What is NEET?

The NEET **(National Eligibility Cum Entrance Test)** is basically an entrance exam conducted in India for candidates who desire to study any graduate medical course (MBBS), dental courses (BDS) or postgraduate course (MD/MS) in private or government medical colleges in India. NEET (Undergraduate) for BDS and MBBS courses would be organized by the CBSE (Central Board of Secondary Education). NEET-UG has replaced the AIPMT (All India Pre Medical Test) and all other individual MBBS exams organized by states or colleges themselves.

NATIONAL ELIGIBILITY CUM ENTRANCE TEST (UG) is ***applicable for admissions*** to the following:-

(i) All India Quota Seats.

(ii) State Government Quota Seats

(iii) Private/Management/NRI Quota Seats in all Private Medical / Dental Colleges or any Private/Deemed University.

The Central Board of Secondary Education conducts the National Eligibility-cum-Entrance Test for admission to MBBS/BDS courses.

WEB DETAILS:

The official website of the Board for NATIONAL ELIGIBILITY CUM ENTRANCE TEST is www.aipmt.nic.in.

(a) All the test related information will be available on this website.

(b) The official websites for counselling related information under 15% All India seats are:

- Ministry of Health & Family Welfare - www.mohfw.nic.in &
- Medical Counselling Committee - www.mcc.nic.in.

(c) The website of concerned State(s)/Institution(s) will give details for the remaining seats.

Who can apply for NEET?

NEET Eligibility Criteria

Nationality: Candidates should be an Indian Nationals or OCI (Overseas Citizen of India).

Age Limit:

Minimum – The minimum age limit is 17 years on 31st December of the year of admission.

Maximum – The maximum age limit is 25 years for general candidates and 30 years for reserved categories.

Qualification: Students must have passed/appearing 12th or equivalent examination from any recognized board with Physics, Chemistry, Biology/Bio-technology or any other elective subject with English.

Percentage Criteria: Students must have secured minimum 50% marks in PCB group for general candidates and 45% (for general PH) and 40% (for SC/ST/OBC categories).

ADMISSION AND RESERVATION

An All India merit list of the qualified candidates shall be prepared on the basis of the marks obtained in the NATIONAL ELIGIBILITY ENTRANCE TEST and candidates shall be admitted to MBBS/BDS courses from the said list only by following the already existing reservation policy.

CBSE will provide All India Rank. Admitting Authorities will invite applications for counselling and merit list shall be drawn based on All India Rank. Admission to MBBS/BDS Courses within the respective categories shall be based solely on marks obtained in the National Eligibility Cum Entrance Test.

Directorate General of Health Services (DGHS) & Medical Counselling Committee (MCC) are the authorities that conduct counselling for admission to 15% all India quota seats.

State colleges of Tamil Nadu conducts counselling for rest of the seats. Seat allotment will be carried out on the basis of candidates scores in entrance test.

NEET Application Form

Aspirants can apply for NEET exam only through **online process**.

The NEET Application Form 2017 is available from the **second week of December 2016 (tentative)**.

Candidates are advised to fill the application form as per the **given instructions**.

After filling the application form, candidates are required to **send the confirmation page** along with required documents to the address mentioned below:

The Assistant Secretary (NEET)
Central Board of Secondary Education,
Shiksha Kendra, 2, Community Centre,
Preet Vihar, Delhi-110 092

NEET Exam Pattern

The examination would be conducted in the first week of May 2017. A glimpse of the exam pattern:

Courses:	Conducted for BDS/MBBS courses
Number of Questions:	180 multiple choice questions
Subjects:	Physics, Chemistry, Biology (Zoology & Botany)
Language:	English, Hindi, Assamese, Bengali, Gujarati, Marathi, Tamil and Telugu
Mode of Exam:	Offline mode (pen and paper based mode)

Duration:	3 hours
Marking Scheme:	4 marks will be awarded for each correct answer
Negative Marking:	1 mark will be deducted for each incorrect answer as negative marking.

How to prepare for NEET 2017

Things to do

1. Give equal weightage to each and every topic from Class 11 and Class 12 for your exam preparation

2. Though NCERT should be your primary focus area, do not limit your preparation approach to the NCERT syllabus. Make sure you prepare each and every topic of various subjects from NCERT as well as popular competitive reference books (ask your respective mentor to assist you regarding the same; there are plenty of options in the market).

3. Have a comprehensive strategy with well-defined short-term and long-term goals in your exam preparations. For example, topics to be done on weekly and monthly basis, in addition to the number of practice tests for various subjects and sub-topics to be taken on fortnightly and monthly basis.

4. Ensure that you keep syllabus completion targets and score achievement targets for your practice tests. Always try to push yourself further in order to reach your goals before the designated time.

5. As you delve further into any given topic, note down critical formulae that you encounter from each and every topic and pin them right in front of you. After covering the complete topic, attach them to a separate file folder for future reference and revision.

6. Make individual notes for each and every topic. Analyse the problem-solving techniques for various numericals and formulate a rough design to approach such questions. If there is more than one method to approach the same problem, make sure you practice both of them till you are adept. Devise a rough and quick method to reach solutions and revise these rough approach methods often.

7. Learn meditation, yoga or any other forms of relaxation techniques as it suits you. Such techniques have a stress relieving effect and also help you attain a higher degree of concentration.

8. Keep an honest account of your progress report. Revise each and every topic frequently. Practice topic-specific questions and update your progress report accordingly.

9. As the overall difficulty of the NEET question paper was higher than AIPMT 2015 question paper, it is advised to have a dedicated and thorough preparation for NEET 2017 examination with mock papers and paper of NEET 2016 examination.

