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| **PHYSICSSYLLABUS** |
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| **SYLLABUS:Class-XI** |
|  |
| **UnitI:PhysicalWorldandMeasurement** |
| Physics-scopeandexcitement;natureofphysicallaws;Physics,technologyandsociety. |
| Needformeasurement:Unitsofmeasurement;systemsofunits;SIunits,fundamentaland  derivedunits.Length,massandtimemeasurements;accuracyandprecisionofmeasuringinstruments;errorsinmeasurement;significantfigures. |
| Dimensionsofphysicalquantities,dimensionalanalysisanditsapplications. |
| **UnitII:Kinematics** |
| Frameofreference,Motioninastraightline:Position-timegraph,speedandvelocity. |
| Uniformandnon-uniformmotion,averagespeedandinstantaneousvelocity.Uniformly  acceleratedmotion,velocitytimeandposition-timegraphs. |
| Relationsforuniformlyacceleratedmotion(graphicaltreatment). |
| Scalarandvectorquantities;Positionanddisplacementvectors,equalityof vectors,  multiplicationofvectorsbyarealnumber;additionandsubtractionofvectors.Relativevelocity.Unitvector;Resolutionofavectorinaplane-rectangularcomponents.Scalarand |
| Motioninaplane.Casesofuniformvelocityanduniformacceleration-projectilemotion.  Uniformcircularmotion. |
| **UnitIII:LawsofMotion** |
| Intuitiveconceptofforce.Inertia,Newton'sfirstlawofmotion;momentumandNewton's  secondlawofmotion;impulse;Newton'sthirdlawofmotion. |
| Lawofconservationoflinearmomentumanditsapplications. |
| Equilibriumofconcurrentforces.Staticandkineticfriction,lawsoffriction,lubrication. |
| Dynamicsofuniformcircularmotion:Centripetalforce,examplesofcircularmotion(vehicle  onalevelcircularroad,vehicleonbankedroad). |
| **UnitIV:Work,EnergyandPower** |
| Workdonebyaconstantforceandavariableforce;kineticenergy,work-energytheorem,  power. |
| Notionofpotentialenergy,potentialenergyofaspring,conservativeforces:conservation  ofmechanicalenergy(kineticandpotentialenergies);non-conservativeforces:motioninaverticalcircle. |

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| **UnitV:MotionofSystemofParticlesandRigidBody** |
| Centreofmassofatwo-particlesystem,momentumconservationandcentreofmass |
| Centreofmassofarigidbody;centreofmassofauniformrod. |
| Momentofaforce,torque,angularmomentum,lawsofconservationofangularmomentum  anditsapplications. |
| Equilibriumof rigidbodies,rigidbodyrotationandequationsof rotationalmotion,  comparisonoflinearandrotationalmotions. |
| Momentofinertia,radiusofgyration.Valuesofmomentsofinertia,forsimplegeometrical  objects(noderivation).Statementofparallelandperpendicularaxestheoremsandtheirapplications. |
| **UnitVI:Gravitation** |
| Keplar'slawsofplanetarymotion.Theuniversallawofgravitation. |
| Accelerationduetogravityanditsvariationwithaltitudeanddepth. |
| Gravitationalpotentialenergyand gravitationalpotential.Escapevelocity.Orbitalvelocityof  asatellite.Geo-stationarysatellites. |
| **UnitVII:PropertiesofBulkMatter** |
| Elasticbehaviour,Stress-strainrelationship,Hooke'slaw,Young'smodulus,bulkmodulus,  shearmodulusofrigidity,Poisson'sratio;elasticenergy. |
| Pressureduetoafluidcolumn;Pascal'slawanditsapplications.Effectofgravityonfluid |
| Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, critical  velocity.Bernoulli'stheoremanditsapplications. |
| Surfaceenergyandsurfacetension,angleofcontact,excessofpressureacrossacurved  surface,applicationofsurfacetensionideastodrops,bubblesandcapillaryrise. |
| Heat,temperature,thermalexpansion;thermalexpansionof solids,liquidsandgases,  anomalousexpansion ofwater;specificheatcapacity;Cp, Cv-calorimetry;changeofstate-latentheatcapacity. |
| Heattransfer-conduction,convectionandradiation,thermalconductivity,Qualitativeideas  ofBlackbodyradiation,Wein'sdisplacementLaw,Stefan'slaw,Greenhouseeffect. |
| **UnitVIII:Thermodynamics** |
| Thermalequilibriumanddefinitionoftemperature(zerothlawofthermodynamics).Heat,  workandinternalenergy.Firstlawofthermodynamics.Isothermalandadiabaticprocesses. |
| Secondlawofthermodynamics:reversibleandirreversibleprocesses.Heatengineand  refrigerator. |
| **UnitIX:BehaviourofPerfectGasesandKineticTheoryofGases** |
| Equationofstateofaperfectgas,workdoneincompressingagas. |
| Kinetictheory of gases- assumptions,concept of pressure.Kineticinterpretationof  temperature;rmsspeedofgasmolecules;degreesoffreedom,lawofequi-partitionofenergy(statementonly)andapplicationtospecificheatcapacitiesofgases;conceptofmeanfreepath,Avogadro'snumber. |

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| **UnitX:OscillationsandWaves** |
| Periodicmotion-timeperiod,frequency,displacementasafunctionoftime.Periodic  functions. |
| Simpleharmonicmotion(S.H.M)anditsequation;phase;oscillationsofaspring-restoring  forceandforceconstant;energyinS.H.M.Kineticandpotentialenergies;simplependulumderivationofexpressionforitstimeperiod. |
| Free,forcedanddampedoscillations(qualitativeideasonly),resonance. |
| Wavemotion.Transverseandlongitudinalwaves,speedofwavemotion.Displacement  relationforaprogressivewave.Principleofsuperpositionofwaves,reflectionofwaves,standingwavesinstringsandorganpipes,fundamentalmodeandharmonics,Beats,Doppler |
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| **CLASSXII-PHYSICS** |
| **UnitI:Electrostatics** |
| ElectricCharges;Conservationofcharge,Coulomb’slaw-forcebetweentwopointcharges,forcesbetween  multiplecharges;superpositionprincipleandcontinuouschargedistribution. |
| Electricfield,electricfieldduetoapointcharge,electricfieldlines,electricdipole,electricfielddue toa dipole,  torqueonadipoleinuniformelectricfleld. |
| Electricflux,statementofGauss’stheoremanditsapplicationstofindfieldduetoinfinitelylongstraightwire,  uniformlychargedinfiniteplanesheetanduniformlychargedthinsphericalshell(fieldinsideandoutside). |
| Electricpotential,potentialdifference,electricpotentialduetoapointcharge,adipoleandsystemofcharges;  equipotentialsurfaces,electricalpotentialenergyofasystemoftwopointchargesandofelectricdipoleinanelectrostaticfield. |
| Conductorsand insulators,freechargesand bound chargesinsidea conductor.Dielectricsandelectric  polarisation,capacitorsandcapacitance,combinationofcapacitorsinseriesandinparallel,capacitanceofaparallelplatecapacitorwithandwithoutdielectricmediumbetweentheplates,energystoredinacapacitor.VandeGraaffgenerator. |
| **UnitII:CurrentElectricity** |
| Electriccurrent,flowofelectricchargesinametallicconductor,driftvelocity,mobilityandtheirrelationwith  electriccurrent;Ohm’slaw,electricalresistance,V-Icharacteristics(linearandnon-linear),electricalenergyandpower,electricalresistivityandconductivity.temperaturedependenceofresistance. |
| Internalresistanceofacell,potentialdifferenceandemfofacell,combinationofcellsinseriesandinparallel. |
| Kirchhoff’slawsandsimpleapplications.Wheatstonebridge,metrebridge. |
| Potentiometer-principleanditsapplicationstomeasurepotentialdifferenceandforcomparingemfoftwo  cells;measurementofinternalresistanceofacell. |
| **UnitIII:MagneticEffectsofCurrentandMagnetism** |
| Conceptofmagneticfield,Oersted’sexperiment. |
| Biot-Savartlawanditsapplicationtocurrentcarryingcircularloop. |
| Ampere’slawanditsapplicationstoinfinitelylongstraightwire.Straightandtoroidalsolenoids,Forceona  movingchargeinuniformmagneticandelectricfields. |
| Forceonacurrent-carryingconductorinauniformmagneticfield.Force betweentwoparallelcurrent-carrying  conductors-definitionofampere.Torqueexperiencedbyacurrentloopinuniformmagneticfield;movingcoilgalvanometer-itscurrentsensitivity. |
| Currentloopasamagneticdipoleanditsmagneticdipolemoment.Magneticdipolemomentofarevolving  electron.Magneticfieldintensityduetoamagneticdipole(barmagnet)alongitsaxisandperpendiculartoitsaxis.Torqueonamagneticdipole(barmagnet)inauniformmagneticfield;barmagnetasanequivalentsolenoid,magneticfieldlines;Earth’smagneticfieldandmagneticelements.Para-,dia-andferro-magnetic  substances,withexamples.Electromagnetsandfactorsaffectingtheirstrengths.Permanentmagnets. |

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| **UnitIV:ElectromagneticInductionandAlternatingCurrents** |
| Electromagneticinduction;Faraday’slaws,inducedemfandcurrent;Lenz’sLaw,Selfandmutualinduction. |
| Alternatingcurrents,peakand rmsvalue of alternatingcurrent/voltage;reactanceand impedance;LC  oscillations(qualitativetreatmentonly),LCRseriescircuit,resonance;powerinACcircuits,wattlesscurrent. |
| ACgeneratorandtransformer. |
| **UnitV:Electromagneticwaves** |
| Electromagneticwavesandtheircharacteristics(qualitativeideasonly).Transversenatureofelectromagnetic  waves. |
| Electromagneticspectrum(radiowaves,microwaves,infrared,visible,ultraviolet,X-rays,gammarays)including  elementaryfactsabouttheiruses. |
| **UnitVI:Optics** |
| Reflectionof light,sphericalmirrors,mirrorformula.Refractionof light,total internalreflectionand its  applications,opticalfibres,refractionatsphericalsurfaces,lenses,thinlensformula,lensmaker’sformula.Magnification,powerofalens,combinationofthinlensesincontactcombinationofalensandamirror.Refractionanddispersionoflightthroughaprism. |
| Scatteringoflight-bluecolourofskyandreddishapprearanceofthesunatsunriseandsunset. |
| **Opticalinstruments:**Microscopesandastronomicaltelescopes(reflectingandrefracting)andtheirmagnifying  powers. |
| **Waveoptics:**WavefrontandHuygen'sprinciple,reflectionandrefractionofplanewaveataplanesurface  usingwavefronts.ProofoflawsofreflectionandrefractionusingHuygen'sprinciple.InterferenceYoung'sdoubleslitexperimentandexpressionforfringewidth,coherentsourcesandsustainedinterferenceoflight.Diffractionduetoasingleslit,widthofcentralmaximum,microscopesandastronomicaltelescopes.Polarisation,planepolarisedlightBrewster'slaw,usesofplanepolarisedlightandPolaroids. |
| **UnitVII:DualNatureofMatterandRadiation** |
| Dualnatureofradiation.Photoelectriceffect,Einstein’sphotoelectricequation-particlenatureoflight. |
| Matterwaves-wavenatureofparticles,deBroglierelation.Davisson-Germerexperiment(experimentaldetails  shouldbeomitted;onlyconclusionshouldbeexplained). |
| **UnitVIII:Atoms&Nuclei** |
| Alpha-particlescatteringexperiment;Rutherford’smodelofatom;Bohrmodel,energylevels,hydrogen |
| Radioactivityalpha,betaandgammaparticles/raysandtheirproperties;radioactivedecaylaw.Mass-energy  relation,massdefect;bindingenergypernucleonanditsvariationwithmassnumber;nuclearfission,nuclearfusion. |
| **UnitIX:ElectronicDevices** |
| Energybandsinsolids(Qualitativeideasonly)conductors,insulatorandsemiconductors;semiconductordiode  – I-Vcharacteristicsin forwardandreverse bias,diode asa rectifier;I-VcharacteristicsofLED,photodiode, solarcell,andZenerdiode;Zenerdiodeas avoltageregulator.Junctiontransistor,transistoraction,characteristicsofatransistor,transistorasanamplifier(commonemitterconfiguration)andoscillator.Logicgates(OR,AND,NOT,NANDandNOR).Transistorasaswitch. |
| **UnitX:CommunicationSystems** |
| Elementsofacommunicationsystem(blockdiagramonly);bandwidthofsignals(speech,TVanddigitaldata);  bandwidthoftransmissionmedium.Propagationofelectromagneticwavesintheatmosphere,skyandspacewavepropagation.Needformodulation.Productionanddetectionofanamplitude-modulatedwave. |

