

GVSAT-2012

Admissions to all undergraduate programs of Suresh Gyan Vihar University (SGVU) for the academic year 2012-13 shall be made on the basis of a PC-based Online Test or a conventional paper-and-pen based offline test conducted by SGVU. This test shall be referred to as GVSAT-2012 hereafter.

GVSAT-2012 shall be conducted for the following undergraduate programs of SGVU :

Programs	Duration	Eligibility
1. B.Tech Programs Computer Science, Electronics & Communication, Information Technology, Electrical Engineering, Automobile Engineering, Civil Engineering, Mechanical Engineering and Mechatronics	4 Years	10+2 (Physics, Chemistry, Mathematics & English) with Aggregate 65%
2. Dual Degree Programs (B.Tech. E&C + M.Tech. VLSI/IC/DWCE/SE) (B.Tech. Electrical + M.Tech. Power Sys/Energy)(B.Tech. Comp. Science. +M.Tech. SE/IC/VLSI)(B.Tech. Mech + M.Tech. Manuf./Energy)	5 Years	10+2 (Physics, Chemistry, Mathematics & English) with Aggregate 60%
3. BCA (Bachelor of Computer Application)	3 Years	10+2 with 60% any stream(Arts/Science/Commerce)
4. BBA (Bachelor of Business Administration)	3 Years	10+2 with 60% any stream(Arts/Science/Commerce)
5. B.Pharm (Bachelor of Pharmacy)	4 Years	10+2 (Physics, Chemistry, Mathematics or Biology)With aggregate 50% .
6. BHMCT (Bachelor of Hotel Management & Catering Technology)	4 Years	10+2 with 50% any stream(Arts/Science/Commerce)
7. BHMTT (Bachelor of Hotel Management and Tour & Travel)	3 years	10+2 with 50% any stream(Arts/Science/Commerce)

Eligibility :

Students appearing for 12th examination in 2012 or who have passed 12th examination in earlier years with minimum qualifying percentage mentioned above are eligible to sit the GVSAT-2012.

Application Procedure :

Online Examination :

All new users are required to register themselves at <http://gvsat.gyanvihar.org> by clicking the “APPLY ONLINE” button and follow these steps :

- ❖ STEP 1 : Full name, mobile number and e-mail ID have to be provided by new user. A system-generated e-mail shall be sent instantly at the e-mail ID provided by the new user, providing him/her with his/her e-mail ID as unique username & 6 digit password and other Important Instructions.

- ❖ You must change your password as per your convenience. Kindly keep remember your email-id as user name and your new password for appearing in online test.
- ❖ STEP 2 : Click the **“REGISTER/LOGIN”** button using the e-mail id & password.
- ❖ STEP 3 : User has to select the program of his/her choice and click on **“PROCEED”** button. The user would then be asked to choose the following payment modes :

Option 1 : Option 1 is to be selected if the user is making the payment through his/her credit/debit card. In this option the user is not required to send a hard copy of the application form to the University.

Option 2: Option 2 is to be selected if the user is making the payment through bank demand draft or GVSAT challan. The user is required to send a print-out of the duly completed application form to the Dy. Registrar Admission, Suresh Gyan Vihar University, Mahal, Jagatpura, Jaipur-302017, Rajasthan by speed post/registered post along with the original demand draft/University challan copy latest by 7th May 2012.

Offline Examination:-

The candidate is required to download the offline application Form from our website <http://gvsat.gyanvihar.org> or fill the application form online and send the duly completed application form to the Admission Office, Suresh Gyan Vihar University, Mahal, Jagatpura, Jaipur-302017, Rajasthan by speed Post/registered post along with prescribed examination fee by demand draft / bank challan by 7th May 2012

Examination Fee :- Rs. 500/-

The fee could be remitted in the following ways:

- a. Through a bank demand draft, drawn in favour of SURESH GYAN VIHAR UNIVERSITY, JAIPUR, payable at Jaipur. The candidate's name, mobile number and program opted for should be mentioned legibly at the back of the Demand Draft.
- b. Through bank challan generated from <http://gvsat.gyanvihar.org> to be deposited at any branch of AXIS Bank across the country and a copy of the same to be sent to the University address with application form by speed post/registered post.
- c. Through Online payment/Net Banking:- Candidate can pay the Examination Fee online through his Credit/Debit Card of any Bank or financial organization.

Examination Pattern :-

Online Examination:-

To take up the online examination the candidate needs to login through the user id and password. The online examination can be taken at any time between 10:00 am to 8:00 pm from 6th May to 6th June 2012. The duration of the exam will be 2 hours and the candidate will be given only one chance to take the exam. The candidate has to sit in front of a computer, which should be connected through the broadband internet connection. Candidates can take the examination as per their choice either from their home or from a Cyber Café.

Result of the online exam will be declared at the same time after the completion of the exam. Though his rank of examination will be provided on 7th June 2012.

Offline Examination:-

Paper & pencil based offline test :- Candidates who wish to sit for offline test can download the admit card from our website <http://gvsat.gyanvihar.org> and can appear for offline test on prescribed date at a pre-designated center.