SYLLABUS

PHYSICS

CONTENTS CLASS XI SYLLABUS

UNIT I: Physical World and Measurement

- Physics: Scope and excitement; nature of physical laws; Physics, technology and society.
- Need for measurement: Units of measurement; systems of units; SI units, fundamental and derived units. Length, mass and time measurements; accuracy and precision of measuring instruments; errors in measurement; significant figures.
- Dimensions of physical quantities, dimensional analysis and its applications.

UNIT II: 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 and position-time, graphs, for uniformly accelerated motion (graphical treatment).

- Elementary concepts of differentiation and integration for describing motion. Scalar and vector quantities: Position and displacement vectors, general vectors, general vectors and notation, equality of vectors, multiplication of vectors by a real number; addition and subtraction of vectors. Relative velocity.
- Unit vectors. Resolution of a vector in a plane-rectangular components.
- Scalar and Vector products of Vectors. Motion in a plane. Cases of uniform velocity and uniform acceleration-projectile motion. Uniform circular motion.

UNIT III: Laws of Motion

- Intuitive concept of force. Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion. Law of conservation of linear momentum and its applications.
- Equilibrium of concurrent forces. Static and Kinetic friction, laws of friction, rolling friction, lubrication.
- Dynamics of uniform circular motion. Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road).

UNIT IV: Work, Energy and Power

- Work done by a constant force and variable force; kinetic energy, work-energy theorem, power.
- Notion of potential energy, potential energy of a spring, conservative forces; conservation of mechanical energy (kinetic and potential energies); non-conservative forces; motion in a vertical circle, elastic and inelastic collisions in one and two dimensions.

UNIT V: Motion of System of Particles and Rigid Body

- Centre of mass of a two-particle system, momentum conservation and centre of mass motion. Centre of mass of a rigid body; centre of mass of uniform rod.
- Moment of a force,-torque, angular momentum, conservation of angular momentum with some examples.
- Equilibrium of rigid bodies, rigid body rotation and equation of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration. Values of M.I. for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications.

UNIT VI: Gravitation

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

UNIT VII: Properties of Bulk Matter

- Elastic behavior, Stress-strain relationship. Hooke's law, Young's modulus, bulk modulus, shear, modulus of rigidity, poisson's ratio; elastic energy.
- Viscosity, Stokes' law, terminal velocity, Reynold's number, streamline and turbulent flow. Critical velocity, Bernoulli's theorem and its applications.
- Surface energy and surface tension, angle of contact, excess of pressure, application of surface tension ideas to drops, bubbles and capillary rise.
- Heat, temperature, thermal expansion; thermal expansion of solids, liquids, and gases. Anomalous expansion. Specific heat capacity: Cp, Cv- calorimetry; change of state – latent heat.
- Heat transfer- conduction and thermal conductivity, convection and radiation. Qualitative ideas of Black Body Radiation, Wein's displacement law, and Green House effect.
- Newton's law of cooling and Stefan's law.

UNIT VIII: Thermodynamics

- Thermal equilibrium and definition of temperature (zeroth law of Thermodynamics). Heat, work and internal energy. First law of thermodynamics. Isothermal and adiabatic processes.
- Second law of the thermodynamics: Reversible and irreversible processes. Heat engines and refrigerators.

UNIT IX: Behaviour of Perfect Gas and Kinetic Theory

- 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; degrees of freedom, law of equi partition of energy (statement only) and application to specific heat capacities of gases; concept of mean free path.

UNIT X: Oscillations and Waves

- Periodic motion-period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion(SHM) and its equation; phase; oscillations of a spring-restoring force and force constant; energy in SHM –Kinetic and potential energies; simple pendulum-derivation of expression for its time period; free, forced and damped oscillations (qualitative ideas only), resonance.
- Wave motion. Longitudinal and transverse waves, speed of wave motion. 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.

CONTENTS OF CLASS XII SYLLABUS

UNIT I: Electrostatics

- Electric charges and their conservation. Coulomb's law-force 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, statement of Gauss's theorem and its applications to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell (field inside and outside)
- Electric potential, potential difference, electric potential due to a point charge, a dipole and system of charges: equipotential surfaces, electrical potential energy of a system of two point charges and of electric diploes in an electrostatic field.
- Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, capacitors and capacitance, 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, Van de Graaff generator.

UNIT II: Current Electricity

- Electric current, flow of electric charges in a metallic conductor, drift velocity and mobility, and their relation with electric current; Ohm's law, electrical resistance, V-I characteristics (liner and non-linear), electrical energy and power, electrical resistivity and conductivity.
- Carbon resistors, colour code for carbon resistors; series and parallel combinations of resistors; temperature dependence of resistance.

- Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel.
- Kirchhoff's laws and simple applications. Wheatstone bridge, metre bridge.
- Potentiometer-principle and applications to measure potential difference, and for comparing emf of two cells; measurement of internal resistance of a cell.

UNIT III: Magnetic Effects of Current and Magnetism

- Concept of magnetic field, Oersted's experiment. Biot-Savart law and its application to current carrying circular loop.
- Ampere's law and its applications to infinitely long straight wire, straight and toroidal solenoids. 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 current-carrying conductors-definition of ampere. Torque experienced by a current loop in a 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. Magnetic dipole moment of a revolving electron. Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis. Torque on a magnetic dipole (bar magnet) in a uniform magnetic field; bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements.
- Para-, dia-and ferro-magnetic substances, with examples.
- Electromagnetic and factors affecting their strengths. Permanent magnets.

UNIT IV: 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; LC oscillations (qualitative treatment only), LCR series circuit, resonance; power in AC circuits, wattles current.
- AC generator and transformer.

UNIT V: Electromagnetic Waves

- Need for displacement current. Electromagnetic waves and their characteristics (qualitative ideas only). Transverse nature of electromagnetic waves.
- Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, x-rays, gamma rays) including elementary facts about their uses.

