. of favourable cases to A/no. of exhaustive cases to A

B. P (AUB) =P(A)+ P (B){ for mutually exclusive events}

C. P(AUB) =P(A)+ P (B)-P(A∩B)(for not mutually exclusive events)

D. Conditional probability: P (B/A) = $\frac{P(A\cap B)}{P(A)}$

MATHEMATICS

SOME IMPORTANT RESULTS

I. $P(A) + P(A') = 1$

ii. $P(A+B) = 1 - P(A'B')$

iii. $P(A/B) = \frac{P(A \cap B)}{P(A)}$

iv. $P(A+B) = P(AB)+P(A'B)+P(AB')$

v. $P(A'B) = P(B)-P(A)$

vi. $P(AB) = P(A)+P(B)-P(A+B)$

vii. P(exactly one event) = $P(AB')+P(A'B)$

viii. $P(A'+B')=1-P(AB)$

ix. P(neither A nor B)= $P(A'B')=1-P(A+B)$

x. No. of exhaustive cases on tossing coin n times $=2^n$

xi. No of exhaustive cases on throwing one dice n times $=6^n$

xii. $P(A \cap B \cap C) = P(A)\,P(B)\,P(C)$, if A,B & C are independent

$*AB = A \cap B$

$A+B = A \cup B$

$A^1 = \overline{A}$

$B^1 = \overline{B}$

INVERSE TRIGONOMETRIC FUNCTIONS MULTIPLE ANGLE FORMULAE INVOLVING 2A AND 3A

- $\sin 2A = 2\sin A \cos A$
- $\sin A = 2\sin (A/2) * \cos (A/2)$
- $\cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A$
- $\sin 2A = 2\tan A / 1+\tan^2 A$
- $\cos 2A = \frac{1-\tan^2(A)}{1+\tan^2(A)}$
- $\tan 2A = 2\tan A / 1-\tan^2 A$
- $\sin 3(A) = 3\sin(A) - 4\sin^3(A)$

DOMAIN AND RANGE OF INVERSE TRIGONOMETRIC FUNCTIONS

Function	Domain	Range
$y = \sin^{-1} x$	[-1, 1]	$[-\pi/2, \pi/2]$
$y=\cos^{-1} x$	[-1,1]	$[0, \pi]$
$y = \tan^{-1} x$	$(-\infty,\infty)$	$(-\pi/2,\pi/2)$
$y=\cot^{-1} x$	$(-\infty,\infty)$	$(0, \pi)$
$y = \sec^{-1} x$	$(-\infty,-1][1,\infty)$	$[0,\pi/2) \cup (\pi/2,\pi]$
$y= \operatorname{cosec}^{-1} x$	$(-\infty,-1][1,\infty)$	$[-\pi/2,0) \cup (0,\pi/2]$

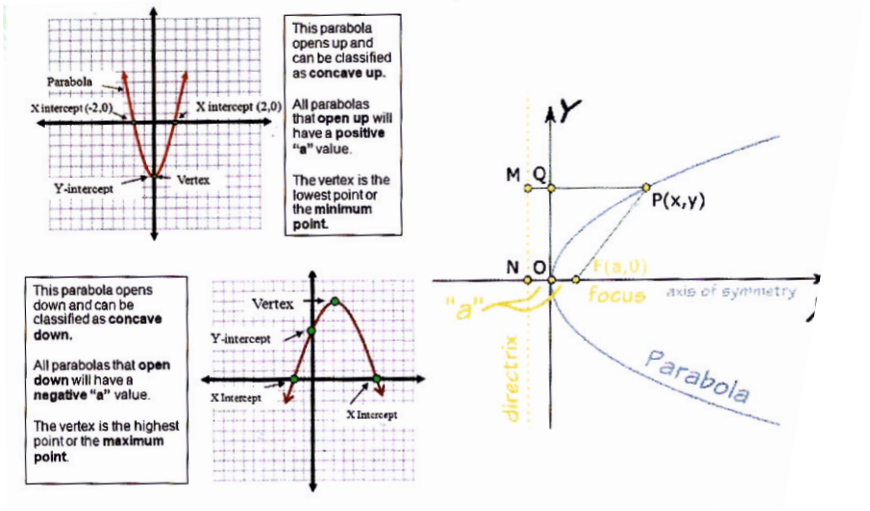
- $\cos 3A = 4\cos^3(A) - 3\cos A$
- $\tan 3A = 3\tan A - \tan^3 A / 1 - 3\tan^2 A$
- $\sin^{-1}(x) + \cos^{-1}(x) = \pi/2$