Examination Centers for Offline Test :-

Center Code	Examination Center	Center Code	Examination Center
101	JAIPUR	102	JODHPUR
103	KOTA	104	CHANDIGARH
105	DELHI	106	INDORE
107	BHOPAL	108	KOLKATA
109	AGRA	110	LUCKNOW
111	ALMORA	112	DEHRADUN
113	RANCHI	114	JAMSHEDPUR
115	PATNA	116	BHAGALPUR
117	AHMEDABAD	118	SURAT

Pattern for Offline Examination and Online Examination

For Engineering /Pharmacy	Number of Questions	For BBA/BCA/BHMCT/BHMTT	Number of Questions
Physics	40	General Knowledge + Quantity Aptitudes	40
Chemistry	40	Current Affairs	40
English Proficiency	15	English Proficiency	40
Logical Reasoning	10	Logical Reasoning	30
Mathematics/Biology	45		
Total Number of questions	150	Total Number of Questions	150

Duration of Exam :- 2 hours (without any break)

- All the questions and instructions of the test will be in English only.
- All questions will be of objective type (multiple choice questions); each question will have four options, only one being the correct one. Each correct answer carries 3 marks, while each incorrect answer has a penalty of 1 mark (-1mark). No marks are awarded for questions not attempted.
- Syllabus: GVSAT-2012 test will be conducted on the basis of NCERT syllabus for 11th and 12th class. The detailed syllabus is given in the last page of this booklet. Candidates may refer to the NCERT textbooks for the contents. A sample test demonstrating the features of GVSAT will be made available to the registered candidates at the GVSAT website on which he/she can practice as many times as desired.
- For offline examination candidates should bring a Blue/Black ball pen for the purpose of rough work, signing etc. Blank sheets for rough work will be provided, if required. Calculators and Logarithmic Tables are not allowed at the test centers. Candidates are not allowed to bring any other personal belongings such as mobiles, books, notepad etc in the examination hall.

Important Dates :

Important Dates	Dates
Online registration start	05 th March 2012
Offline registration start	05 th March 2012
Last date of registration off Line	07th May 2012
Last date of registration on-Line	05 th June
Admit card for offline examination	10 th May 2012
Date of examination (offline)	13 th May 2012
Date of examination (online)	06 May to 06 th June 2012
Declaration of result of online examination	After completion of the examination
Declaration of result offline examination	30 th May 2012

Important Notes:

- Candidates must follow instructions strictly as given on the GVSAT website. Candidates not complying with the instructions shall be disqualified.
- Candidates must keep a photocopy of the Application form for further reference with the University.
- Please ensure before mailing the application form:-
 - The application form is duly signed by the candidate.
 - A recent passport size scanned photograph taken on or after 1st December, 2011 in jpeg format, should be uploaded with the online application form.
 - For offline examination candidate has to affix the recent passport size photograph on downloaded application form.
 - The application form and dd or challan Copy has to be dispatched by registered/speed post only.
- Candidates must ensure that the application form along with original demand draft or University Challan copy should reach to the GVSAT address on or before the last date i.e 07th May 2012 for offline examination and 25th May for online examination. Even after the successful submission of online form or application Form within due date, if the application form does not reach the University on or before the last date or reaches without the requisite fee, the of the candidate will be discarded.
- Information regarding receipt of applications will be available on the GVSAT website.
- Admit card only for offline examination will be available at GVSAT website <http://gvsat.gyanvihar.org> , Candidates after filling the desired information can take the print out of admit card. If admit card is not available there, candidate should contact GVSAT officer. For online examination admit card is not required.
- Candidates must preserve the admit card till the admission process is over. Request for issue of duplicate admit card will not be entertained.
- Candidates who register for GVSAT-2012 for offline examination will be instructed to download an 'ADMIT CARD'. Candidates carrying a valid admit card, will be allowed inside the Test centers. Anyone violating the rules of the test center will not be allowed to continue with the test and will automatically be disqualified.
- The University shall conduct the Offline test in different cities. The final list of centers and actual days of operation will be announced through the GVSAT website <http://gvsat.gyanvihar.org>. The University cannot guarantee that test centers will be set up in all these cities. Further, the Institute reserves the right to cancel any Test center if a situation arises.
- While GVSAT-2012 offline tests are scheduled to be held on 13th May 2012 .The final list of the centers will be announced at GVSAT website after all the applications are received.

- The preferences of examination centers, opted by the candidate are only indicative to guide the GVSAT for deciding the number of centers. The University cannot guarantee that you will get first preference. Further, if the University is unable to allot any center of your choice, you will be allotted a center at Jaipur campus of Gyan Vihar. The exact center where you will be appearing for the test will be announced at GVSAT website.
- The candidate must obey the rules of the test centers; otherwise he/she will be automatically debarred from the test.
- All information and communications regarding GVSAT-2012 and admission to Gyan Vihar are made available to the registered candidates on the Gyan Vihar website www.gyanvihar.org. Candidates are advised to visit the website regularly for all related information on GVSAT and Gyan Vihar admissions.
- In all matters in the conduct of GVSAT-2012, the decision of the president of SGVU will be final.
- All disputes pertaining to GVSAT-2012 shall fall within the jurisdiction of Jaipur city only.

Address for sending complete application Form
Dy Registrar Admissions
Suresh Gyan Vihar University
Mahal, Jagatpura, Jaipur-302017, Rajasthan.
Ph:- 0141-6450389-90, ext :- 212 & 213

GVSAT-2012 Syllabus

PHYSICS

1. Units & Measurement

(1.1) Units (Different systems of units, SI units, fundamental and derived units) , (1.2) Dimensional Analysis (1.3) Precision and significant figures (1.4) Fundamental measurements in Physics (Vernier calipers, screw gauge, Physical balance etc)

2. Kinematics

(2.1) Properties of vectors (2.2) Position, velocity and acceleration vectors (2.3) Motion with constant acceleration (2.4) Projectile motion (2.5) Uniform circular motion (2.6) Relative motion

3. Newton's Laws of Motion

3.1 Newton's laws (free body diagram, resolution of forces) (3.2) Motion on an inclined plane 3.3 Motion of blocks with pulley systems (3.4) Circular motion – centripetal force Inertial and non-inertial frames.