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| **Chemistry** | |
| SYLLABUS:Class-XI&XII | |
| **Unit-1AtomicStructure** | |
| **Contents** | **CONCEPT** |
| IntroductiontoStructureofAtom | Dalton’satomictheory |
| Atomicmodels | Thomsonmodel |
| Rutherfordmodel |
| Bohrmodel |
| DualbehaviorofMatter |
| QuantumMechanicalModel | Conceptoforbitals |
| Heisenberg’s |
| uncertaintyprinciple |
| Quantumnumbers |
| ShapesofAtomicOrbitals | Shapeofs,panddorbitals |
| Nodeandnodalsurface |
| Shieldingeffect |
| RulesforFillingElectronsinOrbitals | Aufbauprinciple |
| Pauli’sexclusionprinciple |
| Hund’sruleElectronicconfigurationofatoms |
| StabilityofCompletelyFilledandhalf-filledOrbitals |  |
| **Unit-2ChemicalBonding** | |
| TypesofChemical | Ionicbond |
| Bonds | Covalentbond |
| Polarcovalentbond |
| ValenceBondTheory | Hybridization |
| VSEPRtheory |
| Resonance |
| MolecularOrbitalTheory | Magnetic characteristics |
| Bondorder |
| HydrogenBond | Intermolecularhydrogenbonding |
| Intramolecularhydrogenbonding |
| **Unit-3StatesofMatter:GasesandLiquids** | |
| IntermolecularForces | Typesofintermolecularforces |
| Natureofintermolecularforces |
| LawsGoverningGaseousState | Boyle’slaw |
| Charleslaw |
| Gay-lussac |
| Avogadrolaw |
| IdealBehaviour | Idealgasequation |
| Dalton’slawofpartialpressure |
| Kinetictheoryofgasespressure |
| DeviationfromIdealBehaviour | Compressibilityfactor |
| Boyle’sTemperature |
| LiquefactionofGases | Criticaltemperature,criticalpressureandcriticalvolume |
| LiquidState | Vapourpressure |
| Viscosity |
| Surfacetension |
| **Unit-4Thermodynamics** | |
| ThermodynamicTerms | Conceptsof: |
| system,surrounding |
| typesofsystem |
| stateofasystem |
| statefunctionandpathfunction |
| extensiveandintensiveproperties |
| reversibleandirreversibleprocess |
| ThermodynamicQuantities | Work |
| Heat |
| FirstLawofThermodynamics | InternalEnergy |
| Enthalpy |
| Heatcapacity |
| Measurementof U |
| Measurementof H |
| Thermochemistry | Enthalpychangeinachemicalreaction |
| Endothermicand |
| Exothermicreactions |
| Standardenthalpyofreactions |
| Enthalpychangesduringphasetransformations |
| Standardenthalpyofformation |
| Thermochemicalequations |
| Hess'sLawofConstantHeatSummation |
| Enthalpiesfordifferenttypesofreactions |
| Spontaneity | Entropy |
| SecondlawofThermodynamics |
| Gibb'senergychangeforspontaneousandnon-spontaneousprocesses |
| Criteriaforequilibrium |
| ThirdLawofThermodynamics |  |

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| **Unit-5ChemicalEquilibrium** | |
| IntroductiontoEquilibrium | Dynamicnatureofequilibrium |
| EquilibriuminPhysicalProcesses | Solid-liquidequilibrium |
| Liquid-vapourequilibrium |
| Solidvapourequilibrium |
| Equilibriuminvolvingdissolutionofsolidandgasesinliquids |
| EquilibriuminChemicalProcesses | Dynamicnatureofchemicalequilibrium |
| lawofchemicalequilibrium |
| Equilibriumconstant |
| TypesofChemicalEquilibria | HomogenousEquilibria |
| HeterogeneousEquilibria |
| ApplicationsofEquilibriumConstant | Predictingtheextentofareaction |
| Predictingthedirectionofthereaction |
| CalculatingEquilibriumConcentrations |
| FactorsAffectingEquilibria | LeChatelier’sprinciple |
| IonicEquilibriuminSolution | Strongandweakelectrolytes |
| Acids,basesandsalts |
| IonizationofAcidsandBases | IonicproductofWater |
| pHscale |
| Ionizationconstantofweakacidsandbases |
| Factorsaffectingacidstrength |
| Commonioneffect |
| BufferSolutions | Bufferactionandrelevantexamples |
| SolubilityEquilibriaofSparinglySolubleSalts | Solubilityproduct |
| Commonioneffectofsolubilityofionicsalts |
| **Unit-6SolidState** | |
| IntroductiontoSolidState  Chemistry | CharacteristicsofSolidState |
| ClassificationofSolidsontheBasis  ofOrderintheArrangement | CrystallineandamorphousSolids |
| CrystalLatticesandUnitCells | PrimitiveandCentredUnitCells |
| NumberofatomsinperunitCellinacubicunitcell |
| ClosePackinginsolids | PackinginSolids |
| Voids |
| PackingEfficiency |
| CalculationofDensityofunitcell |
| ImperfectionsinSolids | TypesofPointDefects |
| StoichiometricandNon-StoichiometricDefects |
| MetalExcessDefect |
| MetalDeficiencyDefect |
| ImpurityDefects |
| ElectricalProperties | Conductors,semiconductorsandinsulators |
| Bandtheoryofsolids |
| n&ptypesemiconductors |
| MagneticProperties | Paramagnetic |
| Diamagnetic |
| Ferromagnetic |
| Antiferromagnetic |
| Ferrimagnetic |
| **Unit-7Solutions** | |
| Introductiontosolutions | Solute |
| Solvent |
| Solution |
| TypesofSolutions | GaseousSolutions |
| LiquidSolutions |
| Solidsolutions |
| ExpressingtheConcentrationofSolutionsofSolidsinLiquids | Variousquantitiesusedtoexpressconcentrationofasolution |
| MoleFraction |
| Molarity |
| Molality |
| Solubility | Solubilityofsolidinliquid |
| Solubilityofgasinliquid |
| Henry’sLaw |
| VapourPressureofLiquidSolutions | Solutionoftwovolatileliquids |
| Solutioncontainingnon-volatilesolute |
| Raoult’sLaw |
| ClassificationofLiquid-LiquidSolutionsonthebasisofRaoult’sLaw | Idealsolutions |
| NonIdealsolutions |
| Positivedeviation |
| Negativedeviation |
| ColligativeProperties | Relativeloweringofvapourpressure |
| Elevationofboilingpoint |
| Depressionoffreezingpoint |
| Osmoticpressure |
| Determinationofmolecularmassesusingcolligativeproperties |
| AbnormalMolecularMass | van’tHoffFactor–Numericalsbasedontheabove |
| **Unit-8RedoxreactionsandElectrochemistry** | |
| OxidationandReductionReactions |  |
| RedoxReactionsinTermsofElectron  TransferReactions | Mechanismofredoxreactionsbyelectrontransferprocess |
| Evolutionoftheelectrochemicalseries. |
| OxidationNumber | Calculationofoxidationnumber |
| TypesofRedoxReactions |  |
| BalancingofRedoxReactions | Oxidationnumbermethod |
| Halfreaction |
| Method |
| TypesofElectrochemicalCells | Electrolyticcells |
|  | Galvaniccells |
| Electrolysis | Electrode |
| Signconventionsatanodeandcathode |
| Lawsofelectrolysis |
| ConductanceinElectrolyticSolutions | Metallicandelectrolyticconductance |
| Typesofelectrolytes |
| Conductance |
| Resistance |
| Molarconductivity |
| Variationofconductivitywithconcentration |
| Kohlrausch’slaw |
| GalvanicCells | EMFofacell |
| Standardelectrodepotential |
| Nernstequationanditsapplicationtochemicalcells |
| RelationbetweenGibbsenergychangeandemfofacell |
| Corrosion | Conceptandmechanismofcorrosioninrelationtoemf |

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| **Unit-9s-Block&p-BlockElementsandmetallurgy** | |
| S-BlockElementsGroup1Elements  &Group2Elements | Electronicconfiguration |
| PhysicalProperties |
| Chemicalproperties |
| Positionofhydrogenintheperiodictable |
| Diagonalrelationship |
| Biologicalimportance |
| Waterandhydrogenperoxide |
| SomeAlkalimetalcompounds |
| SomeAlkalineearthmetalcompounds |
| P-BlockElementsGroup13,14,15,  16,17and18Elements | Electronicconfiguration |
| OccurrenceInertpaireffectReactivity |
| SomecompoundsofGroup13to18elements |
| **Unit-10dandf-BlockElementsandCoordinationCompounds** | |
| d-Blockelements | Generalpropertiesof3delements. |
| Electronicconfiguration |
| VariablevalencyconceptColor |
| Magneticproperties |
| Catalyticproperties |
| Compounds |
| F-BlockElements | Electronicconfiguration |
| Oxidationstates |
| Lanthanidecontraction |
| Coordination Compounds | Generalcomposition |
| Coordinationnumber |
| Typesofligands |
| Wernertheory |
| IUPACNomenclatureofCoordination  Compounds | IUPACrules |
| ValenceBondTheoryasAppliedto  Coordination Compounds | Valencebondtheory |
| Crystalfieldtheory |
| ImportanceofCoordinationCompounds | Analyticalapplications |
| Industrialapplications |
| Biologicalapplications |
| **Unit-11SurfaceChemistry** | |
| AdsorptiononaSurface | Physisorption |
| Chemisorption |
| Factorsaffectingtheadsorptionofgasesonsolids |
| Catalysis | Homogenousandheterogeneouscatalysis |
| Shapeselectivecatalysis |
| Enzymecatalysis |
| Colloids | Distinctionbetweentruesolution,colloidandsuspension |
| Classificationofcolloids |
| Propertiesofcolloids:Mechanical,Optical,Electrical |
| Hardy-Schulzerule |
| applicationofcolloids |
| **Unit-12ChemicalKinetics** | |
| RateofChemicalReaction | Averagerateofreaction |
| Instantaneousrateofreaction |
| FactorsAffectingRateofaReaction | Concentrationofreactants,temperature,catalyst,natureofreactants,pressure(gases),presenceoflight,surfaceareaofthereactants |
| RateLawandSpecificRateConstant |
| OrderAndMolecularity |
| IntegratedRateEquationsandHalflife | Zeroorderreactions |
| Firstorderreactions |
| PseudoFirstorderreaction |
| TemperatureDependenceofRateofReaction | Activation |
| Energy |
| ArrheniusEquation |
| CollisionTheory |  |
| **Unit-13Hydrocarbons,HaloalkanesandHaloarenes** | |
| TypesofHybridizationofCarbon | Typesofhybridizationincarboncompounds |
| Shapesoforganicmolecules |
| 2Dand3Dstructuralrepresentationoforganiccompounds |
| ClassificationofOrganicCompounds | basedonfunctionalgroups |
| basedonstructure |
| IUPACNomenclatureofOrganicCompounds | Priorityorderoffunctionalgroups |
| Prefixesandsuffixesforfunctionalgroups |
| DerivationofstructuralformulafromagivenIUPACnameandvice-versa |
| StereochemistryandIsomerism | Structuralisomerism |
| Stereochemistryandstereoisomerism |
| Projectionformulae |
| Interconversionofprojectionformulas |
| Conformationsandtheirrelativestabilities(ethaneandbutane) |
| Geometricalisomerism(*cis*and*trans*) |
| Opticalisomerism |
| Absoluteandrelativenomenclatureofopticalisomers |
| HomolyticandHeterolyticFissionofaCovalentBond | carbocation |
| carbanion |
| freeradical |
| BasicsofOrganicReaction | Electrophilicandnucleophilicreagents |
| Typesoforganicreactions |
| ElectronicDisplacementsinaCovalentBond | inductiveeffect |
| electromericeffect |
| resonance |
| hyperconjugation |
| Aromaticity | Stabilityofaromaticcompounds |
| Huckel’srule |
| Alkanes(Upto5CarbonAtoms) | Methodsofpreparation(Reduction,Wurtzreaction,Kolbe'selectrolysis) |
| Physicalproperties |
| Chemicalreactions(Halogenation,Isomerisation,Oxidation,Aromatization,Combustion,Pyrolysis) |
| Alkenes(Upto5CarbonAtoms) | Methodsofpreparation(Partialreduction,dehydrohalogenati  on,dehydration,dehalogenation) |
| Physicalproperties |
| Chemicalreactions(AdditionofH2,X2,Markovnikov’sandanti-Markovnikov’srule) |
| AdditionofHX,andH2O,ozonolysis,oxidationandpolymerization |
| Alkynes(Upto5CarbonAtoms) | Methodsofpreparation(Hydrolysisofcalciumcarbide,dehydrohalo-genation) |
| Physicalproperties |
| Chemicalreactions(AdditionofH2,X2,HX,andH2Oandpolymerization) |
| Arenes | Nomenclature,resonanceandstabilityofbenzene,orientationeffectofsubstituentsinbenzene,preparationphysicalandchemicalpropertiesofbenzene |
| Haloalkanesandhaloarenes | Structure |
| Classification |
| Structureof1⁰,2⁰and3⁰haloalkanesandhaloarenes |
| Nomenclature |
| Isomerism |
| Preparationandproperties |

