SATHYABAMA UNIVERSITY

(Established under section 3 of the UGC Act, 1956)
(A Christian Minority Institution)
Declared as Category "A" University by MHRD, Government of India
Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai - 600 119.
www.sathyabamauniversity.ac.in

ALL INDIA B.E. / B.Tech. / B.Arch. / B.D.S. Entrance Examination - 2016

INFORMATION BROCHURE

CONTENTS

I. INTRODUCTION

Sathyabama University aims to provide higher education of high quality teaching and research. The University has attained greater heights under the able guidance and leadership of Chancellor **Col. Dr. JEPPIAAR, M.A., B.L., Ph.D.,** and well supported by Directors **Dr. Marie Johnson, B.E., M.B.A., M.Phil. Ph.D., and Dr. Mariazeena Johnson, B.E., M.B.A., M.Phil. Ph.D.** At present, the University offers 19 Under Graduate programmes, 35 Post Graduate programmes and Ph.D., Programme in Engineering, Technology, Science, and Management. The University admits students into Under Graduate Engineering, Technology, Architecture and Dental Surgery programmes based on the All India Entrance Examination conducted by the University every year.

II. ELIGIBILITY CRITERIA FOR ADMISSION

Candidates can choose any of the following programmes (refer page no.2) based on the eligibility criteria. Candidates should have passed the qualifying examination with first class / grade either in March/April 2015 or should be appearing for the same in March / April 2016. The candidate's date of birth should be on or after 1st January, 1996.

In addition to this, candidates should have passed the 10th class or Equivalent Examination in March/April 2013 or after with a minimum aggregate of 60% marks or "6.0" CGPA.

NOTE :

CANDIDATES PASSED IN COMPARTMENTAL CLASS / GRADE (OR) PASSED WITH ARREAR/S EITHER IN 10th CLASS OR IN 12th CLASS ARE NOT ELIGIBLE FOR ADMISSION.

NON RESIDENT INDIAN (NRI) AND CANDIDATES OF FOREIGN ORIGIN ARE NOT ELIGIBLE TO APPEAR FOR THIS ENTRANCE EXAMINATION

UG PROGRAMMES AND ELIGIBILITY CRITERIA

	PROGRAMME	DURATION	ELIGIBILITY CRITERIA
❀	B.E. – Aeronautical Engg.	4 years	A pass in the 10+2 / HSC / ICSE or equivalent examination with Mathematics, Physics and Chemistry with an average of 60% marks and above (in Mathematics, Physics and Chemistry). Candidate opting for these programmes should appear for Mathematics, Physics and Chemistry in the entrance examination.
❀	B.E. – Automobile Engg.		
❀	B.E. – Civil Engg.		
❀	B.E. – Computer Science and Engg.		
❀	B.E. – Electrical and Electronics Engg.		
❀	B.E. – Electronics and Communication Engg.		
❀	B.E. – Electronics and Instrumentation Engg.		
❀	B.E. – Electronics and Telecommunication Engg.		
❀	B.E. – Mechanical and Production Engg.		
❀	B.E. – Mechanical Engg.		
❀	B.Tech. – Chemical Engg.		
❀	B.Tech. – Information Technology		
❀	B.Tech. – Bioinformatics	4 years	A pass in the 10+2 / HSC / ICSE or equivalent examination with Biology / Mathematics, Physics and Chemistry with an average of 60% marks and above(in Biology / Mathematics, Physics and Chemistry). Candidate opting for these programmes should appear for Mathematics or Biology, Physics and Chemistry in in the entrance examination.
❀	B.Tech. – Biomedical Engg.		
❀	B.Tech. – Biotechnology		
❀	B.D.S. – Bachelor of Dental Surgery	5 years	A pass in the 10+2 / HSC / ICSE or equivalent examination with Biology, Physics and Chemistry with an average of 60% marks and above(in Biology, Physics and Chemistry). Candidate opting for these programme should appear for Biology, Physics and Chemistry in the entrance examination.
❀	B.Arch – Bachelor of Architecture	5 years	A pass in the 10+2 / HSC / ICSE or equivalent examination with Mathematics, Physics and Chemistry with a minimum average of 60% marks (in Mathematics, Physics and Chemistry) and a valid NATA marks (National Aptitude Test in Architecture) with an average of 80 marks out of 200. Candidate opting for this programme should appear for Mathematics, Physics and Chemistry in the entrance examination.

III ENTRANCE EXAMINATION AND ADMISSION PROCEDURE

1. PRIMARY INFORMATION TO ALL CANDIDATES APPLYING FOR ENTRANCE EXAMINATION - 2016

- Candidates are required to assure themselves that they possess the requisite eligibility criteria for admission to a programme before applying for entrance examination. .
- Based on 12th class syllabus (refer page no.10 for detailed syllabus), entrance examination will be conducted in Mathematics, Biology, Physics and Chemistry. All candidates must appear for Physics & Chemistry. A candidate can appear for either Mathematics or Biology as optional subject depending on the opted programme of study (refer eligibility criteria in page no.2).
- Permitting a candidate to appear for the Entrance Examination-2016 or counselling does not entitle the right for admission.
- Candidates who have been offered Provisional Admission after counselling should submit the relevant original documents, such as HSC Mark sheet, Transfer Certificate, etc. to the University at the time of admission. If not, the admission will stand cancelled.
- After the admission, at a later point of time if any discrepancy or malpractice is noticed in the submitted documents, the candidate's admission will be cancelled by the University.

2. ADMISSION PROCEDURE:

The admission to **B.E., / B.Tech., / B.Arch., / B.D.S.,** programmes is done solely on the basis of the performance in the All India **B.E/B.Tech/B.Arch/B.D.S. Entrance Examination 2016** conducted by Sathyabama University.

The candidates will be shortlisted and called for Counselling, based on their performance in the entrance examination-2016. On the day of counselling the branch of study will be allotted depending on the availability of seat and provisional admission order will be issued on the same day.

ALLOTMENT OF BRANCH ONCE MADE DURING THE COUNSELLING IS FINAL AND CANNOT BE CHANGED UNDER ANY CIRCUMSTANCES.

3. APPLICATION PROCEDURE FOR B.E / B.Tech. / B.Arch. / BDS ENTRANCE EXAMINATION-2016

To apply for Entrance Examination-2016, the eligible candidate may choose any one of the following options:

a. APPLICATION FORM (PHYSICAL MODE):

Eligible candidates can get the application form on payment of Rs.1000/- at Sathyabama University campus and major Indian Bank Branches throughout India. (The list of various Indian Bank Branches is available in the University Website.)

Application forms may also be obtained through post by sending a request letter (candidate's mailing address should be mentioned clearly in capital letters with pincode number, mobile number and E-Mail ID) along with a demand draft for Rs.1100/- drawn in favour of Sathyabama University, payable at Chennai. This request letter should reach the University on or before 18th March, 2016 addressed to "The Co-ordinator, Entrance Examination-2016, Sathyabama University, Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai-600 119".

Filled in Data Sheet can be sent to "The co-ordinator, Sathyabama University, Jeppiaar Nagar, Rajiv Gandhi Salai, Chennai-600 119" on orbefore 31st March, 2016.

b. APPLICATION FORM (ONLINE MODE):

Candidates can also use online submission of application which is available at www.sathyabamauniversity.ac.in / online_entrance_home.php. Candidates opting for online submission should fill the application and verify all the details entered. After the verification of the details, online payment of Rs.1000 should be made either by using Net Banking Facility/Credit Card/Debit Card or off line payment (only by Indian Bank Challan mode) at any one of the INDIAN BANK branches.

The candidates who have submitted the applications through online mode need not send any printed forms/account statement/bank or institution challan copy etc. unless otherwise requested by university authorities.

Applications without the fee payment will not be considered.

4. RECEIPT OF ENTRANCE EXAMINATION-2016 APPLICATIONS

- Last date for receipt of filled-in Data Sheet at the university office: 31st March 2016.
- Applications received after the due date will not be processed and rejected.
- CANDIDATES ARE REQUESTED TO RETAIN A PHOTO COPY OF THE FILLED IN DATA SHEET FOR FUTURE REFERENCE.
- The university will not be responsible for any postal delay, loss in postal transit or any damage of the data Sheet.