4. Impulse and Momentum

4.1 Definition of impulse and momentum (4.2) Conservation of momentum (4.3) Collisions (4.4) Momentum of a system of particles (4.5) Center of mass

5. Work and Energy

5.1 Work done by a force (5.2) Kinetic energy and work-energy theorem (5.3) Power (5.4) Conservative forces and potential energy (5.5) Conservation of mechanical energy

6. Rotational Motion

(6.1) Description of rotation (angular displacement, angular velocity and angular acceleration) (6.2) Rotational motion with constant angular acceleration (6.3) Moment of inertia, Parallel and perpendicular axes theorems, rotational kinetic energy (6.4) Torque and angular momentum (6.5) Conservation of angular momentum (6.6) Rolling motion

7. Gravitation

(7.1) Newton's law of gravitation (7.2) Gravitational potential energy, Escape velocity (7.3) Motion of planets – Kepler's laws, satellite motion

8. Mechanics of Solids and Fluids

(8.1) Elasticity, Hooke's Law, Strain, Stress (8.2) Pressure, density and Archimedes' principle (8.3) Viscosity and Surface Tension (8.4) Bernoulli's theorem

9. Oscillations

(9.1) Kinematics of simple harmonic motion , displacement equation of SHM (9.2) Spring mass system, simple and compound pendulum (9.3) Forced & damped oscillations, resonance

10. Waves

10.1 Progressive sinusoidal waves (10.2) Standing waves in strings and pipes (10.3) Superposition of waves, beats (10.4) Doppler Effect

11. Heat and Thermodynamics

(11.1) Kinetic theory of gases (11.2) Thermal equilibrium and temperature (11.3) Specific heat, Heat Transfer - Conduction, convection and radiation, thermal conductivity, Newton's law of cooling (11.4) Work, heat, Zeroth law and first law of thermodynamics (11.5) Second law of thermodynamics, Carnot engine – Efficiency and Coefficient of performance, Carnot theorem.

12. Electrostatics

(12.1) Coulomb's law (12.2) Electric field (discrete and continuous charge distributions)
(12.3) Electrostatic potential and Electrostatic potential energy (12.4) Gauss' law and its applications (12.5) Electric dipole (12.6) Capacitance and dielectrics (parallel plate capacitor, capacitors in series and parallel)

13. Current Electricity

(13.1) Ohm's law, Joule heating (13.2) D.C circuits – Resistors and cells in series and parallel, Kirchoff's laws, potentiometer and Wheatstone bridge, (13.3) Electrical Resistance (Resistivity, origin and temperature dependence of resistivity).

14. Magnetic Effect of Current

(14.1) Biot-Savart's law and its applications (14.2) Ampere's law and its applications
(14.3) Lorentz force, force on current carrying conductors in a magnetic field (14.4) Magnetic moment of a current loop, torque on a current loop.

15. Electromagnetic Induction

15.1 Faraday's law, Lenz's law, eddy currents (15.2) Self and mutual inductance (15.3) Transformers and generators (15.4) Alternating current (peak and rms value) (15.5) AC circuits, LCR circuits

16. Optics

16.1 Laws of reflection and refraction (16.2) Lenses and mirrors (16.3) Optical instruments – telescope and microscope (16.4) Interference – Huygen's principle, Young's double slit experiment (16.5) Interference in thin films (16.7) Electromagnetic waves and their characteristics (only qualitative ideas), Electromagnetic spectrum (16.8) Polarization – states of polarization, Malus' law, Brewster's law

17. Modern Physics

17.1 Dual nature of light and matter – Photoelectric effect, De Broglie wavelength (17.2) Atomic models – Rutherford's experiment, Bohr's atomic model (17.3) Hydrogen atom spectrum (17.4) Radioactivity (17.5) Nuclear reactions : Fission and fusion, binding energy

Chemistry

1. States of Matter

1.1 Measurement: Physical quantities and SI units, Dimensional analysis, Precision, Significant figures. (1.2) Chemical reactions: Laws of chemical combination, Dalton's atomic theory; Mole concept; Atomic, molecular and molar masses; Percentage composition empirical & molecular formula; Balanced chemical equations & stoichiometry (1.3) Gaseous state: Gas Laws, Kinetic theory – Maxwell distribution of velocities, Average, root mean square and most probable velocities and relation to temperature, Diffusion; Deviation from ideal behaviour – Critical temperature, Liquefaction of gases, van der Waals equation. (1.4) Liquid state: Vapour pressure, surface tension, viscosity. (1.5) Solid state: Classification; Space lattices & crystal systems; Unit cell – Cubic & hexagonal systems; Close packing; Crystal structures: Simple AB and AB₂ type ionic crystals, covalent crystals – diamond & graphite, metals. Imperfections- Point defects, non-stoichiometric crystals; Electrical, magnetic and dielectric properties; Amorphous solids – qualitative description.

2. Atomic Structure

2.1 Introduction: Radioactivity, Subatomic particles; Atomic number, isotopes and isobars, Rutherford's picture of atom; Hydrogen atom spectrum and Bohr model. (2.2) Quantum mechanics: Wave-particle duality – de Broglie relation, Uncertainty principle; Hydrogen atom: Quantum numbers and wavefunctions, atomic orbitals and their shapes (s, p, and d), Spin quantum number. (2.3) Many electron atoms: Pauli exclusion principle; Aufbau principle and the electronic configuration of atoms, Hund's rule. (2.4) Periodicity: Periodic law and the modern periodic table; Types of elements: s, p, d, and f blocks; Periodic trends: ionization energy, atomic and ionic radii, electron affinity, electro negativity and valency.