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| **Unit-14OxygencontainingOrganiccompounds** | |
| Structure | Structureofalcohols,phenolsandethers |
| Classification |
| PreparationofAlcoholsandPhenols | Preparationofalcohols(hydrationofalkenes,hydroboration-oxidation,reductionofcarbonylcompounds,fromGrignard'sreagent) |
| PreparationofPhenols(fromchlorobenzene,benzeneandcumene) |
| PropertiesofAlcohols,PhenolsandEthers | PhysicalPropertiesofAlcohols,PhenolsandEthers |
| ChemicalPropertiesofAlcohols(withmetals,esterification,esterification,withHX,dehydration) |
| ChemicalPropertiesof Phenols(halogenation,nitrationandsulphonation, KolbesReimer-Tiemann,deoxygenationandoxidation) |
| PreparationofEthers&chemicalProperties | Preparationfromalcohols |
| Williamsonsethersynthesis |
| EthercleavagebyHX |
| halogenation,nitrationandFriedelcraftsreaction |
| StructureofAldehydes,KetonesandCarboxylicAcids |  |
| PreparationofAldehydesandKetones | Fromalcohols |
| Fromalkenes |
| Fromalkynes |
| Fromaromatichydrocarbons |
| Gattermann-Koch |
| Fromacidchlorides |
| Fromnitriles |
| Physical,ChemicalPropertiesandUsesofAldehydesandKetones | PhysicalPropertiesofaldehydesandketones |
| ChemicalPropertiesofAldehydesandKetones(nucleophilicadditionreactions,nucleophilicaddition-  eliminationreactions,reduction,oxidation,Aldolcondensation,Cannizzarroreaction,electrophiclicsubstitutioninaromaticaldehydes) |
| Carboxylicacids | Structureofcarboxylicacid |
| Preparationofcarboxylicacids(byoxidation,hydrolysis,fromGrignardreagents) |
| Physicalpropertiesofcarboxylicacids |
| Chemicalpropertiesofcarboxylicacids |
| **Unit-15NitrogencontainingOrganiccompounds** | |
| Structure |  |
| PreparationofAmines | Byreductionofnitrocompounds,nitrilesandamides |
|  | Ammonolysisofalkylhalides |
| PhysicalandChemicalPropertiesof  Amines | PhysicalPropertiesofAmines |
| ChemicalPropertiesofAmines |
| DiazoniumSalts | Nomenclature |
| Structure |
| Methodsof |
| Preparation |
| Physicalproperties |
| ChemicalProperties |
| Structureandimportanceofazodyesandexamples |
| **Unit-16Bio-MoleculesandPolymers** | |
| Biomolecules | Carbohydrates |
| Aminoacidsandproteins |
| Nucleicacids |
| Vitamins |
| Polymers | Classification |
| Methodsofpolymerization |
| PreparationofSomepolymers |
| **Unit-17Chemistryineverydaylife** | |
| ChemicalsinMedicines,FoodandHygiene(SoapsandDetergents) | antacids,antihistamines,tranquilizers,analgesics,antimicrobials(antibiotics,antisepticsanddisinfectants),antifertilitydrugsandchemotherapy |
| foodadditives,artificialsweeteningagents,preservativesandantioxidants |
| saponification,Soaps&cleansingproperty |
| detergentsandbio-degradabledetergents |
| **Unit-18EnvironmentalChemistry** | |
| Environmental | Environmentalpollution |
| Pollution | Conservationofnaturalresources |
| WaterPollution | Typesofwaterpollutants |
| Treatmentofwaterpollution |
| BOD |
| IndustrialPollution | Industrialandagricultural |
| chemicalsthat |
| causeenvironmentaldegradation |
| Industrialwastemanagement |
| GreenChemistry |

**Mathematics CLASSXI**

# Sets,RelationsandFunctions

Unit1:Sets Setsandtheirrepresentations,Emptyset,Finite&Infinitesets.Equivalentandequal sets.Subsets.Subsetsofasetofrealnumbersespecially intervals(with notations). Powerset,Universalset.



**Venndiagrams.UnionandIntersectionofsets.Differenceofsets.Complementofaset.Propertiesofcomplementsets.Practicalproblemsonunionandintersectionofsets.**

**Contents LearningOutcomes:**

* 1. **Setsandtheirrepresent-tations**

identifysetsaswelldefinedcollections.representsetsinrosterandsetbuilder form.

identifythesymbols and and understandthedifferencebetweenthetwo.

Conversionfromsetbuilder formtorosterformandviceversa.

* 1. **EmptySet** identifyemptysets(nullsets).
  2. **SingletonSet** Identifysingletonsetandframeexamples.
  3. Finiteand

**infiniteSets**

* 1. **Equivalent**

**andEqualSets**

identifyfiniteandinfinitesets;andtheirrespectiverepresentations.

understandmeaning ofequalandequivalentsets.differentiatebetweenequalandequivalentsets.determinewhetherthegivenpairofsetsisequalornot.

* 1. **Subsets** identifythesubsetsofagivensetanditssymbol( )

understand thateverysethastwotrivialsubsets-nullsetandthesetitself.

understandthedifferencebetweenasubsetandpropersubset.

* 1. **PowerSet** identifypowersetassetofsubsets.
  2. **UniversalSet** identifyuniversalsetanditssymbol( )
  3. Complementofa Set

findthecomplementofasubsetofagivenset,withinagivenuniverse.

* 1. **Intervalsas** closedinterval,openinterval,righthalfopeninterval,lefthalf

**SubsetsofR** open interval.

* 1. Venn

**diagrams**

* 1. **Unionand**

**IntersectionofSets**

* 1. **Differenceof**

**sets**

* 1. **Lawsof**

**OperationsonSets**

* 1. **PropertiesofComplementSets**
  2. **Practical**

**ProblemsonunionandIntersectionofSets**

representsetsusingvenndiagrams.

findtheintersection of setsandunion ofsets.

showtheintersectionandunionofsetsusing Venndiagrams.identifydisjointsetsanditsrepresentationusing venn diagram.

findthedifferenceofsetsandtheirrepresentationusing venndiagram.

applythefollowinglawsofalgebra onsets:

* Lawsofunionofsets(commutativelaw,associativelaw,idempotentlaw,identitylaw)
* lawsofintersectionofsets
* distributivelawsDe

applypropertiesofcomplementsets.

solvepracticalproblemsonunionandintersectionofsets.

applyresultsandsolveproblemsonnumberofelementsof setsusingpropertieslike

1)

2)



Unit2:Relationsand Functions

Orderedpairs,Cartesianproductofsets.NumberofelementsintheCartesianproductoftwofinitesets.Cartesianproductofthe setofallrealswithitself(uptoRxRxR).Definitionofrelation,pictorialdiagrams,domain,co-domainandrangeofarelation.Functionasaspecialkindofrelationfrom onesetto another.Pictorialrepresentationofafunction,domain,co-domain&rangeof afunction.Realvaluedfunctions,domainandrangeofthefunctions:constant,identity,linear&quadraticpolynomial,rational,modulus,signumandgreatestintegerfunctionswiththeirgraphs.Sum,difference,productandquotientsof functions,Evenandoddfunction

Contents LearningOutcomes

* 1. **OrderedPairs Studentswillbeableto:**

identifyanorderedpair.

identifytheequalityoftwoorderedpairs.

* 1. Cartesian

**ProductofSets**

* 1. **DefinitionofRelation**

identifyacartesianproductoftwo nonemptysets.identifythetwosetsgiventheir cartesianproduct.findtheunionandintersectiononcartesianproducts.findorderedtriplets(R R R).

identifythenumberofelementsinthecartesianproductoftwofinitesets.

identifycartesianproductofsetofallrealnumberswithitself.

understandrelationoftwosetsasasubsetoftheircartesianproduct.

* 1. **ArrowDiagram** pictorialrepresentationofarelationbetween twosets.
  2. Domain,Co-domainandRangeofaRelation



* 1. **FunctionasaSpecialKindofRelationfromoneSettoanother**
  2. **Pictorial**

**representationofaFunction**

* 1. **Domain,Co-domainandRangeofaFunction**

identifydomain,co-domainandrangeofarelation.

identifyfunctionasaspecialkindofrelationfromonesettoanother.

determinewhen arelationis afunction.

describeandwritefunctionalrelationshipsforgivenproblemsituations.

understandthatf R AXA.representfunctionsusinggraphs.

tounderstandthat everygraphdoes notrepresentafunction.

identifydomain,co-domainandrangeofafunction.findingdomainandrangeofagivenfunction.identifyevenand odd functions.

findspecificfunctionvalues

findthealgebraoffunctionscovering:(fg)(x)=f(x) g(x)=g(x) f(x)

(fg)(x)=f(x).g(x)

, g(x) 0

* 1. Realvaluedfunctionsandtheirgraphs

**Unit3:TrigonometricFunctions**

recognisethefollowingrealvaluedfunctionso constantfunction

* + - identityfunctiono linearfunction
    - quadraticfunction
    - polynomialfunctiono rationalfunction
    - modulusfunctiono signumfunction
    - greatestintegerfunction

Studentisexpectedtodrawthegraphsoftheabovementionedrealvaluedfunctions

Positiveandnegativeangles.Measuringanglesinradiansandindegreesandconversionfromonemeasuretoanother.Definitionoftrigonometricfunctionswiththehelpofunitcircle.Truth oftheidentitysin²x+cos²x=1,forallx.Signsoftrigonometricfunctions.Domainandrangeoftrigonometricfunctionsandtheirgraphs.Trigonometricfunctionsasperiodicfunctions,theiramplitude,argumentperiod&graph.Expressingsin(x+y)andcos (x+y)intermsofsinx,siny,cosx&cosy.Deducingidentitieslikethefollowing :

tan(x+y)= tan*x*



*y* cot(x+y)= cot*x*cot*y*

1 tan*x*tan*y* cot*y x*

tan

1

cot



*x x*

*y*

*y*

*y*



*x*



sinx+siny=2six cos ,cosx+cosy=2cos .cos

2 2 2

*y*



*x*

2

*x x x*

*y*

*y*

*y*



sinx-siny=2cos .sin , cosx cosy=2sin .sin

2 2 2

*y*



*x*

2

Identitiesrelatedtosin2x,cos2x,tan2x,sin3x,cos3x andtan3x.General solution oftrigonometricequationsofthetypesin= sin,cos =cosandtan=tan.