5. ENTRANCE EXAMINATION-2016 INSTRUCTIONS:

Entrance Examination-2016 will be conducted through COMPUTER BASED MODE only. COMPUTER BASED MODE Examination will be conducted, depending on the number of candidates opting in a particular centre (city) for a minimum of 1 day and maximum of 9 days from 16th April, 2016 to 24th April, 2016 (Inclusive of both dates) in the respective centres (cities).

a. TRACK YOUR ENTRANCE EXAMINATION-2016 APPLICATION

- After submission of application form either online mode or physical mode, a candidate can track his/her application through our website www.sathyabamauniversity.ac.in / online_entrance_home.php.
- After processing the applications received by physical mode, the details of a candidate will be uploaded in the website www.sathyabamauniversity.ac.in/online_entrance_home.php
- A candidate can track his/her application form by entering the application number. After submission of application number, the candidate's data will be displayed in the window. For any corrections, the candidate has to send a request mail to entranceexam2016@sathyabamauniversity.ac.in. This request mail must be sent from an E-Mail, which was given by the candidate in the data sheet.
- E-Mail may be sent to entranceexam2016@sathyabamauniversity.ac.in for any assistance to track the application by mentioning the application number, candidate's name & aadhaar number, (if available) father's/guardian's name, mobile number and date of birth of the candidate.

b. ENTRANCE EXAMINATION DATE & TIME SLOT BOOKING :

SUBMISSION OF ENTRANCE EXAMINATION APPLICATION FORM ALONE IS NOT SUFFICIENT TO APPEAR FOR THE EXAMINATION. THE CANDIDATE SHOULD BOOK THE DATE & TIME ONLINE IN OUR UNIVERSITY WEBSITE :
www.sathyabamauniversity.ac.in / online_entrance_home.php.

The computer based examination will be conducted in different slots depending on the number of candidates applied in a particular centre (city). Though a candidate has opted a state and city to appear for entrance examination-2016, he/she need to book the date and time (slot booking) to appear for the same. Availability of examination dates and slots for each centre will be known only at the time of slot booking. Candidate can download the hall ticket only after booking the slot. Without hall ticket, a candidate will not be allowed to appear for entrance examination.

- The date, time slot booking and downloading of hall ticket will commence from 5th April 2016. All candidates are requested to visit www.sathyabamauniversity.ac.in/online_entrance_home.php for booking the slot and downloading the hall ticket.
- Examination date, time and slot booking will be on first come first serve basis.
- Availability of dates and sessions for slot booking will be based on the number of applicants in a particular city.
- Last date for slot booking will be on 11thApril, 2016.
- Minimum of one day i.e 16th April, 2016 only will be available to book the date and time in all cities. (Refer page no. 23 for state and cities). Depending upon the strength of each city the next consecutive dates and sessions will be opened for slot booking in all cities. Depending on the number of candidates, computer based examination will be conducted for maximum of nine days (16th to 24th April, 2016, all days inclusive of both dates i.e.16th and 24th).
- The Examination Centre, date and session, once booked by the candidate, shall not be changed under any circumstances. Every effort shall be made to allot a centre to a candidate in the city opted by the candidate. Moreover, the university also reserves its right to allot a centre other than that of the candidate's choice, due to administrative reasons.
- For any assistance to book the slot and download the hall ticket, E-Mail may be sent to entranceexam2016@sathyabamauniversity.ac.in. by mentioning the application number, candidate's name & aadhaar number (if available), father's/guardian's name, mobile number and date of birth of the candidate.

c. HALL TICKET

- After successfully booking the slot, the hall tickets should be downloaded from the university website and printout has to be taken on A4 white paper.
- Sathyabama University is not responsible for the incomplete data given by the candidate in the datasheet. Candidates are advised to ensure that the Entrance Examination application form (Data Sheet) submitted is complete in all aspects.
- The Hall Ticket will contain Name of the Candidate, photograph of the candidate, address of the Exam Centre allotted, optional subject and Examination Timings.

- No candidate will be permitted to appear for the computer based examination without a valid Hall Ticket.
- Candidate must not tamper with the Hall Ticket or alter its content in any manner.
- Impersonation of the candidate is a legally punishable offence.
- The Hall Ticket is an important document. It should be preserved and produced at the time of counselling and admission.

d. COMPUTER BASED EXAMINATION

- The Computer Based Examination will be administered in an authorized examination centre.
- The Candidate should be present in the Examination Centre at least 30 minutes before the commencement of Examination.
- The candidate is not allowed to possess or carry any electronic devices inside the Examination Centre such as mobile phone, blue tooth device etc.
- The Candidate is allowed to carry only pen / pencil, eraser inside the examination centre.
- Candidates should compulsorily bring the Examination Hall Ticket issued by Sathyabama University for Verification.
- Candidates are advised to bring any original Photo Identity Proof such as Aadhaar Card/ Voter Identity Card/ Driving License/Bank pass book/School or college ID card/Passport.
- A computer will be assigned for each candidate after the verification of his/her identity to appear for the entrance examination.
- For making rough calculations, a rough sheet will be provided at the examination centre. Writing or copying of questions on to the plain paper will be treated as Malpractice. The Rough sheet should be returned back to the Examination Administrator after the completion of the Examination.
- The Examination administrator is empowered to send the candidate out of the Examination Centre or take any punitive action against the candidate, if the candidate is found to do any of the following :
- Creating disturbance, impersonation of the candidate, talking to other candidates, attempting to tamper with the computer hardware or software, possession of any electronic items or Text Material and not producing Hall Ticket and Identity proof.

6. INFORMATION TO CANDIDATES BY SMS&E-MAIL AT DIFFERENT STAGES OF ENTRANCE EXAMINATION AND ADMISSION PROCESS

All Candidates will be updated with all information regarding Entrance Examination-2016, slot booking, downloading and taking printout of Hall ticket, Counselling Dates etc. to the Mobile Number (given in the Data Sheet) through SMS and E-Mail. Please ensure that the Correct Mobile number and E-Mail ID are provided in the Data Sheet.

7. RESULTS OF THE ENTRANCE EXAMINATION - 2016

- The entrance examination results will be available at www.sathyabamauniversity.ac.in / online_entrance_home.php. and will also be intimated through SMS (only to the mobile number given in the Data sheet).
- Since the examination is computer based mode and evaluated with care, there is no provision for Revaluation or Retotalling. No correspondence in this regard will be entertained.

1. COUNSELLING PROCEDURE AND ADMISSION

- The date/time for counselling will be published in our university website www.sathyabamauniversity.ac.in/online_entrance_home.php after the Publications of results. Candidates can download and take a printout of their counselling call letter from our website and appear for the counselling as per the counselling schedule. Details regarding counselling venues, dates and fees will be mentioned in the counselling call letter.
- Change of date / time of counselling is generally not permissible. If a candidate does not personally appear for counselling on the date and time specified, his / her seat shall be offered to the next candidate in the order of merit.

REQUIRED DOCUMENTS IN ORIGINAL TO BE SUBMITTED DURING COUNSELLING & ADMISSION.

- The candidates should produce the following documents in original along with one set of photocopies while reporting for counselling. Candidates will not be allowed to participate in the counselling process without these documents.
  - o Counselling call letter.
  - o Sathyabama University Entrance Examination-2016 Hall Ticket
  - o NATA score card (for B.Arch only).
  - o Secondary School (Class X) mark sheet.
  - o HSC Mark sheet (Class XII).
  - o If a candidate fails to produce any of these documents, he / she will not be considered for counselling.
  - o Colour passport size Photographs of the candidate and parents.
- The branch of study will be alloted as per the marks secured in the Entrance Examination and availability of seats on that particular date at the time of counselling. After the allotment of branch of study, provisional admission letter will be issued to the candidate. Last date for the submision of remaining fee, submission of original certificates and other admisison procedures will be mentioned in the admission offer letter.
- A candidate should make a decision before the payment of the fee, whether he / she should join the programme based on the branch allotted to him / her at the time of counselling.
- Allotment of branch once made is final and cannot be changed under any circumstances.
- The candidates called for counselling will have to pay the prescribed counselling fee of Rs. 1,00,000/- (after the selection of the programme/branch that is available at the time of counselling) by way of Demand Draft drawn in favour of "Sathyabama University", payable at Chennai.
- After the payment of the counselling fee (Rs. 1,00,000/-), if a candidate wants to withdraw the admission, only Rs.90,000/- will be paid back to the candidate as demand draft. More details regarding this refund will be informed on the day of counselling.
- A candidte's admission will be confirmed only after the payment of remaining tuition and other fee.
- On the day of counselling if the opted branch is not available, the candidate need not pay the counselling fee.