3. Chemical Bonding & Molecular Structure

(3.1) Ionic Bond: Lattice Energy and Born-Haber cycle; Covalent character of ionic bonds and polar character of covalent bond (3.2) Molecular Structure: Lewis picture & resonance structures, VSEPR model & molecular shapes (3.3) Covalent Bond: Valence Bond Theory- Orbital overlap, Directionality of bonds & hybridization (s, p & d orbitals only), Resonance; Molecular orbital theory- Methodology, Orbital energy level diagram, Bond order, Magnetic properties for homonuclear diatomic species. (3.4) Metallic Bond: Qualitative description. (3.5) Intermolecular Forces: Polarity; Dipole moments; Hydrogen Bond.

4. Thermodynamics

4.1 Basic Concepts: Systems and surroundings; State functions; Intensive & Extensive Properties; Zeroth Law and Temperature (4.2) First Law of Thermodynamics: Work, internal energy, heat, enthalpy, heat capacities; Enthalpies of formation, phase transformation, ionization, electron gain; Thermochemistry; Hess's Law. Bond dissociation, combustion, atomization, sublimation, dilution (4.3) Second Law: Spontaneous and reversible processes; entropy; Gibbs free energy related to spontaneity and non-mechanical work; Standard free energies of formation, free energy change and chemical equilibrium (4.4) Third Law: Introduction

5. Physical and Chemical Equilibria

5.1 Concentration Units: Mole Fraction, Molarity, and Molality (5.2) Solutions: Solubility of solids and gases in liquids, Vapour Pressure, Raoult's law, Relative lowering of vapour pressure, depression in freezing point; elevation in boiling point; osmotic pressure, determination of molecular mass; solid solutions. (5.3) Physical Equilibrium: Equilibria involving physical changes (solid-liquid, liquid-gas, solid-gas), Surface chemistry, Adsorption, Physical and Chemical adsorption, Langmuir Isotherm, Colloids and emulsion, classification, preparation, uses. (5.4) Chemical Equilibria: Equilibrium constants (K_p , K_c), Le-Chatelier's principle. (5.5) Ionic Equilibria: Strong and Weak electrolytes, Acids and Bases (Arrhenius, Lewis, Bronsted and Lowry) and their dissociation; Ionization of Water; pH; Buffer solutions; Acid-base titrations; Hydrolysis; Solubility Product of Sparingly Soluble Salts; Common Ion Effect. (5.6) Factors Affecting Equilibria: Concentration, Temperature, Pressure, Catalysts, Significance of G and G^0 in Chemical Equilibria.

6. Electrochemistry

6.1 Redox Reactions: Oxidation-reduction reactions (electron transfer concept); Oxidation number; Balancing of redox reactions; Electrochemical cells and cell reactions; Electrode potentials; EMF of Galvanic cells; Nernst equation; Factors affecting the electrode potential; Gibbs energy change and cell potential; Secondary cells; Fuel cells; Corrosion and its prevention. 6.2 Electrolytic Conduction: Electrolytic Conductance; Specific and molar conductivities; Kohlrausch's Law and its application, Faraday's laws of electrolysis; Coulometer; Electrode potential and electrolysis, Commercial production of the chemicals, NaOH, Na, Al, Cl_2 & F_2 .

7. Chemical Kinetics

7.1 Aspects of Kinetics: Rate and Rate expression of a reaction; Rate constant; Order and molecularity of the reaction; Integrated rate expressions and half life for zero and first order reactions. (7.2) Factor Affecting the Rate of the Reactions: Concentration of the reactants, size of particles; Temperature dependence of rate constant; Activation energy; Catalysis, Surface catalysis, enzymes, zeolites; Factors affecting rate of collisions between molecules. 7.3 Mechanism of Reaction: Elementary reactions; Complex reactions; Reactions involving two/three steps only.

8. Hydrogen and s-block elements

(8.1) Hydrogen: Element: unique position in periodic table, occurrence, isotopes; Dihydrogen: preparation, properties, reactions, and uses; Molecular, saline, interstitial hydrides; Water: Properties; Structure and aggregation of water molecules; Heavy water; Hydrogen peroxide; Hydrogen as a fuel.

(8.2) s-block elements: Abundance and occurrence; Anomalous properties of the first elements in each group; diagonal relationships. (8.3) Alkali metals: Lithium, sodium and potassium: occurrence, extraction, reactivity, and electrode potentials; Biological importance; Reactions with oxygen, hydrogen, halogens and liquid ammonia; Basic nature of oxides and hydroxides; Halides; Properties and uses of compounds such as NaCl, Na₂CO₃, NaHCO₃, NaOH, KCl, and KOH. 8.4 Alkaline earth metals: Magnesium and calcium: Occurrence, extraction, reactivity and electrode potentials; Reactions with non-metals; Solubility and thermal stability of oxo salts; Biological importance; Properties and uses of important compounds such as CaO, Ca(OH)₂, plaster of Paris, MgSO₄, MgCl₂, CaCO₃, and CaSO₄; Lime and limestone, cement.