UNIT VI: Optics

- Reflection of light, spherical mirrors, mirror formula. Refraction of light, total internal reflection and its applications optical fibres, refraction at spherical surfaces, lenses, thin lens formula, lens-maker's formula. Magnification, power of a lens, combination of thin lenses in contact combination of a lens and a mirror. Refraction and dispersion of light through a prism.
- Scattering of light- blue colour of the sky and reddish appearance of the sun at sunrise and sunset.
- Optical instruments: Human eye, image formation and accommodation, correction of eye defects (myopia and hypermetropia) using lenses.
- Microscopes and astronomical telescopes (reflecting and refracting) and their magnifying powers.
- Wave optics: Wavefront and Huygens' principle, reflection and refraction of plane wave at a plane surface using wavefronts.
- Proof of laws of reflection and refraction using Huygens' principle.
- Interference, Young's double hole 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 VII: Dual Nature of Matter and Radiation

- Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation- particle nature of light.
- Matter waves- wave nature of particles, de Broglie relation. Davisson-Germer experiment (experimental details should be omitted; only conclusion should be explained).

UNIT VIII: Atoms and Nuclei

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

UNIT IX: Electronic Devices

- Energy bands in solids (qualitative ideas only), conductors, insulators and 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.

CHEMISTRY

CONTENTS OF CLASS XI SYLLABUS

UNIT I: Some Basic Concepts of Chemistry

- General Introduction: Important and scope of chemistry.
- Laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules.
- Atomic and molecular masses. Mole concept and molar mass; percentage composition and empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry.

UNIT II: Structure of Atom

- Atomic number, isotopes and isobars. Concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbital, quantum numbers, shapes of s,p and d orbitals, rules for filling electrons in orbitals- Aufbau principle, Pauli exclusion principles and Hund's rule, electronic configuration ofatoms, stability of half filled and completely filled orbitals.

UNIT III: Classification of Elements and Periodicity in Properties

- Modern periodic law and long form of periodic table, periodic trends in properties of elements- atomic radii, ionic radii, ionization enthalpy, electron gain enthalpy, electronegativity, valence.

UNIT IV: Chemical Bonding and Molecular Structure

- Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, valence bond theory, resonance, geometry of molecules, VSEPR theory, concept of hybridization involving s, pand d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only). Hydrogen bond.

UNIT V: States of Matter: Gases and Liquids

- Three states of matter, intermolecular interactions, types of bonding, melting and boiling points, role of gas laws of elucidating the concept of the molecule, Boyle's law, Charle's law, Gay Lussac's law, Avogadro's law, ideal behaviour of gases, empirical derivation of gas equation. Avogadro number, ideal gas equation. Kinetic energy and molecular speeds (elementary idea), deviation from ideal behaviour, liquefaction of gases, critical temperature.
- Liquid State- Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

UNIT VI : Thermodynamics

- First law of thermodynamics-internal energy and enthalpy, heat capacity and specific heat, measurement of Uand H,Hess's law of constant heat summation, enthalpy of : bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, solution and dilution.
- Introduction of entropy as state function, Second law of thermodynamics, Gibbs energy change for spontaneous and non-spontaneous process, criteria for equilibrium and spontaneity.
- Third law of thermodynamics- Brief introduction.

UNIT VII: Equilibrium

- Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of chemical equilibrium, equilibrium constant, factors affecting equilibrium-Le Chatelier's principle; ionic equilibrium- ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of polybasic acids, acid strength, concept of PH., Hydrolysis of salts (elementary idea), buffer solutions, Henderson equation, solubility product, common ion effect (with illustrative examples).

UNIT VIII: Redox Reactions

- Concept of oxidation and oxidation and reduction, redox reactions oxidation number, balancing redox reactions in terms of loss and gain of electron and change in oxidation numbers.

UNIT IX: Hydrogen

- Occurrence, isotopes, preparation, properties and uses of hydrogen; hydrides-ionic, covalent and interstitial; physical and chemical properties of water, heavy water; hydrogen peroxide-preparation, reactions, uses and structure.

UNIT X: s-Block Elements (Alkali and Alkaline earth metals)

- Group I and group 2 elements:
- General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens; uses.
- Preparation and Properties of Some important Compounds:
- Sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogencarbonate, biological importance of sodium and potassium.
- Industrial use of lime and limestone, biological importance of Mg and Ca.

UNIT XI: Some p-Block Elements

- General Introduction to p-Block Elements.
- Group 13 elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group; Boron, some important compounds: borax, boric acids, boron hydrides. Aluminium: uses, reactions with acids and alkalies.
- General 14 elements: General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first element. Carbon, allotropic forms, physical and chemical properties: uses of some important compounds: oxides.
- Important compounds of silicon and a few uses: silicon tetrachloride, silicones, silicates and zeolites, their uses.

UNIT XII: Organic Chemistry- Some Basic Principles and Techniques

- General introduction, methods of purification qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds.

- Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyper conjugation.
- Homolytic and heterolytic fission of a covalent bond: free radials, carbocations, carbanions; electrophiles and nucleophiles, types of organic reactions.

UNIT XIII: Hydrocarbons

- Alkanes-Nomenclature, isomerism, conformations (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.
- Alkanes-Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation: chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.
- Alkynes-Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of- hydrogen, halogens, hydrogen halides and water.
- Aromatic hydrocarbons-Introduction, IUPAC nomenclature; Benzene; resonance, aromaticity; chemical properties:mechanism of electrophilic substitution-Nitration sulphonation, halogenation, Friedel Craft's alkylation and acylation; directive influence of functional group in mono-substituted benzene; carcinogenicity and toxicity.

UNIT XIV: Environmental Chemistry

- Environmental pollution: Air, water and soil pollution, chemical reactions in atmosphere, smogs, major atmospheric pollutants; acid rain ozone and its reactions, effects of depletion of ozone layer, greenhouse effect and global warming-pollution due to industrial wastes; green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution.