MATHEMATICS

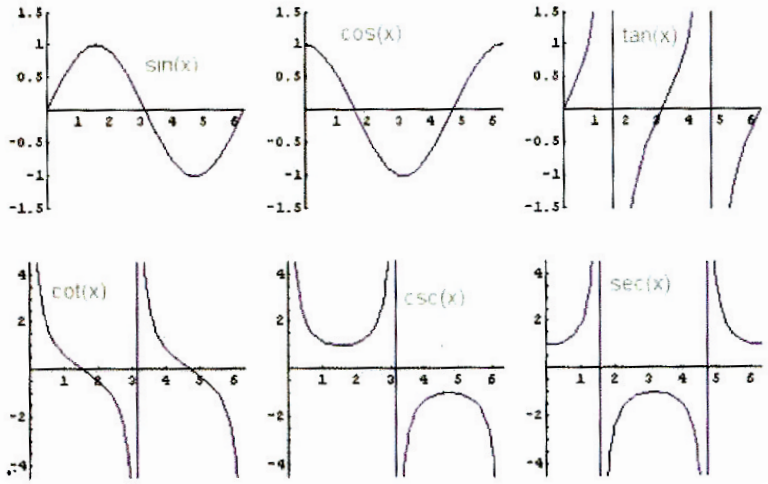
CONIC SECTIONS

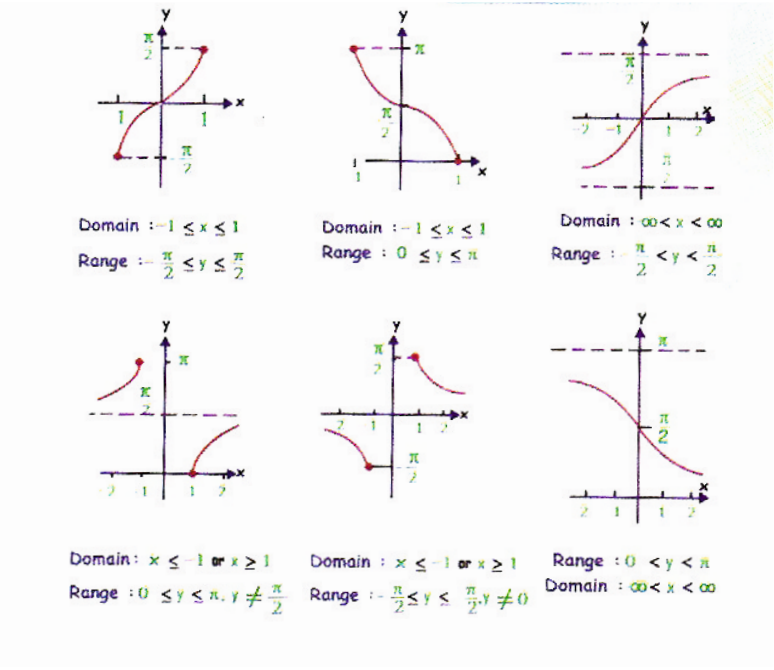
1. The equation of a circle with centre (h, k) and the radius r is $(x-h)^2+(y-k)^2=r^2$
2. Equation of tangent: $xx_1+yy_1+g(x+x_1)+f(y+y_1)+c=0$
3. The equation of the parabola with focus at (a, 0) a>0 and directrix x= -a is $y^2 = 4ax$.
4. Latus rectum of a parabola is a line segment perpendicular to the axis of the parabola, through the focus and whose end points lie on the parabola.
5. Length of the latus rectum of the of the parabola $y^2 =4ax$ is4a.
6. Equation of tangent $x-y\,t+at^2 = 0$
7. An ellipse is the set of all points in a plane the sum of whose distances from two fixed points in the plane is a constant.
8. The equations of an ellipse with foci on the x-axis is $x^2/a^2+y^2/b^2=1$; tangent at $\left(\frac{x}{a}\right)\cos\theta+\left(\frac{y}{b}\right)\sin\theta-1=0$