Proofandsimpleapplicationofsineandcosinerulesonly,lawofsine,lawofcosineand theirapplications.

Contents LearningOutcomes



* 1. **Positiveandnegativeangles**
  2. **Measuring**

**anglesinradiansandindegreesandconversionfromonemeasuretoanother**

* 1. **Definitionoftrigonometricfunctionswiththehelpofunitcircle**
  2. **Signoftrigono-metricfunctions**
  3. **Domainandrangeoftrigonometricfunctions**
  4. **Trigonometricfunctionsasperiodicfunctions,theiramplitude,argument,periodandgraph**
  5. **Trigonometricfunctionsofsumanddifferenceof**

**Studentswillbeableto:**

identifypositiveandnegativeangles.

measureanglesinbothdegreesandin radians,andconvertbetweenthesemeasures

definetrigonometricfunctions withthehelpofunitcircle.

identifythechangeofsignsoftrigonometricfunctionsindifferentquadrants.

developandapplythevalueoftrigonometricfunctionsat0, /6,

/4, /3, /2radiansandtheirmultiples\*.

usethereciprocal andco-functionrelationshipstofindthevaluesofthesecant,cosecantandcotangent0,/6, /4, /3, /2radians

valueoftrigonometricfunctionsatn ,wheren isapositiveinteger

identifythedomainandrangeoftrigonometricfunctions.

identifytrigonometricfunctionsas periodic functions with sineandcosinefunctionshavingaperiodof2,tangentandcotangentfunctionshavingaperiodof , secantandcosecantfunctionshavingaperiodof2 .

constructthegraphsoftrigonometricfunctionsanddescribetheirbehaviour,includingperiodicity,amplitude,zerosandsymmetry.

expresssin(x±y)andcos(x±y)intermsofsinx,siny,cosxandcosy.

tan



) *x* tan*y*

1 tan*x*tan*y*

tan(*x*

*y*



)  *x*cot*y* 1

cot*y*

*x*

* 1. ExpresssumanddifferenceofT-FunctionsastheproductofT-ratios

cot

*y*

cot



**twoangles**

cot(*x*

**3.9 Identities**

**relatedtosin2x,cos2x,tan2x,sin3x,cos3xandtan3x**

deduceidentitiesrelatedtosin2x,cos2x,tan2x,sin3x,cos3xandtan3x,andapplythemtosimplifytrigonometricequations.

findthegeneralsolutionofthetrigonometricequationsofthetype

sin =sin, cos=cos andtan =tan.

findinggeneralsolutionsof

**3.11Proofand**

**simpleapplicationsofsineandcosinerules**

provethelawofsinesandlawofcosine.

applylawofsinesandlawofcosineinvariousproblems.

sin*x* cos

*x*

sin*y*

2sin *y x y*

2 2

*x*

2cos *y x y*

cos*x* cos

cos*y*

##### 2 2

*x*

2cos *y x y*

sin*x* sin

sin*y*

##### 2 2

*x*

2sin *y x y*

cos*x* sin

cos*y*

##### 2 2

usetheaboveidentitiestosimplifytrigonometricequations.

3.10 General

**solutionoftrigonometricequationsofthe typesin =sin ,cos=**

**cos andtan =**

**tan .**

solveforanunknownsideorangle,usingthelawofsinesorthelawofcosine.

determinetheareaof atriangleorparallelogram,giventhemeasureoftwosidesandtheincludedangle.

# Algebra

|  |  |  |  |
| --- | --- | --- | --- |
| **UNIT4:PrincipleofMathematicalInduction:** | | | **Processofthe proof byinduction,motivatingtheapplicationof the methodbylookingatnaturalnumbersastheleastinductivesubsetofrealnumbers.Theprinciple ofmathematical inductionandsimpleapplications.** |
|  | **Contents** |  | **LearningOutcomes** |

* 1. **Processofproofbyinduction**
  2. **Principleofmathematicalinductionanditsapplications**

**UNIT5:ComplexNumbers andQuadraticEquations**

**Students willbeableto:**

apply theprincipleofmathematicalinductiontoestablishthe validityofageneralresultinvolvingnaturalnumbers.

applicationoftheprincipleofmathematicalinductioninsolving problems

Need forcomplexnumbers,especially ,tobe motivatedbyinabilityto

solvesomeofthequadraticequations,standardformofacomplex numberAlgebraicpropertiesofcomplex numbers,Argand plane,themodulusandconjugateofacomplex numberandpolar representationofcomplexnumbersStatementofFundamentalTheoremofAlgebra, solutionofquadraticequationinthecomplexnumbersystem.

Squarerootofacomplex number.Cube roots ofunity and theirproperties.

**Contents LearningOutcomesStudents willbeableto:**

* 1. **Need for**



**complexnumber,especiallyiotatobemotivatedbyinabilitytosolvesomeofquadraticequation.**

* 1. **Standard**

**formofcomplexnumber**

* 1. **Modulusandconjugateofcomplexnumber**
  2. **Multiplica-**

**tionanddivisionofcomplexnumbers**

understandtheneed ofImaginaryQuantitiesunderstand theconcept ofiotaanditsapplication

definea complexnumber (z = a+ib) and identify itsreal and imaginaryparts

concept ofpurelyrealand purelyimaginarycomplex numbergetfamiliarwithequalityofcomplexnumbers

understandthe addition and subtraction of complexnumbers and itsproperties

identifytheconjugate of a complex number and familiarizedwith itsproperties

identifythe modulus of a complex number andfamiliarizedwith itsproperties

understandthemultiplicationofcomplexnumbersanditspropertiesunderstandthedivisionofcomplex numbersanditspropertiesidentify themultiplicativeinverseorreciprocal of acomplexnumber

* 1. **Polarrepresent-tationofcomplexnumber**

understandthepolarortrigonometricalformof acomplexnumberfindthemodulusofacomplex number

findtheargument of acomplex number

* 1. **ArgandPlane** geometricalrepresentationofacomplexnumber

understanddifferentpropertiesofcomplex numbersanditsrepresentationonargandplane

solvedifferentmathematicalproblemsusing argand plane

* 1. **StatementofFundamentaltheoremofalgebra**
  2. **Squarerootofacomplexnumber**
  3. **Solutionof**

**quadraticequationsinthecomplexnumbersystem**

getfamiliarwithfundamentaltheoremofalgebra

findthesquareroot ofacomplex number

solvethequadraticequationsinthecomplex numbersystem

**UNIT6:LinearandQuadraticInequalities**

Linearinequalities.Algebraicsolutionsoflinearinequalitiesinonevariableandtheirrepresentationonthenumberline. Graphicalsolutionof linearinequalityintwovariables.

Graphicalsolutionofsystemoflinearinequalitiesintwovariables.Inequalitiesinvolvingmodulusfunction.Practicalproblemsonlinearinequality,algebraicsolutionofquadraticinequality.

**Contents LearningOutcomes**

* 1. **Linear**

**inequations**

* 1. **Algebraicsolutionsoflinearinequationsinonevariable**
  2. **Algebraicsolutionsoflinear**

understandlinearinequalities

findalgebraicsolutionsoflinearinequalities inonevariable

representthesolutionoflinear inequalitiesinonevariableona numberline

simultaneoussolutionoftwolinearinequalitiesalgebraicallyaswellasonnumberline

findalgebraicsolutionsoflinearinequalitiesintwovariables

**inequationsintwovariables**

* 1. **Graphicalsolutionoflinearinequationsintwovariables**
  2. **Inequationssolvingmodulusfunctions**

**UNIT 7:**

**Permutation andCombination**

Solutionoflinearinequalityintwovariablesandthe graphofitssolutionset

Solutionofsystemof linearinequalitiesintwovariablesandthegraphofits solutionset

inequalitiesinvolvingmodulusfunction.

understandwavycurve methodfor2nddegree and higher degreepolynomialsexpressedintheform (x+a)(x+b) ......(thenumber of suchterms correspondingtothedegree ofthepolynomial)

Fundamental principle of counting. Factorial n. (n!)Permutationsandcombinations. Propertiesof combination,derivation offormulae and theiconnections,simpleapplications.

**Contents LearningOutcomes**

* 1. **Fundamentalprinciplesofcounting**

**Students willbeableto:**

knowthefundamentaladditionprinciplesofcountingandapply ittofindout numberofwaysparticular eventcanoccur

know thefundamentalmultiplicationprinciplesofcountingandapply ittofindoutnumberofwaysparticular eventcanoccur

* 1. **Factorialn(n!)** knowthe meaningoffactorial anditssymbol

knowhowtocompute factorial

knowhowtorepresentproductofconsecutivenumbersinfactorialknowhowtorepresentproductofconsecutivenumbersinfactorial

* 1. **Permutation** familiaritywith themeaningofpermutation

derive theformulaeofalinearpermutation*nP*

*n*

*r*

!

*n*

!

*r*

use the formula of permutation to find other results

*p(n,n)=n*!0!=1

* 1. **Combinations** familiarwiththemeaningofcombination

distinctionbetweencombinationandpermutation

!

!

derivetheformulasofcombination*nC*

*n*

*r n*

*r*

!*r*

* 1. **Derivationofproperties of**

familiarityanduseofproperties ofcombination

*n*

*r n*

*n*

*r*

*Cn*

**combination**

For 0

,wehave *Cr*







* 1. **Typesof**

*r n*

*x y n*

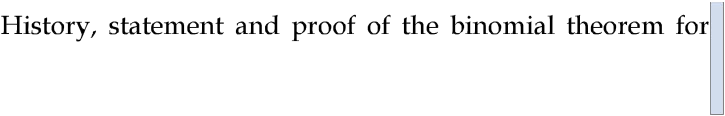
or,

*n*

*y*

1

*n*



If *n* and *r* are non negative integers such that 1

*n*

Then, *Cr C* 1 *C*

If1 ,then

*nC C x y*

*x*

If *n* is aneven natural number,thenthegreatest of thevalues

*nC*,*nC*,*nC* ,.......,*nCisnC*

0 1 2 *n n*2

usetheformulaofcombinationtofindotherresults *nC C*

*n* 0

**7.7 Simple**

**applications**

solvethe simple practicalproblemson permutationsolvethe simple practicalproblemsoncombination

**Contents**

**LearningOutcomes**

**8.1**

**Triangle**

getfamiliarwiththePascal's triangle

observe differentpatternsofnumbersfollowed inpascalstriangle

**8.3Generalandmiddleterminbinomialexpansion**

getfamiliarwiththegeneralterminbinomialexpansion

getfamiliarwithmiddleterminbinomialexpansionwhennumberoftermsare even/odd

getfamiliar withpth termfromtheend

computesimple applicationproblemsusing binomialtheorems

**permutations**

linearpermutationscircularpermutationrestrictedpermutation

permutationswhen particularthing istobe includedeverytimepermutationswhen particularthing isnever tobeincludedpermutationofobjects are notalldifferent

Permutationwith repetition

**UNIT8:Binomial**

**Theorem:** positive integral indices. General and middle termin binomialexpansion,simpleapplications.

**Students willbeableto:**

**8.2History,**

**statement andproofofthebinomialtheoremsforpositiveintegralindices**

knowthebinomialtheoremsforpositiveintegralindicesandtheirproofexpandanexpressionusingbinomial theorem

*r n*

*r*

*r*

*n n*

1

**8.4Applicationofbinomialtheorem**

**UNIT 9:SequencesandSeries:**

Sequencesand Series,ArithmeticProgression(A.P.),ArithmeticMean(A.M.),GeometricProgression(G.P.),generaltermofaG.P.,sumofntermsofaG.P.,infiniteG.P.anditssum,geometric mean (G.M.), relationbetweenA.M.andG.M., Sumto n terms of thespecial series , and ArithmeticGeometricSeries. HarmonicProgression.