9. p- d- and f-block elements

(9.1) General: Abundance, distribution, physical and chemical properties, isolation and uses of elements; Trends in chemical reactivity of elements of a group;. (9.2) Group 13 elements: Boron; Properties and uses of borax, boric acid, boron hydrides & halides. Reaction of aluminum with acids and alkalis; (9.3) Group 14 elements: Carbon: Uses, Allotropes (graphite, diamond, fullerenes), oxides, halides and sulphides, carbides; Silicon: Silica, silicates, silicone, silicon tetrachloride, Zeolites. (9.4) Group 15 elements: Dinitrogen; Reactivity and uses of nitrogen and its compounds; Industrial and biological nitrogen fixation; Ammonia: Haber's process, properties and reactions; Oxides of nitrogen and their structures; Ostwald's process of nitric acid production; Fertilizers – NPK type; Production of phosphorus; Allotropes of phosphorus; Preparation, structure and properties of hydrides, oxides, oxoacids and halides of phosphorus. (9.5) Group 16 elements: Isolation and chemical reactivity of dioxygen; Acidic, basic and amphoteric oxides; Preparation, structure and properties of ozone; Allotropes of sulphur; Production of sulphur and sulphuric acid; Structure and properties of oxides, oxoacids, hydrides and halides of sulphur. (9.6) Group 17 and group 18 elements: Structure and properties of hydrides, oxides, oxoacids of chlorine; Inter halogen compounds; Bleaching Powder; Preparation, structure and reactions of xenon fluorides, oxides, and oxoacids. (9.7) d-Block elements: General trends in the chemistry of first row transition elements; Metallic character; Oxidation state; Ionic radii; Catalytic properties; Magnetic properties; Interstitial compounds; Occurrence and extraction of iron, copper, silver, zinc, and mercury; Alloy formation; Steel and some important alloys; preparation and properties of CuSO₄, K₂Cr₂O₇, KMnO₄, Mercury halides; Silver nitrate and silver halides; Photography. (9.8) f-Block elements: Lanthanoids and actinoids; Oxidation states and chemical reactivity of lanthanoids compounds; Lanthanide contraction; Comparison of actinoids and lanthanoids. (9.9) Coordination Compounds: Coordination number; Ligands; Werner's coordination theory; IUPAC nomenclature; Application and importance of coordination compounds (in qualitative analysis, extraction of metals and biological systems e.g. chlorophyll, vitamin B12, and hemoglobin); Bonding: Valence-bond approach, Crystal field theory (qualitative); Stability constants; Shapes, color and magnetic properties; Isomerism including stereoisomerisms; Organometallic compounds.

10. Principles of Organic Chemistry and Hydrocarbons

10.1 Classification: Based on functional groups, trivial and IUPAC nomenclature. (10.2) Electronic displacement in a covalent bond: Inductive, resonance effects, and hyperconjugation; free radicals; carbocations, carbanions, nucleophiles and electrophiles; types of organic reactions. (10.3) Alkanes and cycloalkanes: Structural isomerism and general properties. (10.4) Alkenes and alkynes: General methods of preparation and reactions, physical properties, electrophilic and free radical additions, acidic character of alkynes and (1,2 and 1,4) addition to dienes. (10.5) Aromatic hydrocarbons: Sources; Properties; Isomerism; Resonance delocalization; polynuclear hydrocarbons; mechanism of electrophilic substitution reaction, directive influence and effect of substituents on reactivity. (10.6) Haloalkanes and haloarenes: Physical properties, chemical reactions. Uses and environmental effects; di, tri, tetrachloromethanes, iodoform, freon and DDT. (10.7) Petroleum: Composition and refining, uses of petrochemicals.

11. Stereochemistry

11.1 Introduction: Chiral molecules; Optical activity; Polarimetry; R,S and D,L configurations; Fischer projections; Enantiomerism; Racemates; Diastereomerism and meso structures. (11.2) Conformations: Ethane conformations; Newman and Sawhorse projections. (11.3) Geometrical isomerism in alkenes

12. Organic Compounds with Functional Groups Containing Oxygen and Nitrogen

12.1 General: Electronic structure, important methods of preparation, important reactions and physical properties of alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, nitro compounds, amines, diazonium salts, cyanides and isocyanides. (12.2) Specific: Effect of substituents on alpha-carbon on acid strength, comparative reactivity of acid derivatives, basic character of amines methods of preparation, and their separation, importance of diazonium salts in synthetic organic chemistry.

13. Biological , Industrial and Environmental chemistry

13.1 The Cell: Concept of cell and energy cycle. (13.2) Carbohydrates: Classification; Monosaccharides; Structures of pentoses and hexoses; Anomeric carbon; Mutarotation; Simple chemical reactions of glucose, Disaccharides: reducing and non-reducing sugars – sucrose, maltose and lactose; Polysaccharides: elementary idea of structures of starch, cellulose and glycogen. (13.3) Proteins: Amino acids; Peptide bond; Polypeptides; Primary structure of proteins; Simple idea of secondary , tertiary and quaternary structures of proteins; Denaturation of proteins and enzymes. (13.4) Nucleic Acids: Types of nucleic acids; Primary building blocks of nucleic acids (chemical composition of DNA & RNA); Primary structure of DNA and its double helix; Replication; Transcription and protein synthesis. (13.5) Vitamins: Classification, structure, functions in biosystems; Hormones (13.6) Polymers: Classification of polymers; General methods of polymerization; Molecular mass of polymers; Biopolymers and biodegradable polymers; Free radical, cationic and anionic addition polymerizations; Copolymerization: Natural rubber; Vulcanization of rubber; Synthetic rubbers. Condensation polymers. (13.7) Pollution: Environmental pollutants; soil, water and air pollution; Chemical reactions in atmosphere; Smog; Major atmospheric pollutants; Acid rain; Ozone and its reactions; Depletion of ozone layer and its effects; Industrial air pollution; Green house effect and global warming; Green Chemistry. (13.8) Chemicals in medicine, health-care and food: Analgesics, Tranquilizers, antiseptics, disinfectants, anti-microbials, anti-fertility drugs, antihistamines, antibiotics, antacids; Preservatives, artificial sweetening agents, antioxidants, soaps and detergents.