9. Latus rectum of the ellipse $x^2/a^2+y^2/b^2=1$ is $2b^2/a$.
10. The eccentricity of an ellipse is the ratio between the distances of a point from the centre of the ellipse to one of the foci and to one of the foci and to one of the vertices of the ellipse.
11. A hyperbola is the set of all points in a plane, the difference of whose distances from two fixed points in the plane is a constant.
12. The equation of a hyperbola with foci on the x-axis is $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ Two asymptotes : $\frac{x^2}{a^2}-\frac{y^2}{b^2}=0$
13. Latus rectum of the hyperbolo : $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is $\frac{2b^2}{a}$



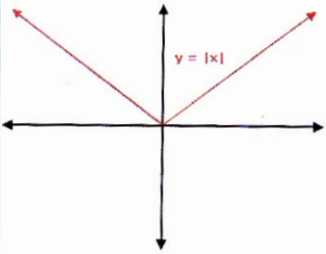
Graphs of Different Functions

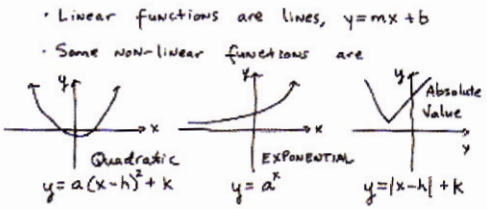


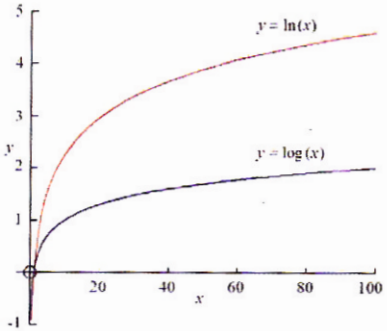


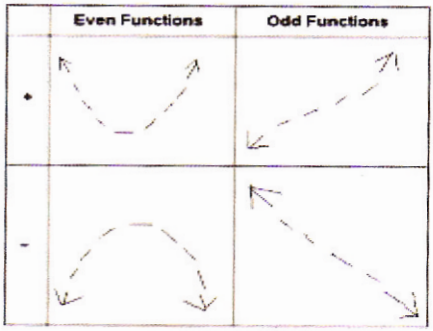
MATHEMATICS

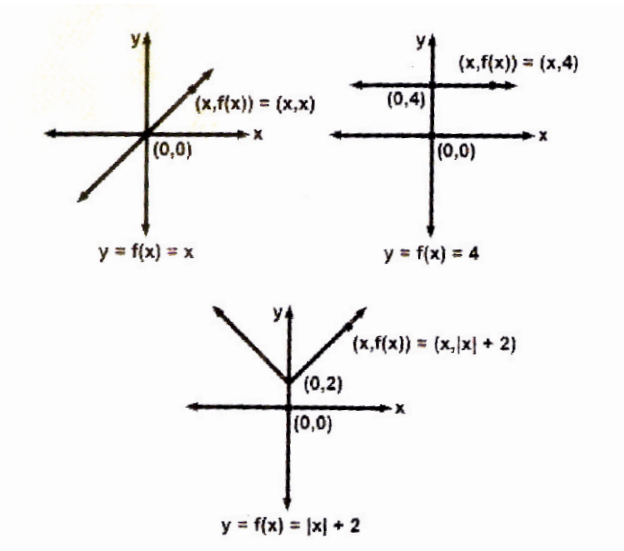
Graph of Some Other Functions











MATHEMATICS

STRAIGHT LINES

1. An acute angle (sayΘ) between lines L and L, with slopes m_1 and m_2 is given by $\tan\Theta = I m_2-m_1/1-m_1m_2I$ $1+m_1m_2\neq0$
2. Equation of a line passing through the points (x_1,y_1) & (x_2,y_2) is given by $y-y_1 = \frac{y_2-y_1}{x_2-x_1}(x-x_1)$
3. Equation of a line making inercepts a and b on the x and y axis, respectively, is x/a + y/b = 1
4. The perpendicular distance (d) of a line Ax+By+C=0 from a point (x_1,y_1) is given by $d = IAx_1+By_1+CI \sqrt{A^2+B^2}$
5. Distance between the parallel lines $Ax+By+C_1 = 0$ and $Ax+By+C_2=0$, is given by $d = IC_1-C_2I \sqrt{A^2+B^2}$

SEQUENCE & SERIES

1. The general term of the n term of the A.P. is given by a = a+(n-1)d
2. The sum S of the first n terms of an A.P. is given by S=n/2[2a+(n-1)d]=n/2 (a+l)
3. The sum S of the first n terms of G.P. is given by S2a(r^n-1)/(r-1) or a(1-r^n)/(1-r), if r≠1