**Contents LearningOutcomesStudents willbeableto:**

* 1. **Arithmetic**

**Progression,GeometricProgression**

* 1. **Arithmeticmean**
  2. **Geometricmean**
  3. **SumtontermsofanA.P.**
  4. **SumtontermsofaG.P.**
  5. **InfiniteG.P.anditssum**
  6. **Relation**

**betweenA.M.andG.M.**

* 1. **Sumton**

**terms ofspecialseries**

* 1. **Arithme-**

**ticogeometricseries**

**9.10HarmonicProgression**

identifyanarithmeticorgeometricsequence.

findtheformulaforthenthtermof anarithmeticsequencefindtheformula forthenthtermofageometricsequence.

prove a givensequencefromanarithmeticprogressionor a geometricprogression

determineaspecifiedtermofanarithmeticsequencedetermine aspecifiedtermofageometricsequence.

generateorconstructsequences fromgivenrecursiverelationshipsfindthearithmeticmean.

i arithmeticmeans between2givennumbers

findthegeometricmean.i

findthesumoffinitetermsofanarithmeticprogression.

findthesum offiniteterms ofageometricprogression.findthesum ofaninfinite geometricprogression.

identifyand applythe relationbetweenarithmeticmean andgeometricmean.

findthesumtonterms ofthespecialseries

2 3

*n*, *n*, *n*



findthesum of n termsofa series givenits nthtermusing results of

*n*, *n*2, *n*3

.

identifyarithmetico-geometricseries.

identifyharmonicprogression.

findthesumtontermsofharmonicprogression.

# Co-ordinate Geometry

Unit10:StraightLinesBriefrecalloftwodimensionalgeometryfromearlierclasses,Shiftingoforigin,Slopeofalineandanglebetweentwolines.Variousformsofequationsofa line:paralleltoaxes,pointslope form,slope interceptform,two-point form,interceptformandnormalform.Generalequationofaline.Equationoffamilyoflinespassingthroughthepointofintersectionoftwolines.Distanceofapointfromaline,distancebetweenparallellines.

**Contents LearningOutcomes**

**Studentswillbeableto:**

* 1. **Briefrecalloftwodimensionalgeometryfromearlierclasses**

distancebetweentwopoints

areaoftrianglewhoseverticesaregiven

co-ordinatesofapointdividesthejoinoftwogivenco-ordinatesintheparticularratio

co-ordinatesofmidpointofalinesegmentjoiningtwoco-ordinates

co-ordinatesofcentroidandincenterofatriangle

* 1. **Shiftingof origin** comprehendthechangeinequationonshiftingthepoint

oforigin

* 1. **Slopeofaline** findtheslopeofalinewhenangleofinclinationisgiven

identifytheslopeofalineintermsofco-ordinatesofanytwopointsonit

familiarwithconditionofparallellinesandperpendicularlinesintermsofslope

use slopesoflinesto investigate geometricrelationships,includingparallellines,perpendicularlines.

* 1. Angle between

*m*2 *m*1

1 *m*1*m*2

haveafamiliaritywith thetheoremthat anglebetweentwo

two lines

lineshavingslopem1

andm2

isgivenby tan



* 1. Variousformsofequationofaline:parallelto

equationoflinesparalleltotheco-ordinateaxis

axis,pointslopform, slop-interceptform,twopointform,interceptform,andnormalform

formtheequationoflinewhenco-ordinatesofpoint throughwhichlinepassesandslopeisgiven(point-slopeform).

formtheequationoflinewhenco-ordinatesoftwopointsthroughwhichlinepassesaregiven(twopointform).

familiarwithinterceptsofalineontheaxes.

formtheequationofline makingslopemandmakinganinterceptcony/xaxis(slopeinterceptform).

formtheequationoflinewhenalinecutsoffinterceptsa&brespectivelyonxandyaxis(interceptform).

formtheequationoflinewhenthelengthoftheperpendicularonitandangleofthatperpendicularisgiven(normalformofline).

usedifferent formsofalinetofindoutmissingparametersofalineinsymmetricform.

* 1. Generalequationofaline

identifygeneralequationandtransformitindifferentstandardforms.

* 1. Equationof

**familyoflinespassingthroughthepointofintersectionoftwolines**

findthepointofintersectionoftwolines.

understandtheconceptoffamilyoflines passingthrough theintersectionoflinesllandl2intermsofl1+kl2=0.

givetheequationoflinespassingthroughthepointofintersectionoftwolinesundergivenconditions.

* 1. Distanceofapointfromaline

computethedistance ofapointfromaline.

* 1. Distancebetweenparallellines

computethedistance between parallellines.

**Unit11:ConicSection** Sectionsofacone:circle,ellipse,parabola,hyperbola,apoint,straightlineandpairofintersectinglinesasadegeneratedcaseoaconicsection.Standardequationofacircle;Generalequationoacircle,generalequationofconicsectionswhenitsfocus,directriand eccentricity are given, standardequationsand simplpropertiesofparabola,ellipseandhyperbola.

Contents LearningOutcomes

**Studentswillbeableto**

* 1. **Introductionto** identifythecircle,parabola,ellipseand hyperbolaascross

**sectionofacone** sectionsofadoublenappedconebyaplane.

* 1. Circle(Standardform)

identifytheequationofacircleinstandardformhavingtheCentre(h,k)and radiusr.

equationofacirclehavingcentreatoriginandradius r.

equationofacirclewhentheendpointsofadiameteraregiven.

* 1. Circle(general

**form)**

generalequationofacirclewithcentreat(-g,-f)andradius

find the equationofthecircleusinggivenconditions.

2

*g*2

*f c*

find theconditionforalinetobeatangenttoacircle

* 1. Parabola

**(standardform)**

identifythestandardparabola(righthanded,lefthanded,upwardanddownwardparabola)

findtheaxis,vertex,focus,directrixandthelatusrectumofthestandard parabola

* 1. Parabola

**(generalform)**

identifythegeneralequationof aparabola

reductionofgeneralformofparabolatothestandardform.

findtheaxis,vertex,focus,directoryandthelatusrectumfromthegeneralequationoftheparabola.

findtheequationofparabolaundergivencondition.

* 1. Ellipse

**(standardform)horizontal&verticalellipse**

identifytheverticalandhorizontalellipse.

findthevertices,majorandminoraxis,foci,directrix,centre,eccentricityandlatusrectumoftheverticalandhorizontalellipse.

* 1. Ellipse(generalform)

identifythegeneralformofanellipse(vertical&horizontal)reductionofgeneralformofellipsetothestandardform.

findthevertices,majorandminoraxis,foci,directrix,centre,eccentricityandlatusrectumfromthegeneralfromofellipse.

findtheequationofanellipseundergivenconditions.

* 1. Hyperbole

**(standardform)**

identifythehyperbolain standardform(alsoconjugatehyperbola)

findthecentre,vertices,foci,directrix,transverseandconjugateaxes,eccentricityandlengthoflatus rectum.



* 1. Hyperbole

**(generalform)**

identifythegeneralformofhyperbole.

reductionofgeneralformofhyperbolatostandardform.

findthecentre,vertices,focidirectrix,transverseandconjugateaxes,eccentricity&latusrectumfromthegeneralequationofhyperbola

findtheequationofhyperboleundergivencondition

* 1. Applicationof

**conicsection**

applytheconceptsofparabola,ellipseandhyperbolainthegivenproblems.

Unit12:IntroductiontoThreedimensionalGeometry

Co-ordinate axes andco-ordinateplanesinthreedimensions.Co-ordinatesofapointinspace.

Distance betweentwopoints and section formula,directioncosinesofaline,directionratiosofline,anglebetweentwolines.

Contents LearningOutcomes

Studentswillbeableto:

identifyco-ordinateaxesinthreedimensions.

* 1. **Co-ordinateaxesandco-ordinateplanesinthreedimensions**

identifyco-ordinateplanesinthreedimensions.findco-ordinatesofapointinspace.

* 1. Distance

**betweentwopointsandsectionformula**

finddistancebetweentwopoints.applysectionformula.

* 1. Someresultsonline inspace

directioncosinesofalinedirectionratiosofaline

anglebetweentwolines.

**Calculus**

**Unit13:Limitsand Continuity**

**IntuitiveideaofLimitofafunction.DerivativeintroducedasrateofchangeofdistancefunctionanditsGeometricmeaning,Definitionofderivative,relateittoslopsoftangentofthecurve,derivative ofsum,**

difference, product and quotient of function, Derivative ofpolynomialsandtrigonometricfunction.

**Contents LearningOutcomesStudentswillbeableto:**

* 1. **Limitof**

**function**

* 1. **Fundam-ental theoremonlimits**

understandthemeaningofx aunderstandthelimitoffunctionatapointapplyfundamentaltheoremsonlimits

1. lim*f x*

*g x*

*g x* lim*f x* lim

*x*

*a x a x a*

1. lim*f x*

*g x*

*g x* lim*f x* lim

*x*

*a x a x a*

1. lim*f x*.*gx* .lim*g x*

lim*f x*

*x*

*a x a x a*

1. lim

*f x*

*g*

*x x*

*a*

*x*

*x a* ,provided

lim

*f*

0

*g x*

lim

g x

*x*

*a*



1. lim*c*.*f x x*

*f*

*c*.lim

*x*

*a x a*

1. if *f x*

*a x a*

*g x*

*g x* then lim*f x* lim

*x*

* 1. Standard

**resultsonlimitsandtheirapplication**

*xn*

lim wherea 0

*n*

*a nan*1,

*x a*

*x*

0

*ex*

1

1

lim

*x*

*x*

0



lim*a*

*x*

1

log

*a*

*x*

*x*

0

limlog(1 )

*x*

1

*x x*

0

lim1

1/

*x*

*x e*

*x*

*a*

* 1. Trigono-

**metriclimits**

lim

*x*

0

sin*x*

limtan*x* wherexisinradius

*x*

1

*x*

1

*x*

0

*a*

*a*

*a*

**13.5 Infinite**

**limits**

lim*f*(*x*)

*x*

lim*f*(*x*)

*x*

**13.6 Onesidedlimit**

Righthandlimit

lim*f*(*x*)

*x a*

existenceoflimit offunction.

Lefthandlimit

lim*f*(*x*)

*x*

**13.7 Continuity**

understandthemeaningofcontinuityofafunction

determinethecontinuityofagivenfunctionatapoint whenthefunctiononboththesidesofthegivenpointissame

determinethecontinuityofagivenfunctionatapoint whenthefunction onboththesidesofthegivenpointisdifferent

determinethevalueofaconstantgiveninthedefinitionofafunctionwhenitiscontinuousatanindicatedpoint

applythealgebraofcontinuousfunctions:

If*f*and*g*arecontinuousfunctionat*x=a*then

1. *f+g*iscontinuousat*x=a*
2. *f g*iscontinuousat *x=a*
3. *fg*iscontinuousat*x=a*
4. *g*iscontinuousat *x=a*

(v) *f/g*iscontinuousat*x=a*when*g(a) 0*

# Probability

**Unit14:Probability**

**Randomexperiments:outcomes, samplespaces(set**

**events,exhaustiveevents,mutuallyexclusiveevents Axiomatic(settheoretic)probability,connectionswiththetheoriesofearlierclasses.Probabilityofanevent,probabilitevents.**

Contents LearningOutcomesStudentswillbeableto:

* 1. **Random**

**experiment:outcomes,samplespaces(setrepresentation).**

* 1. **Events:**

**occurrenceofevents,'or','and',**

**& 'not'events**

* 1. **Exhaustive**

**events,mutuallyexclusiveeventsAxiomatic(settheoretic)probability**

* 1. **Probabilityofanevent**

learntheconceptofrandomexperiment,outcomesofrandomexperimentandsamplespaces

listthesamplespacesofarandomexperiment

understandthetermeventasasubsetofsamplespacewriteevents/samplespaceforagivenexperimentrecognise'or','and'&'not'events

identifyimpossibleeventsandsureeventsIdentifysimpleandcompoundevents

identifymutuallyexclusiveeventsidentifyexhaustiveevents

getfamiliarwithindependentevents,equallylikelyevents,andcomplementaryevents\*

findtheprobabilityofoccurrenceofanevent

* 1. **Oddsofan event** Oddsinfavourofanevent

Oddsagainstanevent.