IV. FEE DETAILS

Particulars	I YEAR	II YEAR	III YEAR	IV YEAR	*V Year
Tuition Fee (Rs.)	1,85,000	1,85,000	1,85,000	1,85,000	1,85,000
Books & Examination Fee (Rs.) (Compulsory for all students)	25,000	10,000	10,000	15,000	15,000
External Placement Training Fee (Rs.) (Compulsory for all students)	10,000	10,000	10, 000	10,000	10,000
**Hostel Fee (Rs.)	60,000	60,000	60,000	60,000	60,000
Total (Rs.)	**2,80,000**	**2,65,000**	**2,65,000**	**2,70,000**	**2,70,000**

* Applicable only for B.Arch students

** Hostel facility is not compulsory. Allotment of hostel facility will be on first come first serve basis.

The entire fee must be paid only by online mode. The detailed procedure for online payment will be informed at the time of counselling. Payment of fee by installment/s is not entertained.

V. SCHOLARSHIP

a. The top 25 rank holders of Sathyabama University entrance examination-2016 will be eligible for scholarship i.e FULL WAIVER OF TUITION FEE throughout the duration of the programme (4 years).

b. University offers REMIBAI JEPPIAAR SCHOLARSHIP to students who secure the top three positions in the University Semester Examinations. A student consistently maintains top rank in eight consecutive semesters is eligible for a maximum Scholarship.

For More Details regarding Scholarships offered for Meritorious students, please visit our University Website: files.sathyabamauniversity.ac.in/news/scholarship.pdf

VI. IMPORTANT DATES TO REMEMBER

Issue of application forms	**18th November, 2015**
Last date to purchase the application through post	**18th February, 2016**
Last date for submitting the filled in application forms by any mode	**31st March, 2016**
Commencement of Slot booking / downloading of Hall Tickets	**5th April, 2016**
Last date for Slot booking / downloading of Hall Tickets	**11th April, 2016**
Date of Computer based Examination	***16th to *24th April, 2016**
Declaration of Results and Commencement of downloading of counselling call letter (tentative)	**4th May, 2016**
Counselling starts from (tentative)	**19th May, 2016**

* Refer page no.5 for more details

VII. QUESTION PAPER PATTERN AND MAXIMUM MARKS

The Question paper is divided into three parts.

PART – A Comprises of 60 questions from Physics and Chemistry (30 questions each) of multiple choice type.

PART– B Comprises of 60 questions from Mathematics of multiple choice type.

PART – C Comprises of 60 questions from Biology of multiple choice type.

PART – A – Compulsory for all the students.

- Candidates can choose either PART – B (Mathematics) or PART – C (Biology).
- Students who answer PART – B are eligible for all B.E./B.Tech. programmes except BDS programme.
- Students who answer PART – C are eligible for B. Tech – Biotechnology; B.Tech – Biomedical; B.Tech – Bioinformatics and BDS programmes only.
- Sample questions are available at www.sathyabamauniversity.ac.in/online_entrance_home.php

EACH QUESTION CARRIES ONE MARK AND
NO NEGATIVE MARKS FOR WRONG ANSWERS

IMPORTANT INFORMATION

- ⇨ We do not have any agent or middle men or broker for our university admissions.
- ⇨ We have only one campus at Chennai.
- ⇨ Official website of Sathyabama University is www.sathyabamauniversity.ac.in
- ⇨ Entrance examination application fee (Rs.1000/-) will not be refunded under any circumstances.
- ⇨ Candidates are requested to enter and shade the contact mobile number properly in data sheet.
- ⇨ Candidates are requested to write their contact E-Mail ID in capital letters neatly and legibly in data sheet.
- ⇨ Hall ticket/Results/Counselling call letter should be only downloaded from our website and will not be sent by post under any circumstances.
- ⇨ Candidates are advised to check the SMS, E-Mail frequently.
- ⇨ Candidates are advised to visit www.sathyabamauniversity.ac.in/online_entrance_home.php for regular updates regarding Entrance Examination-2016.
- ⇨ A candidate must appear for both physics and chemistry in the entrance examination.
- ⇨ A candidate can select either Mathematics or Biology as optional subject in the entrance examination.
- ⇨ For any assistance candidates can send an E-Mail to entranceexam2016@sathyabamauniversity.ac.in by mentioning their application number (if applied), name of the candidate, father's/guardian's name, mobile number, date of birth and aadhaar number (if available).
- ⇨ Contact 044-24502436 (between 8.15 A.M and 3.45 P.M except public holidays) for any enquiry regarding entrance examination.

VIII. SYLLABUS

PHYSICS

UNIT 1: PHYSICS AND MEASUREMENT

Physics, technology and society, S I units, Fundamental and derived units. Least count, accuracy and precision of measuring instruments, Errors in measurement, Significant figures. Dimensions of Physical quantities, dimensional analysis and its applications.

UNIT 2: KINEMATICS

Frame of reference. Motion in a straight line: Position time graph, speed and velocity. Uniform and non uniform motion, average speed and instantaneous velocity Uniformly accelerated motion, velocity-time, position-time graphs, relations for uniformly accelerated motion. Scalars and Vectors, Vector addition and Subtraction, Zero Vector, Scalar and Vector products, Unit Vector, Resolution of a Vector. Relative Velocity, Motion in a plane, Projectile Motion, Uniform Circular Motion.

UNIT 3: LAWS OF MOTION

Force and Inertia, Newton's First Law of motion; Momentum, Newton's Second Law of motion; Impulse; Newton's Third Law of motion. Law of conservation of linear omentum and its applications, Equilibrium of concurrent forces. Static and Kinetic friction, laws of friction, rolling friction. Dynamics of uniform circular motion: Centripetal force and its applications.

UNIT 4: WORK, ENERGY AND POWER

Work done by a constant force and a variable force; kinetic and potential energies, workenergy theorem, power. Potential energy of a spring, conservation of mechanical energy, conservative and nonconservative forces; Elastic and inelastic collisions in one and two dimensions.

UNIT 5: ROTATIONAL MOTION

Centre of mass of a two-particle system, Centre of mass of a rigid body; Basic concepts of rotational motion; Moment of a force, torque, angular momentum, conservation of angular momentum and its applications; moment of inertia, radius of gyration. Values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications. Rigid body rotation, equations of rotational motion.

UNIT 6: GRAVITATION

The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's laws of planetary motion. Gravitational potential energy; gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites.

UNIT 7: PROPERTIES OF SOLIDS AND LIQUIDS

Elastic , Stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus, modulus of rigidity. Pressure due to a fluid column; Pascal's law and its applications. Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, Reynolds number. Bernoulli's principle and its applications. Surface energy and surface tension, angle of contact, application of surface tension – drops, bubbles and capillary rise. Heat, temperature, thermal expansion; specific heat capacity, calorimetry; change of state, latent heat. Heat transfer-conduction, convection and radiation, Newton's law of cooling.

UNIT 8: THERMODYNAMICS

Thermal equilibrium, zeroth law of thermodynamics, concept of temperature. Heat, work and internal energy. First law of thermodynamics. Second law of thermodynamics: reversible and irreversible processes. Carnot engine and its efficiency.

UNIT 9: KINETIC THEORY OF GASES

Equation of state of a perfect gas, work done on compressing a gas.Kinetic theory of gases – assumptions, concept of pressure. Kinetic energy and temperature: rms speed of gas molecules; Degrees of freedom, Law of equi-partition of energy, applications to specific heat capacities of gases; Mean free path, Avogadro's number.

UNIT 10 : OSCILLATIONS AND WAVES

Periodic motion – period, frequency, displacement as a function of time. Periodic functions. Simple Harmonic Motion (S.H.M.) and its equation; phase; oscillations of a spring –restoring force and force constant; energy in

S.H.M. – kinetic and potential energies; Simple pendulum – derivation of expression for its time period; Free, forced and damped oscillations, resonance. Wave motion. Longitudinal and transverse waves, speed of a wave. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, Standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect in sound

UNIT 11 : ELECTROSTATICS

Electric charges: Conservation of charge, Coulomb's law-forces between two point charges, forces between multiple charges; superposition principle and continuous charge distribution. Electric field: Electric field due to a point charge, Electric field lines, Electric dipole, Electric field due to a dipole, Torque on a dipole in a uniform electric field. Electric flux, Gauss's law and its applications to find field due to infinitely long uniformly charged straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell. Electric potential and its calculation for a point charge, electric dipole and system of charges; Equipotential surfaces, Electrical potential energy of a system of two point charges in an electrostatic field. Conductors and insulators, Dielectrics and electric polarization, capacitor, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, Energy stored in a capacitor.