4. A series whose each term is formed by multiplying corresponding terms of an A.P. and a G.P. is called an Arithmetic-geometric series, Summation of n terms :

$$S=\frac{a}{1-r}+\frac{(1-r^{n-1})dr}{(1-r)^2}-\frac{(a+(n-1)d)r^n}{1-r}$$

5. Harmonical progression is defined as a series in which reciprocal of its terms are in A.P. The standard form of a H.P. is $\frac{1}{a}+\frac{1}{a+d}+\frac{1}{a+2d}+$.....

BINOMIAL THEOREM

1. The expansion of a binomial for any positive integral n is given by Binomial Theorem, which is $(a+b)^n = {}^nC_0a^n + {}^nC_1a^{n-1}b+{}^nC_2a^{n-2}b^2+...{}^nC_{n-1}ab^{n-1} + {}^nC_nb^n$. The coefficients of the expansion are arranged in an array. This array is called pascal's triangle.
2. The general term of an expansion $(a+b)^n$ is $T_{r+1} = {}^nC_ra^{n-r}.b^r$
3. In the expansion $(a+b)^n$, if n i even, then the middle term is the $(\frac{n}{2}+1)$ term. If n is odd, then the middle terms are $\frac{(n+1)}{2}$ and $\frac{(n+3)}{2}$

MATHEMATICS

PERMUTATIONS AND COMBINATIONS

1. The number of permutations of n different things taken r at a time, where repetition is not allowed, is denoted by ${}^{n}P_{r}$, and is given by ${}^{n}P_{r}=n!/(n-r)!$, where $0\leq r\leq n$.
2. The number of permutations of n different things, taken r at a time, where repetition is allowed, is n^{r}.
3. The number of permutations of n objects taken all at a time, where p_1 objects are of first kind, p_2 objects are of the second kind,.....,p_k objects are of the k^{th} kind and rest, if any, are all different is $n!/p_1!p_2!....p_k!$
4. The number of combinations of n different things taken r at a time, denoted by ${}^{n}C_{r}$ is given by ${}^{n}C_{r} = n!$, $0\leq r\leq n$.
5. Number of circular permutations of n things when p alike and the rest different taken all at a time distinguish clockwise and anticlockwise arrangement is (n-1)!/p!.