CONTENTS OF CLASS XII SYLLABUS

UNIT I: Solid State

- Classification of solids based on different binding forces; molecular, ionic covalent and metallic solids, amorphous and crystalline solids (elementary idea), unit cell in two dimensional and three dimensional lattices, calculation of density of unit cell, packing in solids, packing efficiency, voids, number of atoms per unit cell in a cubic unit cell, point defects, electrical and magnetic properties, Band theory of metals, conductors, semiconductors and insulators.

UNIT II: Solutions

- Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties- relative lowering of vapour pressure, Raoult's law, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties abnormal molecular mass. Van Hoff factor.

UNIT III: Electrochemistry

- Redox reactions, conductance in electrolytic solutions, specific and molar conductivity variation of conductivity with concentration, kohlrausch's Law, electrolysis and Laws of electrolysis (elementary idea), dry cell- electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Relation between Gibbs energy change and EMF of a cell, fuel cells; corrosion.

UNIT IV: Chemical Kinetics

- Rate of a reaction (average and instantaneous), factors affecting rates of reaction; concentration, temperature, catalyst; order and molecularity of a reaction; rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of collision theory (elementary idea, no mathematical treatment). Activation energy, Arrhenious equation.

UNIT V: Surface Chemistry

- Adsorption-physisorption and chemisorption; factors affecting adsorption of gases on solids, catalysis homogeneous and heterogeneous, activity and selectivity: enzyme catalysis; colloidal state: distinction between true solutions, colloids and suspensions; lyophillic, lyophobic multimolecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation; emulsions- types of emulsions.

UNIT VI: General Principles and Processes of Isolation of Elements

- Principles and methods of extraction-concentration, oxidation, reduction electrolytic method and refining; occurrence and principles of extraction of aluminium, copper, zinc and iron.

UNIT VII: p-Block Elements

- Group 15 elements: General introduction, electronic configuration, occurrence, oxidation states, trends in physical andchemical properties preparation and properties of ammonia and nitric acid, oxides of nitrogen (structure only); Phosphorous- allotropic forms; compounds of phosphorous: preparation and properties of phosphine, halides (PCI 3 ,PCI5) and oxoacids (elementary idea only).
- Group 16 elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physicaland chemical properties; dioxygen: preparation, properties and uses; classification of oxides; ozone. Sulphur – allotropic forms; compounds of sulphur: preparation, preparation, properties and uses of sulphur dioxide; sulphuric acid: industrial process of manufacture, properties and uses, oxoacids of sulphur (structures only).
- Group 17 elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physicaland chemical properties; compounds of halogens: preparation, properties and uses of chlorine and hydrochloric acid, interhalogen compounds oxoacids of halogens (structures only).
- Group 18 elements: General introduction, electronic configuration, occurrence, trends in physical and chemicalproperties, uses.

UNIT VIII: d and f Block Elements

- General introduction, electronic configuration, characteristics of transition metals, general trends in properties of the first row transition metals- metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation. Preparation and properties of K2Cr2O7 and KMnO4.

- Lanthanoids-electronic configuration, oxidation states, chemical reactivity, and lanthanoid contraction and its consequences.

- Actinoids: Electronic configuration, oxidation states and comparison with lanthanoids.

UNIT IX: Coordination Compounds

- Coordination compounds: Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, isomerism (structural and stereo) bonding, Werner's theory VBT,CFT; importance of coordination compounds (in qualitative analysis, biological systems).

UNIT X: Haloalkanes and Haloarenes

- Haloalkanes: Nomenclature, nature of C –X bond, physical and chemical properties, mechanism of substitutionreactions. Optical rotation.
- Haloarenes: Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only).
- Uses and environment effects of – dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

UNIT XI: Alcohols, Phenols and Ethers

- Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only);identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses with special reference to methanol and ethanol.
- Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophillic substitution reactions, uses of phenols.
- Ethers: Nomenclature, methods of preparation, physical and chemical properties uses.

UNIT XII: Aldehydes, Ketones and Carboxylic Acids

- Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties; and mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses.
- Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

UNIT XIII: Organic Compounds Containing Nitrogen

- Amines: Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses,identification of primary secondary and tertiary amines.

- Cyanides and Isocyanides-will be mentioned at relevant places.
- Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

UNIT XIV: Biomolecules

- Carbohydrates-Classification (aldoses and ketoses), monosaccharide (glucose and fructose), D.L. configuration,oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen): importance.
- Proteins-Elementary idea of – amino acids, peptide bond, polypeptides, proteins, primary structure, secondary structure, tertiary structure and quaternary structure (qualitative idea only), denaturation of proteins; enzymes.
- Hormones- Elementary idea (excluding structure).
- Vitamins-Classification and function.
- Nucleic Acids: DNA and RNA

UNIT XV: Polymers

- Classification-Natural and synthetic, methods of polymerization (addition and condensation), copolymerization. Some important polymers: natural and synthetic like polyesters, bakelite; rubber, Biodegradable and non-biodegradable polymers.

UNIT XVI: Chemistry in Everyday Life

- Chemicals in medicines- analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs,antibiotics, antacids, antihistamines.
- Chemicals in food- preservatives, artificial sweetening agents,elementary idea of antioxidants.
- Cleansing agents- soaps and detergents, cleansing action.