* 1. Probabilityofoccurrenceofacomplementaryevents

FindtheprobabilityofcomplementofaneventusingtherelationP(E)=1 P(E)

* 1. Resultson

**probability**

* 1. **Addition**

**theorem**

)=0,P(S)=1

IfE1 E2thenp(E1 2)P(E1-E2)=P(E1)-P(E1 E2)

AdditiontheoremfortwoeventsP(A B)=P(A)+P(B) P(A B)

Additiontheoremfor threeevents

P(A B C)=P(A)+P(B)+P(C) P(A B)-P(BC)-P(C A)+P(A B C)

Additiontheoremformutuallyexclusiveevents.

**Mathematics CLASSXII**

# RelationsandFunctions

Unit1:RelationsandFunctions



**Typesofrelations:reflexive,symmetric,transitiveandequivalencerelations.One tooneand on tofunction,compositefunctions,inverseofafunction.Binary operations.Conceptofexponentialand logarithmicfunction tothebase *e*, logarithmicfunction asinverseofexponentialfunctionandgraphs.**

**Contents LearningOutcomesStudentswillbeableto:**

* 1. **Typesof**

**relations:reflexive,symmetric,transitiveandequivalencerelations**

* 1. **Onetooneandontofunctions**
  2. **Compositefunctions**
  3. **Inverseofafunctionandbinaryoperations**
  4. **Conceptofexponentialandlogarithmicfunctiontothebasee,**

identifyreflexiverelation,illustratereflexiverelation.

identifysymmetricrelationidentifytransitiverelationidentifyantisymmetricrelation

understandtheconditionsforanequivalencerelationdeterminea relationisequivalence

identifyone-onefunctionsidentifyontofunctionsidentifybijectivefunctions

definecompositionoftwofunctions

understandthatgiventwofunctions*f*and *g*,*fog*maynot beequalto*gof*

definetheinverseofagivenfunction,ifexists.understandthedefinitionofbinaryoperationonaset

determineifagivenoperationisabinaryoperation~~o~~nagivensetdeterminethetotalnumberofbinaryoperationsonagivenfiniteset

determineifagivenbinaryoperationiscommutativedetermineifa givenbinaryoperationisassociativedetermineifa givenbinaryoperationisdistributivedetermine theidentityelementforabinaryoperationdeterminetheinverseelementofagivenelementunderstandthepropertiesoflookingatitsgraph.

understandthepropertiesof logarithmicfunctionlookingatitsgraph

definelogarithmicfunctionasinverseofexponentialfunctionsketchthegraphofexponentialfunction

logarithmicfunctionasinverseofexponentialfunctionandtheirgraphs

**Unit2:Inversetrigonometricfunctions**

**Definitionofinversetrigonometricfunctioninunitcircles,range,domainprincipalvaluebranches.Graphsofinversetrigonometricfunctions,Elementarypropertiesofinversetrigonometricfunctions.**

**Contents LearningOutcomes**

* 1. **Definitionofinversetrigonometricfunction inaunitcircle**
  2. **Range,domain,principalvaluebranches**
  3. **Graphsofinversetrigonometricfunctions**
  4. **Elementarypropertiesofinversetrigonometricfunctions**
  5. **Problemsbasedonproperties**

**Studentswillbeableto:**

defineallinversetrigonometricfunctionusingaunitcircle

statethedomainandrangeofinversetrigonometricfunctions

statetheprincipalvaluebranchofinversetrigonometricfunctionsandneighbouringbranches.

sketchthegraphsofsixinversetrigonometricfunctions.

provethepropertiesofinversetrigonometricfunctions

usethetrigonometricpropertiestosolvetrigonometricequationsandtoprovetrigonometricidentities.

# Matrices andDeterminants

Unit3:MatricesConcept,notation,order,equality,typesofmatrices:zeromatrix,transposeofmatrix,symmetricandskewsymmetricmatrices,Addition,multiplicationandscalarmultiplicationofmatrices,simplepropertiesofaddition,multiplicationandscalarmultiplication,Non-commutativityofmultiplicationofmatrixandexistenceof non-zeromatriceswhoseproductisthezeromatrix(restricttosquarematricesoforders).Conceptofelementaryrow andcolumnoperations,invertiblematricesandproofoftheuniquenessofinverse,ifitexists.(Hereallmatriceswillhaverealentries)

**Contents LearningOutcomes**

**Studentswillbeableto:**

* 1. **Matrices** definematrices

usematrixnotation

determinetheorderof amatrixidentifytypesofmatrices:

* + - Rowmatrix
    - Columnmatrix
    - Squarematrix
    - Diagonalmatrix
    - Scalarmatrix
    - Identity orunit
    - Null(zero)matrix
    - Uppertriangularmatrix
    - Lowertriangularmatrix
  1. Equalityof

**matrices**

* 1. **Operationonmatrices**
  2. **Multiplica-tionofmatrices**

understandtheconditionfortheequalityof matrices

performadditionandsubtractionofmatricesunderstandthepropertiesofaddition ofmatrices

performmultiplicationofamatrixbyascalaridentifythepropertiesofscalarmultiplication

understandtheconditionsorderofmatrices tomultiplythemperformmultiplicationofmatrices,whereverpossibleidentifyproperties of matrixmultiplication

canillustratenonzeromatriceswhose productisthezeromatrixsolveproblemsbasedonapplicationofmatrices

* 1. **Transposeof** writethetransposeofamatrix



**matrix** verifythepropertiesoftranspose

* 1. Symmetric

**and skew-symmetricmatrices**

* 1. **Conceptof**

**elementaryrowandcolumntransformations**

**Unit4:Determinants(10Periods)**

identifysymmetricmatricesidentifyskew-symmetricmatrices

understandthat forasymmetricmatrixaij=aji

understandthatinaskewsymmetricmatrix,diagonalelementsarezero.

constructasymmetricand skew symmetric matrix.

provethateverysquarematrixcanbeexpresseduniquelyassumofsymmetricandskewsymmetricmatrix.

writeagivensquarematrixassumofsymmetricandskewsymmetricmatrix.

applyelementaryrow andcolumntransformationsonamatrixoforder2 2 and3 3

invertiblematrices(AB=BA=I).

findtheinverseofamatrixusing columnorrowtransformations

Determinantofasquarematrix(upto3matrices)propertiesofdeterminants,minors,cofactorsandapplicationsofdeterminantsinfindingtheareaofatriangle,collinearityofpoints.Consistency,inconsistencyandnumberofsolutionsofsystemoflinearequationsby examples.Solving system oflinearequationsintwoorthree

3



applicationsonwordproblems.

**Contents LearningOutcomes**

* 1. **Determinantofasquarematrix(upto3×3matrices)**
  2. **Applicationofdeterminant**
  3. **Propertiesofdeterminants**

**Studentswillbeableto:**

findthevalueofadeterminantoforder

determinetheminorofanelementofasquarematrixdeterminethecofactorofanelementofasquarematrixdeterminethedeterminantofasquarematrixoforder3x3

use determinantstofind theareaofatriangle

usedeterminantstodeterminethecollinearityofthreepointsverifythepropertiesofdeterminants

applythepropertiesofdeterminantstosolveproblems

4.4 s

**Unit5:AdjointandInverseofamatrix**

**Adjointofasquarematrixoforder 2 2and3 3.Propertiesofadjointofamatrix.Inverseofasquarematrix.Consistency,inconsistencandnumberofsolutionsofasystemoflinearequations byexamples.Solvingthesystemoflinearequationsintwoandthreevariablesbymatrixmethodanditsapplicationin wordproblem.**

**Contents LearningOutcomesStudentswillbeableto:**

* 1. **Adjointofamatrix**
  2. **Singular andNonsingularmatrix**
  3. **Invertible**

**matrices**

* 1. **Solvinga**

**systemoflinearequationsbyMatrixmethod**

findtheadjointof asquarematrixuptoorder3 3verifythepropertiesofadjoint:

A(adjA)=(adjA).A=AInforamatrixAofordern.adj(AB)=(adjB)(adjA)

(adjA)T =adjATadjA =A n-1

understandthedefinitionofsingularandnonsingularmatrices.identifysingular andnonsingularmatrix.

understandtheconditionforamatrixinordertobeinvertibleprovethateveryinvertiblematrixpossessesaunique inversefindtheinverseofamatrixusingdefinition

findtheinverseofamatrixwhenitsatisfiessomematrixequation.verifyresultsoninvertiblematrices

solveasystemoflinear equationintwovariables(havinguniquesolution)usinginverseofamatrix

understandtheconditionsfor consistencyandinconsistencyofsystemoflinearequations

solveasystemoflinearequationsinthreevariables(havinguniqusolution)usinginverseofamatrix

solveasystemoflinearequationswhentheinverseofcoefficientmatrixisobtainedfromsomegivenrelation

solveproblemsonapplicationof simultaneouslinearequations

# Calculus

**Unit6:Differentiability**

**Differentiability,DerivativeintroducedasrateofchangeofdistancefunctionanditsGeometricmeaning,Definitionofderivativerelateittoslopsoftangentofthecurve,derivativeofsum,difference,productandquotientoffunction,Derivativeofpolynomialsandtrigonometricfunction.Derivativeofcompositefunctions,chainrule,derivatesofinversetrigonometric functions derivateofimplicitfunctions.**

Derivativesoflogarithmicandexponentialfunctions.

**Logarithmic differentiation derivative of functionsexpressedinparametricformssecondsorderderivatives.**

**Contents LearningOutcomesStudentswillbeableto:**

* 1. **Differentia-**

**bility**

understandthemeaningofdifferentiabilityofafunction

determinethedifferentiabilityofafunctionatagivenpointdeterminerelationbetweencontinuityanddifferentiability.derivativeatapoint

geometricalsignificance ofderivativeasslopeoftangent.

physicalsignificanceofderivativeasarateofchangeofywithrespecttox.

derivativeofafunctionbyfirstprinciple.derivativeofalgebraicfunctionsderivativeofscalarmultipleofafunction

derivativeofsumanddifferenceoffunctionsderivativeofapolynomial.

* 1. **ProductRule** derivativeof productoffunction
  2. QuotientRule
  3. **Derivatives**

**ofimplicitfunctions**

* 1. **Derivativeoflogarithmicandexponentialfunctions**
  2. **DerivativeofInfiniteSeries**
  3. **Logarithmic differen-tiation**
  4. **Differen-**

**tiationofonefunctionwithrespect**

derivativeofquotientoffunctiondifferentiablegivenanimplicitfunction

determinethederivativesoflogarithmicandexponentialfunction

findthederivativeofthegivenInfiniteseries

differentiatethefunctionsoftheusing logarithmicdifferentiation

differentiateonefunctionwithrespecttoanotherfunction

toanother.