UNIT 12 : CURRRENT ELECTRICITY

Electric current, Drift velocity, Ohm's law, Electrical resistance, Resistances of different materials, V-I characteristics of Ohmic and nonohmic conductors, Electrical energy and power, Electrical resistivity, Colour code for resistors; Series and parallel combinations of resistors; Temperature dependence of resistance. Electric Cell and its Internal resistance, potential difference and emf of a cell, combination of cells in series and in parallel. Kirchhoff's laws and their applications. Wheatstone bridge, Metre bridge. Potentiometer – principle and its applications.

UNIT 13: MAGNETIC EFFECTS OF CURRENT AND MAGNETISM

Biot – Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long current carrying straight wire and solenoid. Force on a moving charge in uniform magnetic and electric fields. Cyclotron. Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel urrentcarrying conductors-definition of ampere. Torque experienced by a current loop in uniform magnetic field; Moving coil galvanometer, its current sensitivity and conversion to ammeter and voltmeter. Current loop as a magnetic dipole and its magnetic dipole moment. Bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements. Para-, dia- and ferro- magnetic substances. Magnetic susceptibility and permeability, Hysteresis, Electromagnets and permanent magnets.

UNIT 14 : ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENTS

Electromagnetic induction; Faraday's law, induced emf and current; Lenz's Law, Eddy currents. Self and mutual inductance. Alternating currents, peak and rms value of alternating current/ voltage; reactance and impedance; LCR series circuit, resonance; Quality factor, power in AC circuits, current. AC generator and transformer.

UNIT 15 : ELECTROMAGNETIC WAVES

Electromagnetic waves and their characteristics. Transverse nature of electromagnetic waves. Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, Xrays, gamma rays). Applications of e.m. waves.

UNIT 16 : OPTICS

Reflection and refraction of light at plane and spherical surfaces, mirror formula, Total internal reflection and its applications, Deviation and Dispersion of light by a prism, Lens Formula, Magnification, Power of a Lens, Combination of thin lenses in contact, Microscope and Astronomical Telescope (reflecting and refracting) and their magnifyingpowers. Wave optics: wavefront and Huygens' principle, Laws of reflection and refraction using Huygen's principle. Interference, Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes, Polarisation, plane polarized light; Brewster's law, uses of plane polarized light and Polaroids.

UNIT 17 : DUAL NATURE OF MATTER ANDRADIATION

Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation; particle nature of light. Matter waves-wave nature of particle, de Broglie relation. Davisson-Germer experiment.

UNIT 18 : ATOMS AND NUCLEI

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivityalpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

UNIT 19 : ELECTRONIC DEVICES

Semiconductors; semiconductor diode: I-V characteristics in forward and reverse bias; diode as a rectifier; I-V characteristics of LED, photodiode, solar cell and Zener diode; Zener diode as a voltage regulator. Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch.

UNIT 20 : COMMUNICATION SYSTEMS

Propagation of electromagnetic waves in the atmosphere; Sky and space wave propagation, Need for modulation, Amplitude and Frequency Modulation, Bandwidth of signals, Bandwidth of Transmission medium, Basic Elements of a Communication System (Block Diagram only).

CHEMISTRY

PHYSICAL CHEMISTRY

UNIT 1: SOME BASIC CONCEPTS IN CHEMISTRY

Matter and its nature, Dalton's atomic theory; Concept of atom, molecule, element and compound; Physical quantities and their measurements in Chemistry, precision and accuracy, significant figures, S.I. Units, dimensional analysis; Laws of chemical combination; Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae; Chemical equations and stoichiometry.

UNIT 2: STATES OF MATTER

Classification of matter into solid, liquid and gaseous states.

Gaseous State:

Measurable properties of gases; Gas laws – Boyle's law, Charle's law, Graham's law of diffusion, Avogadro's law, Dalton's law of partial pressure; Concept of Absolute scale of temperature; Ideal gas equation; Kinetic theory of gases (only postulates); Concept of average, root mean square and most probable velocities; Real gases, deviation from Ideal , compressibility factor, van der Waals equation, liquefaction of gases, critical constants.

Liquid State:

Properties of liquids – vapour pressure, viscosity and surface tension and effect of temperature on them (qualitative treatment only).

Solid State:

Classification of solids: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea); Bragg's Law and its applications; Unit cell and lattices, packing in solids (fcc, bcc and hcp lattices), voids, calculations involving unit cell parameters, imperfection in solids; Electrical, magnetic and dielectric properties.

UNIT 3 :ATOMIC STRUCTURE

Discovery of sub-atomic particles (electron, proton and neutron); Thomson and Rutherford atomic models and their limitations; Nature of electromagnetic radiation, photoelectric effect; Spectrum of hydrogen atom, Bohr model of hydrogen atom – its postulates, derivation of the relations for energy of the electron and radii of the different orbits, limitations of Bohr's model; Dual nature of matter, de-Broglie's relationship, Heisenberg uncertainty principle. Elementary ideas of quantum mechanics, quantum mechanical model of atom, its

important features, and concept of atomic orbitals as one electron wave functions; Variation of and with r for 1s and 2s orbitals; various quantum numbers (principal, angular momentum and magnetic quantum numbers) and their significance; shapes of s, p and d – orbitals, electron spin and spin quantum number; Rules for filling electrons in orbitals aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of elements, extra stability of half-filled and completely filled orbitals.

UNIT 4: CHEMICAL BONDING AND MOLECULAR STRUCURE

Kossel – Lewis approach to chemical bond formation, concept of ionic and covalent onds.

Ionic Bonding:Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy.

Covalent Bonding: Concept of electronegativity, Fajan's rule, dipole moment; Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules (Linear, Angular, Triangular, Square Planer and Pyramidal).

Quantum mechanical approach to covalent bonding:

Valence bond theory – Its important features, concept of hybridization involving s, p and d orbitals; Resonance.

Molecular Orbital Theory – Its important features, LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, concept of bond order, bond length and bond energy. Elementary idea of metallic bonding. Hydrogen bonding and its applications.

UNIT 5 : CHEMICAL THERMODYNAMICS

Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, types of processes.

First law of thermodynamics - Concept of work, heat internal energy and enthalpy, heat capacity, molar heat capacity; Hess's law of constant heat summation; Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ionization and solution.

Second law of thermodynamics - Spontaneity of processes; $\triangle S$ of the universe and G of the system as criteria for spontaneity, $\triangle G^{o}$ (Standard Gibbs energy change) and quilibrium constant.

UNIT 6 : SOLUTIONS

Different methods for expressing concentration of solution – molality, molarity, mole fraction, percentage (by volume and mass both), vapour pressure of solutions and Raoult's Law Ideal and non-ideal solutions, vapour pressure – composition, plots for ideal and non-ideal solutions; Colligative properties of dilute solutions – relative lowering of vapour pressure, depression of freezing point, elevation of boiling point and osmotic pressure; Determination of molecular mass using colligative properties; Abnormal value of molar mass, van't Hoff factor and its significance.

UNIT 7: EQUILIBRIUM

Meaning of equilibrium, concept of dynamic equilibrium.

Equilibria involving physical processes:Solid –liquid, liquid – gas and solid gas equilibria, Henry's law, general characterics of equilibrium involving physical processes.

Equilibria involving chemical processes: Law of chemical equilibrium, equilibrium constants (Kp and Kc) and their significance, significance of $\triangle G$ and $\triangle G^{o}$ in chemical equilibria, factors affecting equilibrium concentration, pressure, temperature, effect of catalyst; Le Chatelier's principle.

Ionic equilibrium: Weak and strong electrolytes, ionization of electrolytes, various concepts of acids and bases (Arrhenius, Bronstead – Lowry and Lewis) and their ionization, acid – base equilibria (including multistage ionization) and ionization constants, ionization of water, pH scale, common ion effect, hydrolysis of salts and Ph of their solutions, solubility of sparingly soluble salts and solubility products, buffer solutions.