BIOLOGY

CONTENTS OF CLASS XI SYLLABUS

UNIT I: Diversity in Living World

- What is living? ; Biodiversity; Need for classification; Three domains 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-nonchordate up to phyla level and chordate up to classes level (three to five salient features and at least 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 recemose, flower, fruit and seed (To be dealt along with the relevant practical of the Practical Syllabus).
- Animal tissues; Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (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, micro bodies; Cytoskeleton, cilia, flagella, centrioles (ultra structure and function); Nucleus-nuclear membrane, chromatin, nucleolus.
- Chemical constituents of living cells: Biomolecules-structure and function of proteins, carbodydrates, lipids, nucleic acids; Enzymes-types, properties, enzyme action.
- B 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; Site of photosynthesis take place; pigments involved in
- Photosynthesis (Elementary idea); Photochemical and biosynthetic phases of photosynthesis; Cyclic and non cyclic and photophosphorylation; Chemiosmotic hypothesis; Photorespiration C3 and C4 pathways; Factors affecting photosynthesis.
- Respiration: Exchange gases; Cellular respiration-glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); Energy relations-Number of ATP molecules generated; Amphibolic pathways; Respiratory 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,gibberellin, 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; Caloric value of proteins, carbohydrates and fats; Egestion; 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 volumes; Disorders related to respiration-Asthma, Emphysema, Occupational 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, fiagellar, 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; 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, exopthalmic goiter, diabetes, Addison's disease).(Imp: Diseases and disorders mentioned above to be dealt in brief.)

CONTENTS OF CLASS XII SYLLABUS

UNIT I: Reproduction

- Reproduction in organisms: Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction – Asexual and sexual; Asexual reproduction; Modes-Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.
- Sexual reproduction in flowering plants: Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreeding 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).
- Reproductive health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control-Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies – IVF, ZIFT, GIFT (Elementary idea for general awareness).

UNIT II: Genetics and Evolution

- Heredity and variation: Mendelian Inheritance; Deviations from Mendelism-Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination-In humans, birds, honey bee; Linkage and crossing over; Sex linked inheritance-Haemophilia, Colour blindness; Mendelian disorders in humans-Thalassemia; Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.
- Molecular basis of Inheritance: Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation-Lac Operon; Genome and human genome project; DNA finger printing.
- Evolution: Origin of life; Biological evolution and evidences for biological evolution from Paleontology, comparative anatomy, embryology and molecular evidence); Darwin's contribution, Modern Synthetic theory of Evolution; Mechanism of evolution-Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg's principle; Adaptive Radiation; Human evolution.

UNIT III: Biology and Human Welfare

- Health and Disease; Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis. Typhoid, Pneumonia, common cold, amoebiasis, ring

worm); Basic concepts of immunology-vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse.

- Improvement in food production; Plant breeding, tissue culture, single cell protein, Biofortification; Apiculture and Animal husbandry.
- Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.

UNIT IV: Biotechnology and Its Applications

- Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).
- Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy; Genetically modified organisms-Bt crops; Transgenic Animals; Biosafety issues-Biopiracy and patents.

UNIT V: Ecology and environment

- Organisms and environment: Habitat and niche; Population and ecological adaptations; Population interactions- mutualism, competition, predation, parasitism; Population attributes-growth, birth rate and death rate, age distribution.
- Ecosystem: Patterns, components; productivity and decomposition; Energy flow; Pyramids of number, biomass, energy; Nutrient cycling (carbon and phosphorous); Ecological succession; Ecological Services-Carbon fixation, pollination, oxygen release.
- Biodiversity and its conservation: Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries.
- Environmental issues: Air pollution and its control; Water pollution and its control; Agrochemicals and their effects; Solid waste management; Radioactive waste management; Greenhouse effect and global warning; Ozone depletion; Deforestation; Any three case studies as success stories addressing environmental issues.

Note:

- Questions would be asked from the above mentioned subjects only.
- It will contain 11th & 12th board (NCERT & CBSE) academic syllabus.
- Few questions would be asked from the other boards syllabus too.

LIST OF CITIES FOR CENTRES OF NEET EXAM

CHENNAI	864
COIMBATORE	865
MADURAI	866
SALEM	867
TIRUCHIRAPALLI	868

State medical education directorates & offices where counseling related information may be available below:

The Director (Public Health and Preventive Medicine)
Directorate of Health Services,
359, Anna Salai,
Teynampet, Chennai-600006
Telephone No. : 044-24320802
Fax No. : 044-24323942
Website : http://www.tnhealth.org
E-mail ID : dphpm@rediffmail.com

LIST OF CODE OF OCCUPATION

(For Father's/Guardian's/Mother's only)

Occupation	**Code**
Agriculture	01
Business	02
Medical	03
Engineering	04
Law practice	05
Government service	06
Public sector service	07
Private service	08
Teaching/research	09
Other (including house wife)	10

LIST OF CODE OF INCOME

(For Father's/Guardian's/Mother's only)

Income	Code
Upto Rs.25000	01
Rs.25001-50000	02
Rs 50001-75000	03
Rs 75001-100000	04
Rs.100001-200000	05
Rs.200001 – 450000	06
Rs.450001 – 550000	07
Rs.550001 – 650000	08
Rs.650001 AND ABOVE	09