* 1. **Derivatives**

**offunctionsexpressedinparametricform**

* 1. **Secondorderderivative**

**Unit7:Applications ofDerivatives**

differentiatefunctionsgiveninparametricform

determinesecondorderderivativeofagivenfunction

Applications of derivativesrate ofchangeincreasing/decreasing

**tangentsandnormalapproximation,maximaandminima(firsderivativetestLocal Maxima/LocalMinimaandsecondderivativetesAbsoluteMaxima/AbsoluteMinima).Simple problems (thaillustratebasicprinciplesandunderstandingtothesubjectaswellareal-lifesituations).**

**Contents LearningOutcomesStudentswillbeableto:**

* 1. **Rateof**

**change**

* 1. **Increasing/**

**decreasingfunctions**

solveproblemsonrateofchangeof*y* withrespectto*x*where*y*=*f*(*x*)isafunctionof*x*

determineifafunctionisstrictlyincreasinginagivenintervaldetermineifafunctionisstrictlydecreasinginagivenintervaldetermineifafunctionisincreasing/decreasing

identifythe necessaryandsufficientconditionformontonicityofafunction

findaninterval inwhichafunctionisincreasingordecreasing

provethemonotonicityofafunctiononagiven interval

* 1. Rolle's

**theorem,Lagrange'smeanvaluetheorem(withoutproof)andtheirgeometricalinterpretationandsimple**

understandthestatementofRolle'stheorem

understandthegeometricalinterpretationofRolle'stheorem

check the applicabilityofRolle'stheoremforagivenfunctioninagiveninterval

verifyRolle'stheorem foragivenfunctioninagivenintervalapplyRolle'stheoremtosolveaproblem

understandthestatementofLagrange'smeanvaluetheoremunderstandthegeometricalinterpretationofLagrange'smeanvalue

**application** theorem

verifyLagrange'smeanvalue theoremforagivenfunctionapplyLagrange'smeanvaluetheoremtosolveproblems

* 1. Tangents

**andnormals**

determinetheslopeoftangentsandnormalstoagivencurveatagivenpoint

determinepointsonagivencurveatwhichtangentisparalleltoagivenline

determinepointsonagivencurveatwhichtangentisperpendiculartoagivenline

determinetheequationofthetangentto agivencurveatagivenpoint

determinethe equationofthenormalto agivencurveatagivenpoint

determine the angleof intersection oftwocurvesi.e.theanglebetweenthetangentstothetwocurves

* 1. Approxim-ations

understandthetermsabsoluteerror,relativeerror,percentageerror

solve problemsbased on applicationofdifferentiation underapproximation.

* 1. Maximaandminima(localmaxima/localminimaandabsolutemaxima/absoluteminima),firstderivativetest,secondderivativetest,simpleproblems(that



understandthedefinitionoflocalmaximaandminimaunderstandthedefinitionofabsolutemaximaandminima

understand thealgorithmfor the first derivativetest forlocalmaximaand minima

determinethepointsoflocalmaximaandlocalminimaforagivenfunction

determinethepointsofinflexionforagivenfunctionunderstandthealgorithmforsecondderivativetest

determinethemaximumand minimumvaluesofafunctioninaclosedinterval

determinethepointsof absolutemaximaandminimasolvepracticalproblemsonmaximaandminima

1

*n*

1

*x*

*x C*

1

,

*a*

*dx dx dx*

2

2

2

*x*

*px*

2

2

*dx*

*q*)*dx dx dx dx* (*px q*)

*bx c*

**illustratebasicprinciplesandunderstandingofthesubjectaswellasreallifesituations)**

**Unti8:IndefiniteIntegrals**

**Contents**

**LearningOutcomes**

**Studentswillbeableto:**

**8.1 Integrationasaninverseprocessofdifferentiation**

definetheterms:primitiveorantiderivativeandindefiniteintegralsidentifythefundamentalintegration formulas

understandintegrationasinverse processofdifferentiation

**8.2Integrationofavarietyoffunctionsbysubstitution**

*n*

evaluateintegralsby using *xdx C*and *dx* log

*n x*

understand thegeometricalinterpretationofindefiniteintegrals

**Integrationasinverseprocessofdifferentiation,integration ofa**

**varietyoffunctionsbysubstitution;**

*a*

(

*ax*

*x*2

,

,

*x*

,

2

*ax bx*

*c*

,

,

,

,

,

*a*2 *x*2 *a*2

*ax*2 *bx c*

*ax*2 *bx c*

*ax*

*x*2

*dx*, *ax*2*bxcdx*,(*px q*) *ax*2 *bx cdx*

cos*x*,*a*

**Integrationbyparts,integrationbypartialfactions**

sin,

2

*a*

,

*dx*

*b*

*f ax*

*b dx*

*dx*

*f x*

*n*

*x*

*xor*cos

*x*

*x*

cos

*n*

*xdx*,cos

*m*

*x*cos

*n*

*dx*

*a*

sin *x*

*b*cos

*x*

*a*

sin*x*

sin*x*

*b*cos

*d*cos

*x*)

(*x*)

*x*

1

(*x*)

*kx*

*dx*

sin

*ax*

*c*

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  | evaluateintegralsoftheform usingsubstitutionmethod  *f*' *x*  evaluateintegralsoftheform  evaluateintegralsoftheform *f x f*' *xdx*    sin *dx*sin  integrationusing trigonometricidentities integraloftheform sin *nxdx*  whennisodd  sin *xdx*  Whereatleastoneofmornisoddevaluate  *x*  byputtinga=rc  *dx*.  evaluate *c x* |
|  | | |
| **8.3 Integrationbyparts** | | | evaluatetheintegrationbyparts:evaluate *e f f*1( *dx*  evaluate *e kf f* (*x*)*dx*  evaluate *e bx* |



*dx*

cos

*ax*

*c*

*dx dx dxa*2 *x*2 *x*2 *a*2 *a*2 *x*2

*dx* (*px q*)*dxax*2 *bx c ax*2 *bx c*

*dx dx dx dx*

*a b*cos2*x a b*sin2*x a*sin2 *x b*cos2*x a b*sin2*x c*cos2*x*1

*dx* , *dx*

(*a*sin*x b*cos*x*)2 *a*cos2*x b*sin*x*cos*x c*sin2 *x d*

*dx* , *dx* , *dx* , *dx*

*a*sin*x b*cos*x a b*sin*x a b*cos*x a*sin*x b*cos*x c*

*dx* (*x* 1)*dx* (*x*2 1)*dx*

*x*4 *kx*2 1 *x*4 *kx*2 1 *x*4 *kx*21

*dx dx dx*

*a*2 2 2 2 2 2

*dx*

2 *bx c*

*px q dx*

*ax*2 *bx c*

*a*2 *x*2*dx*, *x*2 *a*2*dx*, *a*2 *x*2*dx*

*ax*2 *bx cdx*,(*px q*)*ax*2 *bx cdx*

*e bx*

and

**8.4 Somespecialintegrals**

evaluatetheintegralsoftheform , ,

(withproofs)

evaluatetheintegral ,

evaluatetheintegral

, , ,

evaluatetheintegral

(using

halfangleformula)

2

evaluatetheintegrals , , andreducibletothisform

evaluate , , (withproofs)and

*x x a x a*

reducibletothisfrom

evaluatetheintegralsoftheform and

*ax*

evaluatetheintegral (with

proofs)andreducible tothisform.

evaluateintegrals



*dx*

*x*

*dx*

*x*

*dx*

*x*

*dx*

*x*

0,



evaluateintegralsoftheform ,Where*P*is Qbothare

*P Q*

linearfunctionsofx

evaluateintegralsoftheform ,Where*P*isaquadratic

*P Q*

expressionand*Q*isalinearexpression

evaluateintegralsoftheform ,Where*P*isalinear

*P Q*

expressionand*Q*isaquadraticexpression

evaluateintegralsoftheform ,Where*P*isaquadratic

*P Q*

expressionand*Q*isaquadraticexpression xi.ePax2+bandq=cx2+d

**8.5 Integrationbypartialfraction**

**Unit9:Definiteintegrals**

**LearningOutcomes**

**Thestudentswillbeableto:**

**9.1 Fundam-ental theoremofcalculus(withoutproof)**

**9.2 Definite**

**integralbysubstitution**

evaluatedefiniteintegralsbysuitablesubstitution.

evaluatetheintegralofarationalfunction

1. *x*
2. *x*

,*g x*

when

g(x)isaproductofnonrepeatedlinearfactors

wheng(x)haslinearandrepeatedfactors.wheng(x)containsquadraticfactors.

understandthefundamentaltheorem ofintegralcalculus(without

proof)

* 1. Basicpropertiesofdefiniteintegralsandevaluationofdefiniteintegrals

identifythebasicpropertiesofdefiniteintegralspropertyI

*b b*

*ti*.*e*

.,Integrationisindependentofthechange

*f x dx*

*f t d*

*a a*

ofvariable.

propertyII

*b a*

*dx*

*f x dx*

*f x*

*a b*

i.e.,ifthelimitsofadefiniteareinterchangedthenitsvaluechangesbyminussignonly.

propertyIII

*b c b*

*f x dx f xdx*,*whena*

.

*c b*

*f x dx*

*a a c*

property IV

*a*,*b*,

Ifisacontinuousfunctiondefinedon then

*b b*

*b-x dx*

*f x dx*

*f a+*

*a a*

propertyV

|  |  |  |
| --- | --- | --- |
| *f*  If | *x* 0,  is acontinuousfunctiondefinedon | *a*,  then |
| *a* | *a* |  |

0 0

*f x dx*

*f a x dx*

propertyVI

*aa*, ,

f x

If is acontinuousfunctiondefinedon then

*a x isanevenfunction*

*dx*,

*f x dx*

2

0

*a*

*f x if f*

*a* 0

, *if f x isanoddfunction*

propertyVII

*f x* 0,2*a*,

If isacontinuousfunctiondefinedon

2*a f x*

*a*

*dx*, *if*

*f x dx*

2

0

*f* 2*a*

0 , *if f* 2*a*

0

*x f x*

*x f x*



* 1. Definite

**integralsasalimit ofsum.**

evaluatethedefiniteintegralsusingabovementionedproperties.understandtheconceptof limitofsum.

evaluatedefiniteintegral asalimitofsum(linear, quadratic,cubicand exponentialfunctions)

Unit10:Applicationof theintegrals

**Applicationsin findingthe areaboundedbyacurveandaline. Areaboundedbetweenlines. Areasboundedbetweentwocurves.Areasofcircles/ ellipses (in standardformonly). Areaunderthe curve***y* **,** *y* **(theregion shouldbeclearly identifiable)**



**Contents LearningOutcomes**

*x*

sin

*x*

cos



* 1. **Finding theareas ofcircles/parabolas/ellipses (instandardformonly)**
  2. **Area**

**boundedbyacurveandaline**

**Studentswillbeableto:**

determinetheareaenclosedinacircledeterminetheareaenclosed inanellipse

determinetheareaboundedbyacurveandalinea lineandtheaxes

twolinesandanaxis

determinetheareaofatriangle

determinetheareaboundedbymodules functionandgivenlines

* 1. Area

**bounded**

determinetheareaboundedbetweentwocurves

betweentwocurves

determinetheareaunderthecurve'*y* '

f

sin*x*



Unit11:DifferentialEquations

find the areaboundedbyy=sin x&y=cosxundergivenconditions

Definition orderand degree,generaland particularsolutionsofdifferential equation,Formation of differential equationwhosgeneralsolutionisgivenSolutionisdifferentialequationsbymethodofseparationofvariables,homogeneousdifferentialequationsoffirst

**orderandfirstdegreesolutionsoflineardifferentialequationofthetype:**

*py q*

*dy*

**where*p* and*q*arefunctionsof*x*and**

*dx*

*px q*

*dx*

**where*p*and*q*arefunctionsof*y***

*dy*

**Contents LearningOutcomesStudentswillbeableto:**

* 1. **Definition,**

**order anddegree**

* 1. **Generalandparticularsolutionsofadifferentialequation**
  2. **Formationofdifferentialequation**
  3. **Homog-**

**enousdifferentialequationoffirstorderandfirstdegree**

* 1. **Linear**

identifyadifferential equation

telltheorderand degreeofadifferentialequation

verifythatthegivensolutionissolutionofagivendifferentialequation

formadifferentialequationgivenitsgeneralsolution

solvedifferentialequationsinvariableseparableformdetermineparticularsolution,when initialvaluesaregiven

solvedifferentialequationsthatarereducibleto variableseparableform

identifyhomogenousdifferentialequationoffirstdegreeandfirstorder

solvethehomogenousdifferentialequationoffirstdegreeandfirstorder

solvelineardifferentialequationofthetype

equationoffirstorder

,where

*dy py qdx*

*p*and*q*arefunctionsof*x*

solvelineardifferentialequationofthetype

#### dx px q,dy

where

*p*and*q*arefunctionsof*y*

* 1. Applications

**ofdifferentialequation**

solveproblemsofapplicationongrowthanddecay

solveproblemsonvelocity,acceleration,distanceand timesolvepopulationbasedproblemsonapplicationofdifferentialequations

solveproblemsofapplicationonco-ordinategeometry

# VectorsandThreeDimensionalGeometry

Unit12:VectorsVectorsandScalars,Magnitude anddirectionofa vector.Representationofvectors,typesofvectors,positionvectorofapoint,componentsofavector,Additionofvectors(propertiesofaddition,lawsofaddition),Multiplicationofavectorbyascalar,positionvectorofapointdividingalinesegmentinagivenratio.Scalar(dot)productofvectors,projectionofavectoronaline.Vector(cross)productofvectors,scalartripleproduct.