UNIT 8 : REDOX REACTIONS AND ELECTROCHEMISTRY

Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number, balancing of redox reactions. Eectrolytic and metallic conduction, conductance in electrolytic solutions, specific and molar conductivities and their variation with concentration: Kohlrausch's

law and its applications. Electrochemical cells – Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including standard electrode potential, half – cell and cell reactions, emf of a Galvanic cell and its measurement; Nernst equation and its applications; Relationship between cell potential and Gibbs' energy change; Corrosion and its prevention.

UNIT 9 : CHEMICAL KINETICS

Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst; elementary and complex reactions, order and molecularity of reactions, rate law, rate constant and its units, differential and integral forms of zero and first order reactions, their characteristics and half – lives, effect of temperature on rate of reactions Arrhenius theory, activation energy and its calculation, collision theory of bimolecular gaseous reactions (no derivation).

UNIT-10 : SURFACE CHEMISTRY

Adsorption: Physisorption and Chemisorption and their characteristics, factors affecting adsorption of gases on solids –, adsorption from solutions.

Catalysis: Homogeneous and heterogeneous, activity and selectivity of solid catalysts, enzyme catalysis.

Colloidal state : distinction among true solutions, colloids and suspensions, classification of colloids – lyophilic, lyophobic; multi molecular, macromolecular and associated colloids (micelles), preparation and properties of colloids – Tyndall effect, Brownian movement, electrophoresis, dialysis, coagulation and flocculation; Emulsions and their characteristics.

INORGANIC CHEMISTRY

UNIT 11 : CLASSIFICATON OF ELEMENTS AND PERIODICITY IN PROPERTIES

Modem periodic law and present form of the periodic table, s, p, d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

UNIT 12 : GENERAL PRINCIPLES AND PROCESSES OF ISOLATION OF METALS

Modes of occurrence of elements in nature, minerals, ores; Steps involved in the extraction of metals – concentration, reduction (chemical and electrolytic methods) and refining with special reference to the extraction of Al, Cu, Zn and Fe; Thermodynamic and electrochemical principles involved in the extraction of metals.

UNIT 13 : HYDROGEN

Position of hydrogen in periodic table, isotopes, preparation, properties and uses of hydrogen; Physical and chemical properties of water and heavy water; Structure, preparation, reactions and uses of hydrogen peroxide; Classification of hydrides – ionic, covalent and interstitial; Hydrogen as a fuel.

UNIT 14 : S – BLOCK ELEMENTS (ALKALI ANDALKALINE EARTH METALS)

Group – 1 and 2 Elements General introduction, electronic configuration and general trends in physical and chemical properties of elements, anomalous properties of the first element of each group, diagonal relationships. Preparation and properties of some important compounds – sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogen carbonate; Industrial uses of lime, limestone, Plaster of Paris and cement; Biological significance of Na, K, Mg and Ca.

UNIT 15 : P – BLOCK ELEMENTS Group – 13 to Group 18 Elements

General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups; unique of the first element in each group.

Groupwise study of the p block elements Group 13

Preparation, properties and uses of boron and aluminium; Structure, properties and uses of borax, boric acid, diborane, boron trifluoride, aluminium chloride and alums.

Group 14

Tendency for catenation; Structure, properties and uses of allotropes and oxides of carbon, silicon tetrachloride, silicates, zeolites and silicones.

Group 15

Properties and uses of nitrogen and phosphorus; Allotrophic forms of phosphorus; Preparation, properties, structure and uses of ammonia, nitric acid, phosphine and phosphorus halides, (PCI_3, PCI_5); Structures of oxides and oxoacids of nitrogen and phosphorus.

Group 16

Preparation, properties, structures and uses of dioxygen and ozone; Allotropic forms of sulphur; Preparation, properties, structures and uses of sulphur dioxide, sulphuric acid (including its industrial preparation); Structures of oxoacids of sulphur.

Group 17

Preparation, properties and uses of chlorine and hydrochloric acid; Trends in the acidic nature of hydrogen halides; Structures of Interhalogen compounds and oxides and oxoacids of halogens.

Group 18

Occurrence and uses of noble gases; Structures of fluorides and oxides of xenon.

UNIT 16 : d– and f –BLOCK ELEMENTS

Transition Elements

General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first row transition elements – physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic , magnetic properties, complex formation, interstitial compounds, alloy formation; Preparation, properties and uses of $K_2 Cr_2 O_7$ and KM_nO_4.

UNIT 17 : CO-ORDINATION COMPOUNDS

Introduction to co-ordination compounds, Werner's theory; ligands, co-ordination number, denticity, chelation; IUPAC nomenclature of mononuclear coordination compounds, isomerism; Bonding-Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties; Importance of coordination compounds (in qualitative analysis, extraction of metals and in biological systems).

ORGANIC CHEMISTRY

UNIT 18 : PURIFICATION AND CHARACTERISATION OF ORGANIC COMPOUNDS

Purification – Crystallization, sublimation, distillation, differential extraction and chromatography – principles and their applications.

Qualitative analysis– Detection of nitrogen, sulphur, phosphorus and halogens.

Quantitative analysis (basic principles only) – Estimation of carbon, hydrogen, nitrogen, halogens, sulphur, phosphorus. Calculations of empirical formulae and molecular formulae; Numerical problems in organic quantitative analysis.

UNIT 19 : SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY

Tetravalency of carbon; Shapes of simple molecules – hybridization (s and p); Classification of organic compounds based on functional groups: - C = C - , - C h C – and those containing halogens, oxygen, nitrogen and sulphur; Homologous series; Isomerism – structural and stereoisomerism.

Nomenclature (Trivial and IUPAC)

Covalent bond fission – Homolytic and heterolytic: free radicals, carbocations and carbanions; stability of carbocations and free radicals, electrophiles and nucleophiles.

Electronic displacement in a covalent bond

Inductive effect, electromeric effect, resonance and hyperconjugation.

Common types of organic reactions – Substitution, addition, elimination and earrangement.

UNIT 20 : HYDROCARBONS

Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties and reactions.

Alkanes – Conformations: Sawhorse and Newman projections (of ethane); Mechanism of halogenations of alkanes.

Alkenes – Geometrical isomerism; Mechanism of electrophilic addition: addition of hydrogen, halogens, water, hydrogen halides (Markownikoff's and peroxide effect); Ozonolysis, oxidation, and polymerization.

Alkynes – Acidic character; Addition of hydrogen, halogens, water and hydrogen halides; Polymerization.

Aromatic hydrocarbons – Nomenclature, benzene – structure and aromaticity; Mechanism of electrophilic substitution: nitration, Friedel Craft's alkylation and acylation, directive influence of functional group in mono-substituted benzene.

UNIT 21 : ORGANIC COMPOUNDS CONTAINING HALOGENS

General methods of preparation, properties and reactions; Nature of C-X bond; Mechanisms of substitution reactions. Uses; Environmental effects of chloroform, iodoform, freons and DDT.

UNIT 22 : ORGANIC COMPOUNDS CONTAINING OXYGEN

General methods of preparation, properties, reactions and uses.

ALCOHOLS, PHENOLS AND ETHERS

Alcohols: Identification of primary, secondary and tertiary alcohols; mechanism of dehydration.

Phenols: Acidic nature, electrophilic substitution reactions: , nitration and sulphonation, Reimer – Tiemann reaction.

Ethers: Structure.

Aldehyde and Ketones: Nature of carbonyl group;Nucleophilic addition to >C=O group, relative reactivities of aldehydes and ketones; Important reactions such as Nucleophilic addition reactions (addition of HCN, NH_3 and its derivatives), Grignard reagent; oxidation; reduction (Wolff Kishner and Clemmensen); acidity of _ - hydrogen, aldol condensation, Cannizzaro reaction, Haloform reaction; Chemical tests to distinguish between aldehydes and Ketones.

CARBOXYLIC ACIDS

Acidic strength and factors affecting it.

UNIT 23 : ORGANIC COMPOUNDS CONTAINING NITROGEN

General methods of preparation, properties, reactions and uses.

Amines: Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character.

Diazonium Salts:Importance in synthetic organic chemistry.