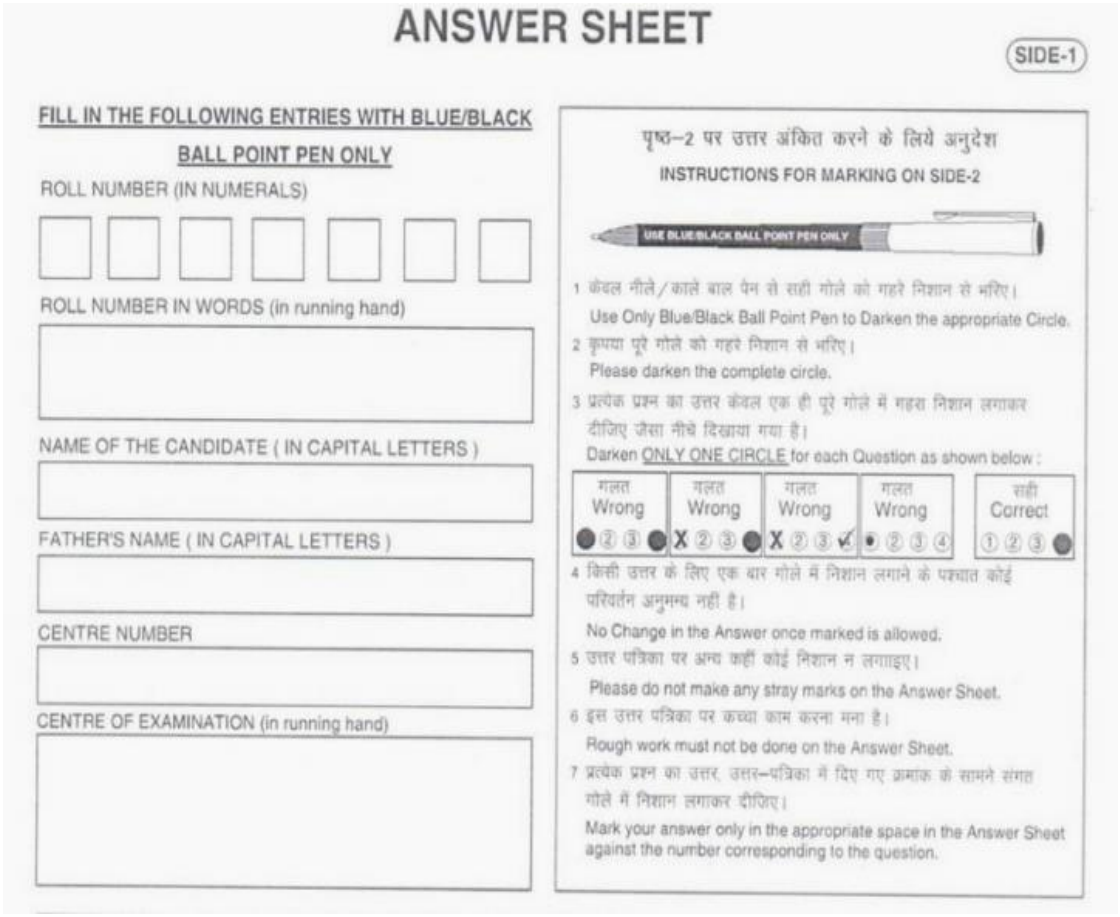
LIST OF CODE OF QUALIFICATION

(For Father's/Guardian's/Mother's only)

Qualification	Code
Illiterate	01
Below class X	02
Class X and class XII	03
Diploma in Engineering	04
Graduate – BA/BSc/BCom/BCA	05
Engineering Graduate – BE/BTech/BSc(Engg)	06
Medicine Graduate – MBBS/BDS/BUMS/BVSC	07
Law Graduate – LLB	08
Post graduate – MA/MSc/MCom/MCA	09
Engineering Post Graduate – ME/MTech/MSc(Tech	10
Medical Post Graduate – MD/MS/MVSc	11
Law Post Graduate – LLM	12
MBA/CA/ICWA	13
PhD/DPhil/DSc/DM	14

SAMPLE COPY:

Answer sheet OMR front and back



ANSWER SHEET

SIDE-1

FILL IN THE FOLLOWING ENTRIES WITH BLUE/BLACK BALL POINT PEN ONLY

ROLL NUMBER (IN NUMERALS)

ROLL NUMBER IN WORDS (in running hand)

NAME OF THE CANDIDATE (IN CAPITAL LETTERS)

FATHER'S NAME (IN CAPITAL LETTERS)

CENTRE NUMBER

CENTRE OF EXAMINATION (in running hand)

पृष्ठ–2 पर उत्तर अंकित करने के लिये अनुदेश

INSTRUCTIONS FOR MARKING ON SIDE-2

USE BLUE/BLACK BALL POINT PEN ONLY

1 केवल नीले / काले बाल पेन से सही गोले को गहरे निशान से भरिए।
Use Only Blue/Black Ball Point Pen to Darken the appropriate Circle.

2 कृपया पूरे गोले को गहरे निशान से भरिए।
Please darken the complete circle.

3 प्रत्येक प्रश्न का उत्तर केवल एक ही पूरे गोले में गहरा निशान लगाकर दीजिए जैसा नीचे दिखाया गया है।
Darken ONLY ONE CIRCLE for each Question as shown below :

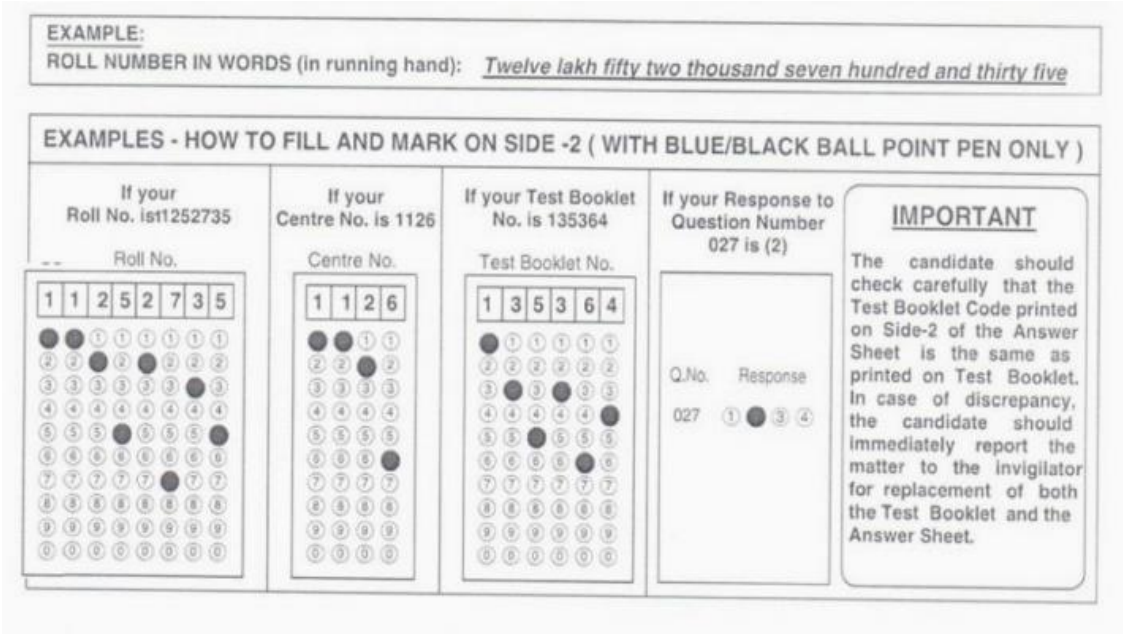
गलत Wrong	गलत Wrong	गलत Wrong	गलत Wrong	सही Correct
● ② ③ ●	X ② ③ ●	X ② ③ ✓	● ② ③ ④	① ② ③ ●