MATRICES

1. Order of matrix : a matrix which has m rows and n columns is called a matrix of order m X n.

TYPES OF MATRICES

1. Row matrix - if in a matrix, there is only one row, then it is called a row matrix
2. Column matrix - if in a matrix, there is only column, then it is called column matrix.
3. Square matrix - if number of rows and number of column in a matrix are equal, then it is called a square matrix.
4. Singleton matrix - if in a matrix there is only one element then it is called singleton matrix
5. Null or zero matrix - if in a matrix all the elements are zero then is called a Zero matrix and it is generally denoted by 0.
6. Diagonal matrix - if all elements except the principal diagonal in a square matrix are zero, it is called a Diagonal matrix.
7. Scalar matrix - if all the elements of the principal diagonal of a diagonal matrix are equal, E_r Non-Zero, it is called scalar matrix.
8. Unit matrix - if all elements of principal diagonal in a diagonal matrix are 1, then it is called Unit matrix. A unit matrix of order n is denoted by I_n

GLOBAL & NATIONAL COLLABORATION

USM
UNIVERSITI SAINS MALAYSIA

MPGI has an academic collaboration with University Sains Malaysia for pharmaceutical sciences, research and development.

MAHSA UNIVERSITY

MPGI has an academic collaboration with MAHSA University Malaysia for pharmaceutical sciences, research and development.

MPGI has an academic collaboration with Faculty of Pharmacy, Universitas Airlangga (UNAIR), Surabaya Indonesia for pharmaceutical sciences, research and development.

GLOBAL & NATIONAL COLLABORATION

Electronics & ICT Academy (E & ICT Academy) at IIT Kanpur was established in 2016 in partnership with the Ministry of Electronics and Information Technology (MeitY), Government of India. It is mandated to provide industry focused and industry-driven hands-on courses in electronics & ICT.

MPGI has signed Memorandum Of Understanding (MOU) with ICT-IITK for fundamental and advance training in verbal communication, Soft Skills, Matlab C++, Python, DBMS/SQL, CAD/CAM & Machine Learning.

In 2006, Amazon Web Services (AWS) began offering broad set of global cloud-based products including compute, storage, databases, analytics, networking, mobile, developer tools, management tools, IoT, security, and enterprise applications: on-demand, available in seconds, with pay-as-you-go pricing.

MPGI has Collobarated with Amazon Web Services for certification courses in Cloud Developing, Cloud Operations, Cloud Foundations & Cloud Architecting. (for Educator and educatee)

The Tata Institute of Social Sciences (TISS) was established in 1936. Since its inception, the Vision of the TISS has been to be an institution of excellence in higher education that continually responds to changing social realities.

MPGI has Collobarated with TISS for work integrated training programme. The aim is "ERN while you learn". The B.Voc program in being implemented for the first time in India with a focus on job specific skills.

* PricewaterhouseCoopers (PWC) is the world's largest professional services organization. Drawing on the knowledge and skills of 155,000 in 150 countries, we help our clients solve complex business problems and measurably enhance their ability to build value, manage risk and improve performance.

* L&T is committed to helping fresh graduates achieve the skills and expertise required to take their careers to the next level. It offers them comprehensive technical training to acquire, maintain and optimize their automation skills.

Vikalp
A success option for students

MPGI
blend of fine education

25000+
Successful Alumni

3.5 LAC
Average Package

RECRUITERS @ MPGI

• Engineering • Pharmacy • Management • Computer Applications • Biotech • Life Science
• Dentistry • Nursing • Physiotherapy • Agriculture • Polytechnic • Vocational Education

INDUSTRIAL VISIT

Industrial visits at RSPL, Scooter India, RBI, Nerolac Paints, Pharmaceutical manufacturing plants, BSNL, BHEL, Infosys, Rotomac, DMSRDE, Marco Polo, Parle G, Tata motors etc. are arranged for students with an objective of providing students functional opportunity in different sectors like IT, Manufacturing and services, finance and marketing. Industrial visit helps to combine theoretical knowledge with industrial knowledge.

CORPORATE TIE-UPS

JBM CADMIUM PVT. LTD

MPGI has collaborated with JBM to impart hands-on training on the live machines to enrich their practical knowledge. In this program, the students of MPGi are selected through a rigorous screening process and selected students from pre-final and final year have to undergo an Industrial training at various plants of JBM across India. Rigorous training on CNC machining, Coordinate Measuring machine (CMM) and various tool including laser cutting tool used in the manufacturing of parts of its client such as Maruti Suzuki, Eicher, Volvo, Honda four wheelers is imparted to our students. In addition to this value-added sessions delivered for grooming corporate etiquettes , group dyanamics and business presentation.