**Contents LearningOutcomesStudentswillbeableto:**

* 1. **Vectorsand**

**Scalars**

differentiateScalarandVectorsquantities.

representa vector.

findmagnitudeofvector.

representnegativeofa vector.

* 1. Magnitudeanddirectionofavector
  2. **Position**

**vectorofapoint**

* 1. **Compon-**

**entsofavector**

defineandillustratevarioustypeofvectors,e.g.parallelvector,coinitialvectors,coterminouscollinearvectors,likeandunlikevectors,equalvectors

writethepositionvectorofapoint

identifycomponentsofavectorin twodimensionidentifycomponentsofavectorinthreedimension

identifycomponentsofavectorintermsofcoordinatesofitsendpoints

* 1. Additionofvectors
  2. **Properties**

**ofadditionofvectors**

understandsand canusetrianglelawofvectoraddition.

understandsandcanuseparallelogramlawofadditionofvectorsprovecommutativepropertyunderaddition

proveassociativepropertyunderadditionfindadditiveidentity

findadditiveinverseofagivenvector.

solveproblemsbasedonvectoraddition

* 1. Multiplica-

**tionofavectorbyascalar**

multiplythevectorbyascalar

appreciatethefollowingpropertiesofmultiplicationofvectors*a*, *b*

byascalarm,n

*n*

*a n a na*

(i)

*n a na*

(ii)

(iii)

(iv)

(v)

*m na*

*mna n ma*

*m*

*na ma na*

*m a*

*b ma nb*

provethesectionformulaforinternaldivisionandexternaldivisionofvectors

usetheappropriatesectionformulatofindthepositionvectorofapoint dividingthegivenlinesegmentingivenratio.

* 1. Position

**vectorofapointdividingalinesegmentinagivenratio**

* 1. **Direction**

**cosinesanddirectionratiosofvector**

* 1. **Scalar(dot**

**product)ofvectors**

find the positionvector of a point dividingtheline segment(internallyandexternally)

finddirectionratiosofavector

determinethedirectioncosinesofavector

findtheunitvectorinthedirectionofgivenvectordefinescalarproduct

understandthegeometricalinterpretation ofscalarproductfindthescalarproductoftwogivenvectors

applythescalarproduct



* + 1. tochecktheperpendicularityoftwovectors
    2. todeterminetheanglebetweentwovectors
    3. tofindtheprojectionof avectoronaline
    4. tofindtheworkdonebyagivenforceindirectionofdisplacement

understandandapplythefollowingpropertiesof scalarproduct

1. commutativity
2. distributivityofscalarproductovervectoraddition

0

1. *a*.*b*



*a*isperpendicularto *b*where *a*and *b* arenon

zerovectors

1. Foranyvector*a*,

*a*.*a*

*a*



2

1. *ma* .*b*



*m a*.*b a*. *mb*

Where*a*,*b*arevectorsand*m*isscalar

1. *ma*.*nb*



*mna*. *b mna* .*b a*.*mnb*

Where*a*,*b*arevectorsand*m*,*n*arescalars

1. *a*.



*b*

*a*.*b*

*a* .*b*

(viii)

2 2 2

*b*

*b*

*a*

*b*

2*a*.



*a*



2

2

2

*a*

* 1. Projection

**ofavectorona**

**numberline**

2 2

*a b*. *a b a*

*b*

*b*

*a*

*b*

2*a*.

*b*

* 1. Vector

**product**

definethevectorproductofgivenvectors

understandthegeometricalinterpretationofthevectorproduct



findthevectorproductofgivenvectors

understandandapplythepropertiesofvectorproduct

Let *a*and *b*bevectorsand *m*,*n*bescalars

(i)

*b b a*

*a*

*ma*

*b m a b a mb*

(ii)

*ma*

*nb mn a b m a nb n ma b*

(iii)

*a*

*b c a b a c*

(iv)

*b*

*c a b a c a*

*a*

*b c a b a c*



(v)

(vi) *a a*and*b*arenonzerovectorsuse thevectorproductto

*b*

0 *a*||*b*,



checkthecollinearityof twovectors

findunitvectorperpendiculartovectors*a*&*b*bothfindmomentofaforceindirectionofdisplacement

findareaofparallelogramformedbyadjacentvectors*a*&*b*

findtheareaoftrianglewith adjacentsides*a*&*b*

find the areaofquadrilateralwith diagonals*d*1&*d*2

* 1. Scalartripleproduct

definescalartripleproduct.

understandgeometrical interpretationofscalartripleproductfindthescalartripleproduct.

find thevolumeoftheparallelepipedhavingadjacentedgesusingscalartripleproduct

findthevolumeoftheparallelepipedwiththegivenvertices

usescalartripleproducttoshow thatthreevectorsarecoplanar.

Unit13:Three-dimensionalGeometry

**Directioncosinesanddirectionratiosofalinejoiningtwopoints.Cartesianandvectorequationofaline.Coplanarand skewlines.Shortestdistancebetweentwolines.Cartesianandvectorequationofaplane.Anglebetweentwolines.Anglebetweentwo planes.Anglebetweenaline andaplane.Distanceofapointfromaplane**

**Contents LearningOutcomes**

**Studentswillbeableto:**

**13.1 Briefrecall**

**ofdirectioncosinesanddirectionratiosofaline**

recallthedirectionratiosofalinepassingthroughtwopointsrecallthedirectioncosinesofalinepassingthroughtwopoints

findtheanglebetweentwovectorsintermsoftheirdirectionscosinesfindtheanglebetweentwovectorsintermsoftheirdirection ratios

0



**13.2 Cartesian**

**andvectorequationofastraightline**

findthevectorandCartesianequationofastraightlinethroughagivenpointandparalleltogivenvector

findthevectorandCartesianequationofalinepassingthroughtwogivenpoints

conversionofequationofalinefromvectorformtoCartesianformandviceversa

findequationofalinepassingthroughagivenpointandperpendiculartotwogivenlines

findthefootandlength ofperpendicularfromagivenpointonagivenline

intersectinglinesandtheirpointofintersectioncondition fortwogivenlinestointersect

**13.3 Angle**

**betweentwo lines**

**13.4 Shortest**

**distancebetweentwo lines**

defineskewlines

definelineofshortestdistance

findtheshortestdistance(S.D.)betweentwolines

understandthatifS.D.=0linesareintersectingandcanfindthepointofintersectionoftwolines.

**13.5 Distance**

**betweenparallellines**

**13.6 Equationof**

**aplaneinnormalform**

findequationof a planewhenthe normalto the plane and distanceoftheplanefromtheoriginaregiven(bothvectorand Cartesian

form)

findanglebetweentwolines

findthedistancebetweentwoparallellines

* 1. Equationofaplanepassingthroughagivenpoint



find equation of plane passing through a given point andperpendiculartoagivenvector(bothvectorandCartesianform)

findequationofplanepassingthroughtwopointsandparallelto agivenline(bothvectorandCartesianform)

findequationofaplane throughagivenpointand paralleltotwogivenlines

findequationof a plane containingtwolines(both vectorandCartesianform)

findequationofaplanepassingthroughthreepoints(bothvectorandCartesian form)

* 1. Equationof

**planeininterceptform**

* 1. **Equationof**

**planeingeneralform**

* 1. **Equationofplanethroughtheintersectionoftwoplanes**
  2. **Angle**

**betweentwoplanes**

* 1. **Distanceofapointfromaplane**
  2. **Imageofa**

**pointinplane**

* 1. **Coplanarlines**

find equationofaplanewhoseinterceptson coordinateaxesaregiven

generalequation oftheplaneanditsreductiontonormalform

findequationofaplanepassingthroughintersectionoftwogivenplanes(bothvectorandCartesianform)

findanglebetweentwoplanes

findanglebetweenalineandaplane

findthedistanceofapointfromaplanein(Cartesianform andvectorform)

findtheimageofthepointinagivenplane

conditionforthe coplanarityoftwolines and equationofthe planecontaining them.

# Probability

Unit14:Probability

**Multiplicationtheoremonprobability. Conditional probability,**

variableanditsprobabilitydistribution,meanandvarianceofrandomvariable.Repeatedindependent(Bernoulli)trialsandBinomialdistribution.

**Contents LearningOutcomesStudentswillbeableto:**

* 1. **Conditional**

**Probability**

understandthemeaningofconditionalprobability

derivetheformulaofconditionalprobabilityusingmultiplicationtheorem

*P A B P A B*

*P AB*

(*B*) 0or

*assumethatP*

*P BA*

*P B P A*

*assumethatP*(*A*)

0

understandand use the propertiesofconditionalprobability.solvetheproblemsbasedonconditionalprobability.

* 1. Multipli-

**cation**

understandthatif*A*and*B*aretwoeventsassociatedwitharandomexperiment, then

theoremon

**probability**

*P A B P A*

*P*(*A*) *PB*

0,( ) 0

.*PB A P*(*B*).*P*(*A*/*B*),*giventhat*

understandtheextensionofmultiplicationtheoremthatif

*A*1,*A*2,*A*3,.....*An*are*n*eventsassociatedwitharandomexperiment,then

2 3 1 2 1 3 1 2

*P A*1 *A A*.....*An P A P A A P A A A* ......

*AnA*1 *A* ....*An* ..

2 1 .

* 1. IndependentEvents



Identifytheindependenceordependenceofevents

usetheformula*P A B* forindependenteventsunderstandthatP(A/B)=P(A),P(B) 0 for independent

*B P A P*

&P(B/A)=P(B),P(A)0 eventsA&B

findtheprobabilityofsimultaneousoccurrenceforindependentevents

findprobabilityofoccurrenceofatleastoneeventforindependent

events



* 1. Total

**Probability**

findtheprobabilityofaneventwhencertainconditionalprobabilitiesofthateventaregiven.

* 1. usetheconditionalprobabilitytomakepredictionsinreverse

theorem

* 1. **Random**

**variableanditsprobabilitydistribution**

* 1. **Meanand**

**varianceofrandomvariable**

understandthemeaningofrandomvariable

writeprobabilitydistributionofrandomvariables

findmeanofadiscreterandomvariablefindmeanofcontinuousrandomvariablefindvarianceofdiscreterandomvariable

* 1. Repeated

**independent(Bernoulli)trialsandBinomialdistribution**

know thedefinition ofBernoullitrial.

findtheprobabilitiesforBernoullitrialsusingbinomialprobabilityformula