4 किसी उत्तर के लिए एक बार गोले में निशान लगाने के पश्चात कोई परिवर्तन अनुमन्य नहीं है।
No Change in the Answer once marked is allowed.

5 उत्तर पत्रिका पर अन्य कहीं कोई निशान न लगाइए।
Please do not make any stray marks on the Answer Sheet.

6 इस उत्तर पत्रिका पर कच्चा काम करना मना है।
Rough work must not be done on the Answer Sheet.

7 प्रत्येक प्रश्न का उत्तर, उत्तर–पत्रिका में दिए गए क्रमांक के सामने संगत गोले में निशान लगाकर दीजिए।
Mark your answer only in the appropriate space in the Answer Sheet against the number corresponding to the question.



EXAMPLE:
ROLL NUMBER IN WORDS (in running hand): *Twelve lakh fifty two thousand seven hundred and thirty five*

EXAMPLES - HOW TO FILL AND MARK ON SIDE -2 (WITH BLUE/BLACK BALL POINT PEN ONLY)

If your Roll No. ist1252735

Roll No.

1	1	2	5	2	7	3	5

If your Centre No. is 1126

Centre No.

1	1	2	6

If your Test Booklet No. is 135364

Test Booklet No.

1	3	5	3	6	4

If your Response to Question Number 027 is (2)

Q.No.	Response
027	① ● ③ ④

IMPORTANT

The candidate should check carefully that the Test Booklet Code printed on Side-2 of the Answer Sheet is the same as printed on Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the invigilator for replacement of both the Test Booklet and the Answer Sheet.

SIDE-2

Answer Sheet No.

ROLL No. | CENTRE No. | TEST BOOKLET No.