14. Theoretical Principles of Experimental Chemistry

14.1 Volumetric Analysis: Principles; Standard solutions of sodium carbonate and oxalic acid; Acid-base titrations; Redox reactions involving KI, H₂SO₄, Na₂SO₃, Na₂S₂O₃ and H₂S; Potassium permanganate in acidic, basic and neutral media; Titrations of oxalic acid, ferrous ammonium sulphate with KMnO₄, K₂Cr₂O₇/Na₂S₂O₃, Cu(II)/Na₂S₂O₃. (14.2) Qualitative analysis of Inorganic Salts: Principles in the determination of the cations Pb²⁺, Cu²⁺, As³⁺, Mn²⁺, Zn²⁺, Co²⁺, Ca²⁺, Sr²⁺, Ba²⁺, Mg²⁺, NH₄⁺, Fe³⁺, Ni²⁺ and the anions CO₃²⁻, S²⁻, SO₄²⁻, SO₃²⁻, NO₂⁻, NO₃⁻, Cl⁻, Br⁻, I⁻, PO₄³⁻, CH₃COO⁻, C₂O₄²⁻. (14.3) Physical Chemistry Experiments: preparation and crystallization of alum, copper sulphate, ferrous sulphate, double salt of alum and ferrous sulphate, potassium ferric sulphate; Temperature vs. solubility; pH measurements; Lyophilic and lyophobic sols; Dialysis; Role of emulsifying agents in emulsification. Equilibrium studies involving (i) ferric and thiocyanate ions (ii) [Co(H₂O)₆]²⁺ and chloride ions; Enthalpy determination for (i) strong acid vs. strong base neutralization reaction (ii) hydrogen bonding interaction between acetone and chloroform; Rates of the reaction between (i) sodium thiosulphate and hydrochloric acid, (ii) potassium iodate and sodium sulphite (iii) iodide vs. hydrogen peroxide, concentration and temperature effects in these reactions. (14.4) Purification Methods: Filtration, crystallization, sublimation, distillation, differential extraction, and chromatography. Principles of melting point and boiling point determination; principles of paper chromatographic separation – R_f values. (14.5) Qualitative Analysis of Organic Compounds: Detection of nitrogen, sulphur, phosphorous and halogens; Detection of carbohydrates, fats and proteins in foodstuff; Detection of alcoholic, phenolic, aldehydic, ketonic, carboxylic, amino groups and unsaturation. (14.6) Quantitative Analysis of Organic Compounds: Basic principles for the quantitative estimation of carbon, hydrogen, nitrogen, halogen, sulphur and phosphorous; Molecular mass determination by silver salt and chloroplatinate salt methods; Calculations of empirical and molecular formulae. (14.7) Principles of Organic

Chemistry Experiments: Preparation of iodoform, acetanilide, p-nitro acetanilide, di-benzoyl acetone, aniline yellow, Paracetamol, beta-naphthol; Preparation of acetylene and study of its acidic character.

Mathematics

1. Algebra

(1.1) Complex numbers, addition, multiplication, conjugation, polar representation, properties of modulus and principal argument, triangle inequality, roots of complex numbers, geometric interpretations (1.2) Theory of Quadratic equations, quadratic equations in real and complex number system and their solutions, relation between roots and coefficients, nature of roots, equations reducible to quadratic equations. (1.3) Arithmetic, geometric and harmonic progressions, arithmetic, geometric and harmonic means, arithmetico-geometric series, sums of finite arithmetic and geometric progressions, infinite geometric series, sums of squares and cubes of the first n natural numbers. (1.4) Logarithms and their properties. (1.5) Exponential series. (1.6) Permutations and combinations (1.7) Binomial theorem for a positive integral index, properties of binomial coefficients, Pascal's triangle (1.8) Matrices and determinants of order two and three, properties and evaluation of determinants, addition and multiplication of matrices, adjoint and inverse of matrices, Solutions of simultaneous linear equations in two and three variables with the help of matrices, elementary row and column operations of matrices, (1.9) Sets, Relations and Functions, algebra of sets and their applications, equivalence relations, mappings, one-one, into and onto mappings, composition of mappings, binary operation, inverse of function, functions of real variables like polynomial, modulus, signum and greatest integer. (1.10) Mathematical Induction (1.11) Linear Inequalities, solution of linear inequalities in one and two variables.

2. Trigonometry

2.1 Measurement of angles in radians and degrees, positive and negative angles, trigonometric ratios, functions and identities. (2.2) Solution of trigonometric equations. (2.3) Properties of triangles and solutions of triangles. (2.4) Inverse trigonometric functions. (2.5) Heights and distances

3. Two-dimensional Coordinate Geometry

3.1 Cartesian coordinates, distance between two points, section formulae, shifting of origin. (3.2) Straight lines and pair of straight lines: Equation of straight lines in various forms, angle between two lines, distance of a point from a line, lines through the point of intersection of two given lines, equation of the bisector of the angle between two lines, concurrent lines. (3.3) Circles and family of circles : Equation of circle in various form, equation of tangent, normal & chords, parametric equations of a circle, intersection of a circle with a straight line or a circle, equation of circle through point of intersection of two circles, conditions for two intersecting circles to be orthogonal. (3.4) Conic sections : parabola, ellipse and hyperbola their eccentricity, directrices & foci, parametric forms, equations of tangent & normal, conditions for $y=mx+c$ to be a tangent and point of tangency.

4. Three dimensional Coordinate Geometry

4.1 Co-ordinate axes and co-ordinate planes, distance between two points, section formula, direction cosines and direction ratios, equation of a straight line in space and skew lines. (4.2) Angle between two lines whose direction ratios are given, shortest distance between two lines. (4.3) Equation of a plane, distance of a point from a plane, condition for coplanarity of three lines, angles between two planes, angle between a line and a plane.