UNIT 24 : POLYMERS

General introduction and classification of polymers, general methods of polymerization-addition and condensation, copolymerization; Natural and synthetic rubber and vulcanization; some important polymers with emphasis on their monomers and uses – polythene, nylon, polyester and ibberel.

UNIT 25 : BIOMOLECULES

General introduction and importance of biomolecules.

CARBOHYDRATES – Classification: aldoses and ketoses; monosaccharides (glucose and fructose), constituent monosaccharides of oligosaccharides (sucrose, lactose, maltose) and polysaccharides (starch, cellulose, glycogen).

PROTEINS – Elementary Idea of _ - amino acids, peptide bond, polypeptides; Proteins: primary structure (qualitative idea only), denaturation of proteins, enzymes.

UNIT 26 : PRINCIPLES RELATED TO PRACTICAL CHEMISTRY

- Detection of extra elements (N,S, halogens) in organic compounds; Detection of the following functional groups: hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketone), carboxyl and amino groups in organic compounds.

- Chemistry involved in the preparation of the following: Inorganic compounds: Mohr's salt, potash alum. Organic compounds: Acetanilide, pnitroacetanilide, aniline yellow, iodoform.
- Chemistry involved in the titrimetric excercises – Acids bases and the use of indicators, oxalic-acid vs KmnO4, Mohr's salt vs KmnO4.
- Chemical principles involved in the qualitative salt analysis:

Cations – Pb^{2+}, Cu^{2+}, AI^{3+}, Fe^{3+}, Zn^{2+}, Ni^{2+}, Ca^{2+}, Ba^{2+}, Mg^{2+}, NH^{4+}. Anions- CO_3^{2-}, S^{2-}, SO_4^{2-}, NO_2-, NO_3-, CI -, Br-, I-.

(Insoluble salts excluded).

MATHEMATICS

UNIT 1 : SETS, RELATIONS AND FUNCTIONS

Sets and their representation; Union, Intersection and Complement of sets and their algebraic properties; Power set; Relation, Types of relations, Equivalence relations, functions; one-one, into and onto functions, composition of functions.

UNIT 2 :COMPLEX NUMBERS AND QUADRATIC EQUATIONS

Complex numbers as ordered pairs of reals, Representation of complex numbers in the form a+ib and their representation in a plane, Argand diagram, Algebra of complex numbers, Modulus and Argument (or Amplitude) of a complex number, square root of a complex number, triangle inequality, Quadratic equations in real and complex number system and their solutions. Relation between roots and co-efficients, nature of roots, formation of quadratic equations with given roots.

UNIT 3 :MATRICES AND DETERMINANTS

Matrices, Algebra of matrices, Types of matrices, Determinants and matrices of order two and three. Properties of determinants, Evaluation of determinants, Area of triangles using determinants. Adjoint and evaluation of inverse of a square matrix using determinants and elementary transformations, Test of consistency and solution of simultaneous linear equations in two or three variables using determinants and matrices.

UNIT 4 :PERMUTATIONS AND COMBINATIONS

Fundamental principle of counting, permutation as an arrangement and combination as selection, Meaning of P(n,r) and C (n,r), simple applications.

UNIT 5 :MATHEMATICAL INDUCTION

Principle of Mathematical Induction and its simple applications.

UNIT 6 :BINOMIAL THEOREM AND ITS SIMPLE APPLICATIONS

Binomial theorem for a positive integral index, general term and middle term, properties of Binomial coefficients and simple applications.

UNIT 7 : SEQUENCES AND SERIES

Arithmetic and Geometric progressions, insertion of arithmetic, geometric means between two given numbers. Relation between A.M. and G.M. Sum upto n terms of special series: Sn, Sn2, Sn3, Sn3. Arithmetic Geometric regression.

UNIT 8 : LIMIT, CONTINUITY AND DIFFERENTIABILITY

Real – valued functions, algebra of functions, polynomials, rational, trigonometric, logarithmic and exponential functions, inverse functions. Graphs of simple functions. Limits, continuity and differentiability. Differentiation of the sum, difference, product and quotient of two functions. Differentiation of trigonometric, inverse trigonometric, logarithmic, exponential, composite and implicit functions; derivatives of order upto two. Rolle's and Lagrange's Mean Value Theorems. Applications of derivatives: Rate of change of quantities, monotonic – increasing and decreasing functions, Maxima and Minima of functions of one variable, Tangents and Normals.

UNIT 9 : INTEGRAL CALCULUS

Integral as an anti – derivative. Fundamental integrals involving algebraic, trigonometric, exponential and logarithmic functions. Integration by substitution, by parts and by partial fractions. Integration using trigonometric identities.

$$\int \frac{dx}{x^2 \pm a^2}, \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{a^2 - x^2}, \int \frac{dx}{\sqrt{a^2 - x^2}}, \int \frac{dx}{ax^2 + bx + c},$$

$$\int \frac{dx}{\sqrt{ax^2 + bx + c}}, \int \frac{(px+q)dx}{ax^2 + bx + c}, \int \frac{(px+q)dx}{\sqrt{ax^2 + bx + c}}$$

$$\int \sqrt{a^2 \pm x^2}\, dx \quad \int \sqrt{x^2 - a^2}\, dx$$

Integral as limit of a sum. Fundamental Theorem of Calculus. Properties of definite integrals. Evaluation of definite integrals, determining areas of the regions bounded by simple curves in standard form.

UNIT 10 : DIFFERENTIAL EQUATIONS

Ordinary differential equations, their order and degree. Formation of differential equations. Solution of differential equations by the method of separation of variables, solution of homogeneous and linear differential equations of the type:

$$\frac{dy}{dx} + p(x)y = q(x)$$

UNIT 11: CO-ORDINATE GEOMETRY

Cartesian system of rectangular co-ordinates in a plane, distance formula, section formula, locus and its equation, translation of axes, slope of a line, parallel and perpendicular lines, intercepts of a line on the coordinate axes.

Straight lines

Various forms of equations of a line, intersection of lines, angles between two lines, conditions for concurrence of three lines, distance of a point from a line, equations of internal and external bisectors of angles between two lines, coordinates of centroid, and circumcentre of a triangle, equation of family of lines passing through the point of intersection of two lines.

Circles, conic sections

Standard form of equation of a circle, general form of the equation of a circle, its radius and centre, equation of a circle when the end points of a diameter are given, points of intersection of a line and a circle with the centre at the origin and condition for a line to be tangent to a circle, equation of the tangent. Sections of cones, equations of conic sections (parabola, ellipse and hyperbola) in standard forms, condition for y = mx + c to be a tangent and point (s) of tangency.

UNIT 12: THREE DIMENSIONAL GEOMETRY

Coordinates of a point in space, distance between two points, section formula, direction ratios and direction cosines, angle between two intersecting lines. Skew lines, the shortest distance between them and its equation. Equations of a line and a plane in different forms, intersection of a line and a plane, coplanar lines.

UNIT 13: VECTOR ALGEBRA

Vectors and scalars, addition of vectors, components of a vector in two dimensions and three dimensional space, scalar and vector products, scalar and vector triple product.

UNIT 14: STATISTICS AND PROBABILITY

Measures of Dispersion: Calculation of mean, median, mode of grouped and ungrouped data. Calculation of standard deviation, variance and mean deviation for grouped and ungrouped data.

Probability: Probability of an event, addition and multiplication theorems of probability, Baye's theorem, probability distribution of a random variate, Bernoulli trials and Binomial distribution.

UNIT 15: TRIGONOMETRY

Trigonometrical identities and equations. Trigonometrical functions. Inverse trigonometrical functions and their properties. Heights and Distances.

UNIT 16: MATHEMATICAL REASONING:

Statements, logical operations AND, OR, IMPLIES, IMPLIED BY, IF AND ONLY IF. Understanding of Tautology, Contradiction, Converse and Contrapositive.

BIOLOGY

UNIT I: DIVERSITY OF LIVING ORGANISM

What is living? Biodiversity;Need for classification; Three domain of life; Taxonomy & Systematics; Concept of species and taxonomical hierarchy; Binomial nomenclature; Tools for study of Taxonomy-Museums, Zoos, Herbaria, Botanical gardens. Five kingdom classification; Salient features and classification of Monera; Protista and Fungi into major groups; Lichens; Viruses and Viroids. Salient features and classification of plants into major groups-Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms (three to five salient and distinguishing features and at least two examples of each category); Angiosperms – classification up to class, characteristic features and examples. Salient features and classification of animals-non chordate up to phyla level and chordate up to classes level (three to five salient features and atleast two examples).