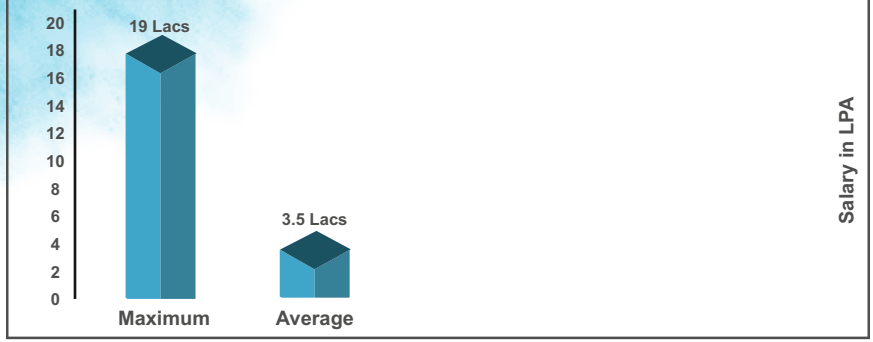
HUAWEI

HUAWEI has set up its centre of excellence at MPGI campus. The MPGI-HUAWEI centre aims to train young engineering graduates on the domain knowledge of telecommunication. The centre imparts in-depth training on communication, full-service communication network, LTE3G, Cloud-computing, MAN-Transport network and data network.

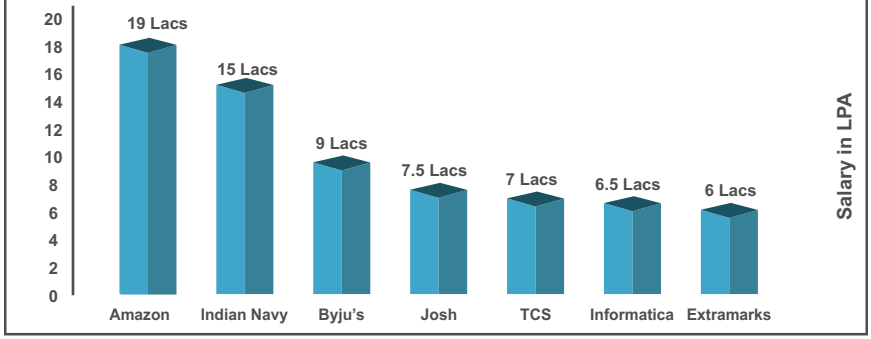
ZTE

ZTE, the world's Fourth largest telecom company has collaborated with MPGI for resource sharing. ZTE conducts the training and induction for its newly recruited Graduate Engineer Trainee. MPGI has created a state of the art corporate training center equipped with accomodation/mess, transportation, Internet/Wi-fi, air-conditioned labs, lecture theatres, conference hall. This resource center is designed to cater to the needs of corporate Training.

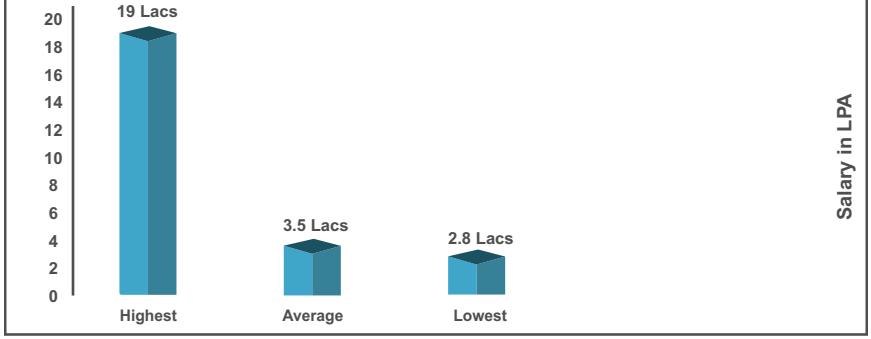
Salary Statistics



Highest Salary Package Offered to MPGI Students



Salary Statistics



TRAINING & PLACEMENT
AS SAID BY CORPORATES

ZTE中兴

We appreciate the efforts of MPGI faculty, staff and management for grooming their students to the best industry standards.