5. Differential calculus

5.1 Domain and range of a real valued function, Limits and Continuity of the sum, difference, product and quotient of two functions, Differentiability. (5.2) Derivative of different types of functions (polynomial, rational, trigonometric, inverse trigonometric, exponential, logarithmic, implicit functions), derivative of the sum, difference, product and quotient of two functions, chain rule. (5.3) Geometric interpretation of

derivative, Tangents and Normals. (5.4) Increasing and decreasing functions, Maxima and minima of a function of one variable. (5.5) Rolle's Theorem, Mean Value Theorem and Intermediate Value Theorem.

6. Integral calculus

6.1 Integration as the inverse process of differentiation, indefinite integrals of standard functions. (6.2) Methods of integration: Integration by substitution, Integration by parts, integration by partial fractions. (6.3) Definite integrals and their properties, Fundamental Theorem of Integral Calculus. (6.4) Application of definite integrals to the determination of areas of regions bounded by simple curves.

7. Ordinary Differential Equations

7.1 Order and degree of a differential equation, formulation of a differential equation whose general solution is given. Differential equation of first order and first degree and their solutions. 7.2 Linear first order differential equations.

8. Probability

8.1 Various terminology in probability, axiomatic and other approaches of probability, addition and multiplication rules of probability. (8.2) Conditional probability, total probability and Baye's theorem (8.3) Independent events 8.4 Discrete random variables and distributions with mean and variance.

9. Vectors

9.1 Addition, Subtraction and Multiplication of vectors, scalar multiplication, position vector of a point dividing a line segment in a given ratio. (9.2) Dot and cross products of two vectors, projection of a vector on a line. (9.3) Scalar triple products and their geometrical interpretations.

10. Statistics

(10.1) Measures of dispersion (10.2) Measures of skewness and Central Tendency, Analysis of frequency distributions with equal means but different variances

11. Linear Programming

(11.1) Various terminology and formulation of linear Programming 11.2 Solution of linear Programming using graphical method, feasible and infeasible regions, feasible and infeasible solutions, optimal feasible solutions (upto three nontrivial constraints)

BIOLOGY (BOTANY AND ZOOLOGY)

Unit : 1 Diversity in Living World

Biology – its meaning and relevance to mankind , What is living; Taxonomic categories and aids (Botanical gardens, herbaria, museums, zoological parks); Systematics and Binomial system of nomenclature.

Introductory classification of living organisms (Two-kingdom system, Five-kingdom system); Major groups of each kingdom alongwith their salient features (Monera, including Archaeobacteria and Cyanobacteria, Protista, Fungi, Plantae, Animalia); Viruses; Lichens Plant kingdom – Salient features of major groups (Algae to Angiosperms); Animal kingdom – Salient features of Nonchordates up to phylum, and Chordates up to class level.

Unit : 2 Cell : The Unit of Life ; Structure and Function

Cell wall; Cell membrane; Endomembrane system (ER, Golgi apparatus/Dictyosome, Lysosomes, Vacuoles); Mitochondria; Plastids; Ribosomes; Cytoskeleton; Cilia and Flagella; Centrosome and Centriole; Nucleus; Microbodies. Structural differences between prokaryotic and eukaryotic, and between plant and animal cells. Cell cycle (various phases); Mitosis; Meiosis. Biomolecules – Structure and function of Carbohydrates, Proteins, Lipids, and Nucleic acids. Enzymes – Chemical nature, types, properties and mechanism of action.

Unit : 3 Genetics and Evolution

Mendelian inheritance; Chromosome theory of inheritance; Gene interaction; Incomplete dominance; Co-dominance; Complementary genes; Multiple alleles; Linkage and Crossing over; Inheritance patterns of hemophilia and blood groups in humans. DNA –its organization and replication; Transcription and Translation; Gene expression and regulation; DNA fingerprinting. Theories and evidences of evolution, including modern Darwinism.

Unit : 4 Structure and Function – Plants

Morphology of a flowering plant; Tissues and tissue systems in plants; Anatomy and function of root, stem(including modifications), leaf, inflorescence, flower (including position and arrangement of different whorls, placentation), fruit and seed; Types of fruit; Secondary growth; Absorption and movement of water (including diffusion, osmosis and water relations of cell) and of nutrients; Translocation of food; Transpiration and gaseous exchange; Mechanism of stomatal movement. Mineral nutrition – Macro- and micro-nutrients in plants including deficiency disorders; Biological nitrogen fixation mechanism. Photosynthesis – Light reaction, cyclic and non-cyclic photophosphorylation; Various pathways of carbon dioxide fixation; Photorespiration; Limiting factors . Respiration – Anaerobic, Fermentation, Aerobic; Glycolysis, TCA cycle; Electron transport system; Energy relations.

Unit : 5 Structure and Function - Animals

Tissues; Elementary knowledge of morphology, anatomy and functions of different systems of earthworm, cockroach and frog. Human Physiology – Digestive system - organs, digestion and absorption; Respiratory system – organs, breathing and exchange and transport of gases. Body fluids and circulation – Blood, lymph, double circulation, regulation of cardiac activity; Hypertension, Coronary artery diseases. Excretion system – Urine formation, regulation of kidney function Locomotion and movement – Skeletal system, joints, muscles, types of movement. Control and co-ordination – Central and peripheral nervous systems, structure and function of neuron, reflex action and sensory reception; Role of various types of endocrine glands; Mechanism of hormone action.