UNIT II: STRUCTURAL ORGANISATION IN ANIMALS AND PLANTS

Morphology and modifications; Tissues; Anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence-cymose and racemose, flower, fruit and seed (To be dealt along with the relevant practical of the Practical Syllabus). Animal tissues; Morphology, anatomy and functions of different system (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (a brief account only)

UNIT III: CELL STRUCTURE AND FUNCTION

Cell theory and cell as the basic unit of life; Structure of prokaryotic and eukaryotic cell; Plant cell and animal cell; Cell envelope, cell membrane, cell wall; Cell organelles – structure and function; Endomembrane system-endoplasmic reticulum, Golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, microbodies; Cytoskeleton, cilia, flagella, centrioles (ultra structure and function); Nucleus-nuclear membrane, chromatin, nucleous. Chemical constituents of living cells: Biomolecules-structure and function of proteins, carbodydrates, lipid, nucleic acids, Enzymes-types, properties, enzymes action. Cell division : Cell cycle, mitosis, meiosis and their significance.

UNIT IV: PLANT PHYSIOLOGY

Transport in plants: Movement of water, gases and nutrients; Cell to cell transport-Diffusion, facilitated diffusion, active transport; Plant-water relations-Imbibition, water potential, osmosis, plasmolysis; Long distance transport of water-Absorption, apoplast, symplast, transpiration pull, root pressure and guttation; Transpiration-Opening and closing of stomata; Uptake and translocation of mineral nutrients-Transport of food, phloem transport, Mass flow hypothesis; Diffusion of gases (brief mention). Mineral nutrition: Essential minerals, macro and micronutrients and their role; Deficiency symptoms; Mineral toxicity; elementary idea of Hydroponics as a method to study mineral nutrition; Nitrogen metabolism-Nitrogen cycle, biological nitrogen fixation.

Photosynthesis: Photosynthesis as a means of Autotrophic nutrition; Where does photosynthesis take place, How many pigments are involved in Photosynthesis (Elementary idea); Photochemical and biosynthetic phases of photosynthesis; Cyclic and non cyclic photophosphorylation; Chemiosmotic hypothesis; Photorespiration; C3 and C4 pathways; factors affecting photosynthesis.

Respiration: Exchange of gases; Cellular respiration – glycolysis, fermentation (anaerobic), TCAcycle and electron transport system (aerobic); Energy relations-Number of ATP molecules generated; Amphibolic pathways; Respiratroy quotient.

Plant growth and development: Seed germination; Phases of plant growth and plant growth rate; Conditions of growth; Differentiation, dedifferentiation and redifferentiation; sequence of developmental process in a plant cell; Growth regulators-auxin, , cytokinin, ethylene, ABA; Seed dormancy; Vernalisation: Photoperiodism.

UNIT V: HUMAN PHYSIOLOGY

Digestion and absorption: Alimentary canal and digestive glands, Role of digestive enzymes and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; Calorific value of proteins, carbohydrates and fat (for box item not to be evaluated); Egeston; Nutritional and digestive disorders-PEM, indigestion, constipation, vomiting, jaundice, diarrhea.

Breathing and Respiration: Respiratory organs in animals (recall only); Respiratory system in humans; Mechanism of breathing and its regulation in humans-Exchange of gases, transport of gases and regulation of respiration, Respiratory volume. Disorders related to respiration-Asthma, Emphysema, Occupatonal respiratory disorders.

Body fluids and circulation: Composition of blood, blood groups, coagulation of blood; Composition of lymph and its function; Human circulatory system-Structure of human heart and blood vessels; Cardiac cycle, cardiac output, ECG; Double circulation; Regulation of cardiac activity; Disorders of circulatory system-Hypertension, Coronary artery disease, Angina pectoris, Heart failure.

Excretory products and their elimination: Modes of excretion – Ammonotelism, ureotelism, uricotelism; Human excretory system-structure and fuction; Urine formation, Osmoregulation; Regulation of kidney function-Renin-angiotensin, Atrial Natriuretic Factor, ADH and Diabetes insipidus; Role of other organs in excretion; Disorders-Uraemia, Renal failure, Renal calculi, Nephritis; Dialysis and artificial kidney.

Locomotion and Movement: Types of movement – ciliary, flagellar, muscular; Skeletal muscle-contractile proteins and muscle contraction; Skeletal system and its functions (To be dealt with the relevant practical of Practical syllabus); Joints; Disorders of muscular and skeletal system – Myasthenia gravis, Tetany, Muscular dystrophy, Arthritis, Osteoporosis, Gout.

Neural control and coordination: Neuron and nerves; Nervous system in humans-central nervous system & peripheral nervous system and visceral nervous system; Generation and conduction of nerve impulse; Reflex action; Sensory perception; Sense organs; Elementary structure and function of eye and ear.

Chemical coordination and regulation: Endocrine glands and hormones; Human endocrine system-Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary Idea); Role of hormones as messengers and regulators, Hypo-and hyperactivity and related disorders (Common disorders e.g. Dwarfism, Acromegaly, Cretinism, goiter, exphthalmic goiter, diabetes, Addision's disease).

Reproduction

Reproduction in organisms: Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction-A sexual and sexual reproduction; Modes- Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.

Sexual reproduction in flowering plant: Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreedings devices; Pollen- Pistil interaction; Double fertilization; Post fertilization events-Development of endosperm and embryo, Development of seed and formation of fruit; Special modes-apomixis, parthenocarpy, polyembryony; Significance of seed and fruit formation. Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis-spermatogenesis & oogenesis; Menstrual cycle; Fertilisation embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).

IX. INSTRUCTIONS TO FILL THE ENTRANCE EXAMINATION APPLICATION (DATA SHEET)

1. **NAME OF THE CANDIDATE:** Write name in CAPITAL LETTERS as given in Secondary (X Std.) or Higher Secondary (XII Std.) School certificate. Write only one letter in a box. Do not leave any blank box between the letters in a word. One box should be left blank between consecutive words of name. KEEP THE INITIALS OF THE NAME AT THE END. If name has several initials, leave one blank after each of them. Darken the corresponding alphabet underneath each letter of the name. Do not prefix your name with Mr, Ms., etc. Do not use box for full stop between the initials, instead you can leave an empty box.

2. **GENDER:** Write the appropriate serial number in the boxes provided and then darken the appropriate oval to correspond with the code.

3. **COMMUNITY:** Write the appropriate serial number in the boxes provided and then darken the appropriate oval to correspond with the code.

4. **NATIONALITY:** Write the appropriate serial number in the boxes provided and then darken the appropriate oval to correspond with the code.

5. **RELIGION:** Write the appropriate serial number in the boxes provided and then darken the appropriate oval to correspond with the code.

6. **DATE OF BIRTH:** Write the date, month and year of birth as per the English calendar and as recorded in High school/Higher secondary school Examination Certificate. Use numerals 01 to 31 for DATE, numerals 01 to 12 for MONTH, and all the four digits for the YEAR of birth. Darken the corresponding numerals for date, month and year in each column.

7. **NATIVE STATE:** Write the appropriate serial number (by looking into the following table) in the boxes provided and darken the appropriate oval to correspond with the code.

STATE	CODE	STATE	CODE
ANDHRA PRADESH	01	MAHARASHTRA	15
ARUNACHAL PRADESH	02	MANIPUR	16
ASSAM	03	MEGHALAYA	17
BIHAR	04	MIZORAM	18
CHATTISGARH	05	NAGALAND	19
GOA	06	ODISHA	20
GUJARAT	07	PUNJAB	21
HARYANA	08	RAJASTHAN	22
HIMACHAL PRADESH	09	SIKKIM	23
JAMMU AND KASHMIR	10	TAMILNADU	24
JHARKAND	11	TELANGANA	25
KARNATAKA	12	TRIPURA	26
KERALA	13	UTTARAKAND	27
MADHYA PRADESH	14	UTTAR PRADESH	28
		WEST BENGAL	29

UNION TERRITORY	CODE	UNION TERRITORY	CODE
ANDAMAN & NICOBAR ISLANDS	30	DAMAN & DIU	34
CHANDIGARH	31	LAKSHADWEEP	35
NEW DELHI	32	PUDUCHERRY	36
DADRA & NAGAR HAVELI	33		

8. **CONTACT MOBILE NUMBER:** Write the MOBILE NUMBER in the boxes provided and then darken the appropriate oval to correspond with the code. Candidates are requested to check this entry and shading many times. Because this number will be used for sending the SMS at various stages regarding the Entrance Examination.