R SYSTEMS

MPGI has helped us discover a talent position within a city of exceptionally talented that have matched our expectations and skill set.

bharti

Change can be difficult for anyone, however MPGI's ability to present clear opportunities in an honest and precise manner for their students has made the entire process educational fun.

HCL TECHNOLOGIES

The students had an overall positive approach towards the campus drive. Most of the students were versatile with their area of specialization.

RANBAXY

It was wonderful to have met and interacted with such technically competent and well groomed students of MPGI. We wish them all the best for future.

Birlasoft

MPGI professionals understood our need for talent acquisition. The team handled the interview, GD & PI process with exceptional professionalism.

TRAINING & PLACEMENT

ALUMNI TESTIMONIALS

Jyotika Singhal - B.Tech EI (2004) - Application Development Manager at Accenture
UPTU Silver Medalist (2nd Rank Holder). 1st Rank in college across branches.

My past 20 years road to success and growth started in 2000 when I joined MPEC to pursue my B.Tech from Electronics & Instrumentation branch. The infrastructure , facilities and the best in class faculty makes it one of the pioneer institute for higher education."THANK YOU" for making me what I am today.

Sachin Kumar - B.Tech ME (2004) - Advisory Project Manager - IBM
PGPMAX from Indian Schhon Of Business (ISB) Hyderabad

When I joined MPEC in 2000 to pursue B.Tech from mechanical Engineering. The foundation was laid here and then there was no looking back starting from SAP certification to senior positions at big corporates. I would like to thank the faculty & the management of MPEC to shape up my personal self into a thorough professional.

Satyarth Shukla - Mechanical Engineering
2004-08 - HCL Technology

After having worked with corporate giants like Tata Motors, E&Y, HCL I can say that the foundation laid at MPEC was a big step for transition into the corporate world. The best part is learning at MPEC is not restricted to just academics. Student gets an opportunity to learn through various self-organized events, industry visits, seminars etc.

Akash Deep - Mechanical Engineering
2004-08 - MPEC - Mandhana Campus

I attribute the kick off to my career largely to MPEC. It laid the professional foundation and helped me secure two offers thru college placements - Infosys Technologies and Satyam Computers. . I have seen the college/organization grow and strongly believe that it will continue to be a center where imagination leads to innovation.

Harsh Srivasatava - *Batch-* Mechanical (2010-14)
Placed In- Indo-US MIM Tech - *Currently In-* Maruti Suzuki India Limited

The academic experience in B.Tech (ME) with excellent faculty at MPEC has endured me with a lifelong career excellence. As far as the placements are concerned, enough opportunities are provided to every student and it is upto the individual how you take it. I am really lucky and proud because of the things I have learned over there.

Ankur Tripathi
Manager, PE-Electrical - NTPC Ltd.

"I am very glad to share a positive journey of BTech at MPEC. Here the atmosphere is full of motivation and innovation. Because of the support of the Training and Placement Cell, I got an opportunity to apply and got selected in NTPC Ltd."

Mahima Chaturvedi
Btech: CSE (2016-20) - Amazon

My name is Mahima Chaturvedi I am a cloud support associate at AWS. I can positively say that Maharana Pratap Group Of Institutions has been the best part of my life, full of learning opportunities that were filled with fun and frolic. . I am very thankful to Maharana Pratap Engineering College for building this bridge between the students and the industry.

We want the education by which character is formed, strength of mind is increased, the intellect is expanded, and by which one can stand on one's own feet

SWAMI VIVEKANANDA

Vikalp

A success option for students

FORMULAE HANDBOOK

*Although all the care has been taken while typing, but we are not responsible for any error.

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Kothi, Mandhana, Kanpur

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