Unit : 6 Reproduction, Growth and Movement in Plants

Asexual methods of reproduction; Sexual Reproduction - Development of male and female gametophytes; Pollination (Types and agents); Fertilization; Development of embryo, endosperm, seed and fruit (including parthenocarpy and apomixis). Growth and Movement – Growth phases; Types of growth regulators and their role in seed dormancy, germination and movement; Apical dominance; Senescence; Abscission; Photoperiodism; Vernalisation; Various types of movements.

Unit : 7 Reproduction and Development in Humans

Male and female reproductive systems; Menstrual cycle; Gamete production; Fertilisation; Implantation; Embryo development; Pregnancy and parturition; Birth control and contraception.

Unit : 8 Ecology and Environment

Meaning of ecology, environment, habitat and niche. Ecological levels of organization (organism to biosphere); Characteristics of Species, Population, Biotic Community and Ecosystem; Succession and Climax. Ecosystem – Biotic and abiotic components; Ecological pyramids; Food chain and Food web; Energy flow; Major types of ecosystems including agroecosystem. Ecological adaptations – Structural and physiological features in plants and animals of aquatic and desert habitats. Biodiversity – Meaning, types and conservation strategies (Biosphere reserves, National parks and Sanctuaries). Environmental Issues – Air and Water Pollution (sources and major pollutants); Global warming and Climate change; Ozonedepletion; Noise pollution; Radioactive pollution; Methods of pollution control (including an idea of bioremediation); Deforestation; Extinction of species (Hot Spots).

Unit : 9 Biology and Human Welfare

Animal husbandry – Livestock, Poultry, Fisheries; Major animal diseases and their control. Pathogens of major communicable diseases of humans caused by fungi, bacteria, viruses, protozoans and helminths, and their control. Cancer; AIDS. Adolescence and drug/alcohol abuse; Basic concepts of immunology.

Plant Breeding and Tissue Culture in crop improvement. Biofertilisers (green manure, symbiotic and free-living nitrogen-fixing microbes, mycorrhizae); Biopesticides (micro-organisms as biocontrol agents for pests and pathogens); Bioherbicides; Microorganisms as pathogens of plant diseases with special reference to rust and smut of wheat, bacterial leaf blight of rice, late blight of potato, bean mosaic, and root - knot of vegetables. Bioenergy – Hydrocarbon - rich plants as substitute of fossil fuels.

Unit : 10 Biotechnology and its Applications

Microbes as ideal system for biotechnology; Microbial technology in food processing, industrial production (alcohol, acids, enzymes, antibiotics), sewage treatment and energy generation. Steps in recombinant DNA technology – restriction enzymes, DNA insertion by vectors and other methods, regeneration of recombinants. Applications of R-DNA technology. In human health –Production of Insulin, Vaccines and Growth hormones, Organ transplant, Gene therapy. In Industry – Production of expensive enzymes, strain improvement to scale up bioprocesses. In Agriculture – GM crops by transfer of genes for nitrogen fixation, herbicide-resistance and pest-resistance including Bt crops.

English Proficiency

This test is designed to assess the test takers' general proficiency in the use of English language as a means of self-expression in real life situations and specifically to test the test takers' knowledge of basic grammar, their vocabulary, their ability to read fast and comprehend, and also their ability to apply the elements of effective writing.

1. Grammar

(1.1) Concord, Tense, Articles, Relative pronouns (1.2) Determiners, Prepositions, Modals, Adjectives (1.3) Voice, Speech 1.4 Question tags, Phrasal verbs

2. Vocabulary

(2.1) Synonyms, Antonyms, Odd Word, One Word, Jumbled letters, Homophones, Spelling (2.2) Contextual meaning. (2.3) Analogy

3. Reading Comprehension

(3.1) Content/ideas (3.2) Vocabulary (3.3) Referents (3.4) Idioms/Phrases (3.5) Reconstruction (rewording)

4. Composition

(4.1) Rearrangement (4.2) Paragraph Unity (4.3) Linkers/Connectives

Logical Reasoning

The test is given to the candidates to judge their power of reasoning spread in verbal and nonverbal areas. The candidates should be able to think logically so that they perceive the data accurately, understand the relationships correctly, figure out the missing numbers or words, and to apply rules to new and different contexts. These indicators are measured through performance on such tasks as detecting missing links, following directions, classifying words, establishing sequences, and completing analogies.

1. Verbal Reasoning

1.1 Analogy

Analogy means correspondence. In the questions based on analogy, a particular relationship is given and another similar relationship has to be identified from the alternatives provided.

1.2 Classification

Classification means

to assort the items of a given group on the basis of certain common quality they possess and then spot the odd option out.

1.3 Series Completion

Here series of numbers or letters are given and one is asked to either complete the series or find out the wrong part in the series.

1.4 Logical Deduction –

Here a brief passage is given and based on the passage the candidate is required to identify the correct or incorrect logical conclusions.

1.5 Chart Logic

Here a chart or a table is given that is partially filled in and asks to complete it in accordance with the information given either in the chart / table or in the question.

2. Nonverbal Reasoning

2.1 Pattern Perception

Here a certain pattern is given and generally a quarter is left blank. The candidate is required to identify the correct quarter from the given four alternatives.

2.3 Figure Formation and Analysis

The candidate is required to analyze and form a figure from various given parts.

2.4 Paper Cutting

It involves the analysis of a pattern that is formed when a folded piece of paper is cut into a definite design.

2.5 Figure Matrix

In this more than one set of figures is given in the form of a matrix, all of them following the same rule. The candidate is required to follow the rule and identify the missing figure.

2.6 Rule Detection

Here a particular rule is given and it is required to select from the given sets of figures, a set of figures, which obeys the rule and forms the correct series.