9. **PHOTOGRAPH:** Affix recent (taken not earlier than a month) good quality colour passport size photograph with light colour background in the space provided for this purpose. Spectacles if being used regularly are allowed. The photograph should be firmly affixed to the application form. It should not be pinned or stapled. Photograph should not be larger than the space provided in the box for pasting it.

10. **SIGNATURE:** Candidate's signature establishes identity. Use black ball point pen to sign in the box provided.

11. **AADHAAR NUMBER:** Write the candidate's Aadhaar number, if available.

12. **DETAILS OF THE QUALIFYING EXAMINATION:** Give the details of Board, Name and complete address of school, Month and Year of passing or appearing the final year examination.

13. **NAME OF THE FATHER / GUARDIAN:** Write the name in CAPITAL LETTERS. Write only one letter in a box. Do not leave any blank box between the letters in a word. One box should be left blank between consecutive words of the name. If the name has several initials, leave one blank after each of them. Darken the corresponding alphabet underneath each letter of the name. Do not prefix the name with Mr., Ms., etc

14. **YEAR OF PASSING STANDARD 'X' OR EQUIVALENT EXAMINATION:** Mention the year of passing the Standard 'X' (or) Equivalent Examination.

15. **YEAR OF PASSING STANDARD 'XII' :** Mention the year of passing the Standard XII Examination. If the candidate is appearing for final year examination in March/April, 2016, please enter as 2016.

16. **% of marks in Std. X:** Write the % of marks in the boxes provided and then darken the appropriate oval to correspond with the number.

17. **OPTIONAL SUBJECT IN ENTRANCE EXAMINATION-2016:** While selecting the optional subject, the candidate should consider the following eligibility criteria.

    MATHS: Candidate choosing this as optional subject, needs to answer three subjects in the Entrance examination, i.e., Mathematics, Physics and Chemistry. Candidates who choose this option are eligible for all B.E. / B.Tech / B.Arch programmes and not eligible for BDS programme.

    BIOLOGY: Candidate choosing this as optional subject, needs to answer three subjects in the Entrance examination, i.e., Biology, Physics and Chemistry. Candidates who choose this option are eligible ONLY for Bio programmes (B.Tech. – Biotechnology, Bioinformatics and Biomedical) and BDS. These candidates are not eligible for B.Arch and other B.E. / B.Tech programme.

18 . **PROGRAMME APPLYING FOR:** Write the appropriate serial number in the boxes provided and then darken the appropriate oval to correspond with the code.

19. EXAMINATION CENTRE CODE: Select the appropriate Entrance Examination Centre from the following and shade it accordingly. **CHANGE OF EXAMINATION CENTRE WILL NOT BE ENTERTAINED UNDER ANY CIRCUMSTANCES.**

STATE	EXAMINATION CENTRE	EXAM CENTRE CODE
ANDAMAN	PORT BLAIR	011
ANDHRA PRADESH	ANANTHAPUR	012
ANDHRA PRADESH	CUDDAPAH	013
ANDHRA PRADESH	GUNTUR	014
ANDHRA PRADESH	KURNOOL	015
ANDHRA PRADESH	NELLORE	016
ANDHRA PRADESH	ONGOLE	017
ANDHRA PRADESH	RAJAHMUNDRY	018
ANDHRA PRADESH	TANUKU	019
ANDHRA PRADESH	TIRUPATI	020
ANDHRA PRADESH	VIJAYAWADA	021
ANDHRA PRADESH	VISAKHAPATNAM	022
ASSAM	GUWAHATI	023
BIHAR	PATNA	024
CHHATTISGARH	BILASPUR	025
GUJARAT	AHMEDABAD	026
MAHARASHTRA	MUMBAI	027
JHARKAND	RANCHI	028
KARNATAKA	BENGALURU	029
KERALA	ERNAKULAM	030
KERALA	THIRUVANANTHAPURAM	031
MADHYA PRADESH	BHOPAL	032
NEW DELHI	NEW DELHI	033
ODISHA	BHUBANESHWAR	034
PUDUCHERRY	PUDUCHERRY	035
RAJASTHAN	KOTA	036
TAMILNADU	CHENNAI	037
TAMILNADU	COIMBATORE	038
TAMILNADU	KRISHNAGIRI	039
TAMILNADU	MADURAI	040
TAMILNADU	NAGAPATTINAM	041
TAMILNADU	NAGERCOIL	042
TAMILNADU	NAMAKKAL	043
TAMILNADU	SALEM	044
TAMILNADU	TANJORE	045
TAMILNADU	TRICHY	046
TAMILNADU	THIRUNELVELI	047
TAMILNADU	VILUPPURAM	048
TELANGANA	HYDERABAD	049
TELANGANA	KARIMNAGAR	050
TELANGANA	WARANGAL	051
TRIPURA	AGARTALA	052
UTTAR PRADESH	LUCKNOW	053
WEST BENGAL	KOLKATA	054

20. CHOICE OF BRANCH / SPECIALIZATION:

(a) CHOICE OF BRANCH OPTION - 1: Write the appropriate serial number (by looking to the following table) in the boxes provided and then darken the appropriate oval to correspond with the code.

(b) CHOICE OF BRANCH OPTION - 2: Write the appropriate serial number (by looking to the following table) in the boxes provided and then darken the appropriate oval to correspond with the code.

(c) CHOICE OF BRANCH OPTION 3: Write the appropriate serial number (by looking to the following table) in the boxes provided and then darken the appropriate oval to correspond with the code.

BRANCHES	CODE
AERONAUTICAL ENGINEERING	11
AUTOMOBILE ENGINEERING	12
BIO TECHNOLOGY	13
BIO INFORMATICS	14
BIO MEDICAL	15
CHEMICAL ENGINEERING	16
CIVIL ENGINEERING	17
COMPUTER SCIENCE AND ENGINEERING	18
ELECTRICAL AND ELECTRONICS ENGINEERING	19
ELECTRONICS AND COMMUNICATION ENGINEERING	20
ELECTRONICS AND INSTRUMENTATION ENGINEERING	21
ELECTRONICS AND TELECOMMUNICATION ENGINEERING	22
INFORMATION TECHNOLOGY	23
MECHANICAL ENGINEERING	24
MECHANICAL AND PRODUCTION ENGINEERING	25
ARCHITECTURE	26
BACHELOR OF DENTAL SURGERY	27

21. BLOOD GROUP: Write the candidate's blood group in the box provided and then darken the appropriate oval to correspond with the code.

22. COMPLETE POSTAL ADDRESS, STARTING WITH PARENT'S NAME: Write the complete postal address in capital letters to which all communication will be sent. The address must include name of the parent, and all other details including the correct pincode for letters to reach the candidate. Indicate Email ID, Phone No. with the correct STD code. Candidates are requested to write the E-Mail ID in capital letters neatly and legibly. Candidates are requested to take much care to write this E-Mail ID, since all information regarding entrance examination will be sent to this E-Mail ID. Note that this block will be scanned by machine, hence the details should be written within the rectangular box provided.

23. DECLARATION: Read the declaration and sign in the box provided. Signature of Applicant and Parent is compulsory and should be done with black ball point pen only.

ENGINEERING | ARCHITECTURE | DENTAL | RESEARCH | ARTS & SCIENCE

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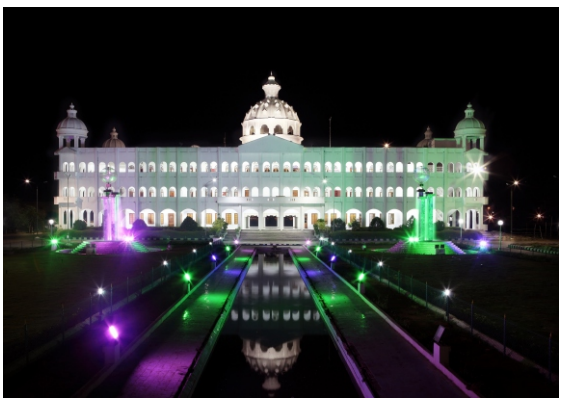

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