Test Booklet Code

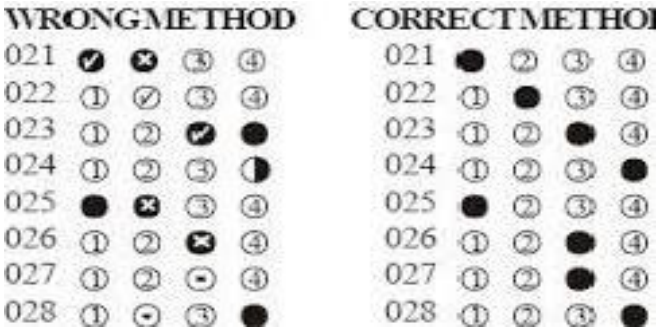
A

Q.No.	Response	Q.No.	Response	Q.No.	Response	Q.No.	Response	Q.No.	Response
001	① ② ③ ④	037	① ② ③ ④	073	① ② ③ ④	109	① ② ③ ④	145	① ② ③ ④
002	① ② ③ ④	038	① ② ③ ④	074	① ② ③ ④	110	① ② ③ ④	146	① ② ③ ④
003	① ② ③ ④	039	① ② ③ ④	075	① ② ③ ④	111	① ② ③ ④	147	① ② ③ ④
004	① ② ③ ④	040	① ② ③ ④	076	① ② ③ ④	112	① ② ③ ④	148	① ② ③ ④
005	① ② ③ ④	041	① ② ③ ④	077	① ② ③ ④	113	① ② ③ ④	149	① ② ③ ④
006	① ② ③ ④	042	① ② ③ ④	078	① ② ③ ④	114	① ② ③ ④	150	① ② ③ ④
007	① ② ③ ④	043	① ② ③ ④	079	① ② ③ ④	115	① ② ③ ④	151	① ② ③ ④
008	① ② ③ ④	044	① ② ③ ④	080	① ② ③ ④	116	① ② ③ ④	152	① ② ③ ④
009	① ② ③ ④	045	① ② ③ ④	081	① ② ③ ④	117	① ② ③ ④	153	① ② ③ ④
010	① ② ③ ④	046	① ② ③ ④	082	① ② ③ ④	118	① ② ③ ④	154	① ② ③ ④
011	① ② ③ ④	047	① ② ③ ④	083	① ② ③ ④	119	① ② ③ ④	155	① ② ③ ④
012	① ② ③ ④	048	① ② ③ ④	084	① ② ③ ④	120	① ② ③ ④	156	① ② ③ ④
013	① ② ③ ④	049	① ② ③ ④	085	① ② ③ ④	121	① ② ③ ④	157	① ② ③ ④
014	① ② ③ ④	050	① ② ③ ④	086	① ② ③ ④	122	① ② ③ ④	158	① ② ③ ④
015	① ② ③ ④	051	① ② ③ ④	087	① ② ③ ④	123	① ② ③ ④	159	① ② ③ ④
016	① ② ③ ④	052	① ② ③ ④	088	① ② ③ ④	124	① ② ③ ④	160	① ② ③ ④
017	① ② ③ ④	053	① ② ③ ④	089	① ② ③ ④	125	① ② ③ ④	161	① ② ③ ④
018	① ② ③ ④	054	① ② ③ ④	090	① ② ③ ④	126	① ② ③ ④	162	① ② ③ ④
019	① ② ③ ④	055	① ② ③ ④	091	① ② ③ ④	127	① ② ③ ④	163	① ② ③ ④
020	① ② ③ ④	056	① ② ③ ④	092	① ② ③ ④	128	① ② ③ ④	164	① ② ③ ④
021	① ② ③ ④	057	① ② ③ ④	093	① ② ③ ④	129	① ② ③ ④	165	① ② ③ ④
022	① ② ③ ④	058	① ② ③ ④	094	① ② ③ ④	130	① ② ③ ④	166	① ② ③ ④
023	① ② ③ ④	059	① ② ③ ④	095	① ② ③ ④	131	① ② ③ ④	167	① ② ③ ④
024	① ② ③ ④	060	① ② ③ ④	096	① ② ③ ④	132	① ② ③ ④	168	① ② ③ ④
025	① ② ③ ④	061	① ② ③ ④	097	① ② ③ ④	133	① ② ③ ④	169	① ② ③ ④
026	① ② ③ ④	062	① ② ③ ④	098	① ② ③ ④	134	① ② ③ ④	170	① ② ③ ④
027	① ② ③ ④	063	① ② ③ ④	099	① ② ③ ④	135	① ② ③ ④	171	① ② ③ ④
028	① ② ③ ④	064	① ② ③ ④	100	① ② ③ ④	136	① ② ③ ④	172	① ② ③ ④
029	① ② ③ ④	065	① ② ③ ④	101	① ② ③ ④	137	① ② ③ ④	173	① ② ③ ④
030	① ② ③ ④	066	① ② ③ ④	102	① ② ③ ④	138	① ② ③ ④	174	① ② ③ ④
031	① ② ③ ④	067	① ② ③ ④	103	① ② ③ ④	139	① ② ③ ④	175	① ② ③ ④
032	① ② ③ ④	068	① ② ③ ④	104	① ② ③ ④	140	① ② ③ ④	176	① ② ③ ④
033	① ② ③ ④	069	① ② ③ ④	105	① ② ③ ④	141	① ② ③ ④	177	① ② ③ ④
034	① ② ③ ④	070	① ② ③ ④	106	① ② ③ ④	142	① ② ③ ④	178	① ② ③ ④
035	① ② ③ ④	071	① ② ③ ④	107	① ② ③ ④	143	① ② ③ ④	179	① ② ③ ④
036	① ② ③ ④	072	① ② ③ ④	108	① ② ③ ④	144	① ② ③ ④	180	① ② ③ ④

Before handing over the Answer Sheet to the invigilator, the candidate should check that Roll No., Centre No. & Test Booklet No. have been filled in and marked correctly.

SIGNATURE OF CANDIDATE (in running hand)

SIGNATURE OF INVIGILATOR



List of top 10 medical colleges in India

India's Top Ten Medical Colleges			
Rank	**NAME OF THE COLLEGE**	**Address**	**College Website**
1	All India Institute of Medical Sciences(AIIMS)	Ansari Nagar, Delhi	http://www.aiims.edu/en.html
2	Christian Medical College, Vellore (CMC, Vellore)	Vellore	http://www.cmch-vellore.edu/
3	Maulana Azad Medical College(MAMC)	Bahadur Shah Zafar Marg, Delhi	http://www.mamc.ac.in/
4	Armed Forces Medical College(AFMC)	Sholapur Road, Pune	http://www.afmc.nic.in/
5	Kasturba Medical College(KMC)	SH 65, Madhav Nagar, Manipal, Karnataka 576104	http://manipal.edu/mu.html

6	Lady Hardinge Medical College(LHMC)	C- 604, Shivaji Stadium Bus Terminal Co. Place, Shaheed Bhagat Singh Marg, Delhi	
7	Grant Medical College	J J Marg, Nagpada-Mumbai Central, Off Jijabhoy Road, Mumbai - 400008.	http://www.gmcjjh.org/
8	University College of Medical Sciences & GTB Hospital	Dilshad Garden , Delhi-110 095	http://www.ucms.ac.in/d_medicine.htm
9	King George's Medical University	(Erstwhile Chhatrapati Shahuji Maharaj Medical University) , Chowk, Lucknow, Uttar Pradesh	http://kgmu.org/
10	Sri Ramachandra Medical College & Research Institute	1 , Ramachandra Nagar, Porur, Chennai	http://www.sriramachandra.edu.in/

Sources: http://indiatoday.intoday.in/

NEET 2 - 2016
(Physics, Chemistry and Biology)
Code AA

Time: 3 hrs **Total Marks: 720**

General Instructions:

1. The Answer Sheet is inside this Test Booklet. When you are directed to open the Test Booklet, take out the Answer Sheet and fill in the particulars on **Side-1** and **Side-2** carefully with **blue/black** ballpoint pen only.
2. The test is of **3 hours** duration and Test Booklet contains **180** questions. Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, **one mark** will be deducted from the total score. The maximum marks are **720**.
3. Use **Blue/Black Ballpoint Pen** only for writing particulars on this page/ marking responses.
4. Rough work is to be done on the space provided for this purpose in the Test Booklet only.
5. On completion of the test, the candidate must hand over the Answer Sheet to the Invigilator before leaving the Room/Hall. The candidates are allowed to take away Test Booklet only with them.
6. The CODE for this Test Booklet is **AA**. Make sure that the CODE printed on **Side-2** of the Answer Sheet is the same as that on this Test Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
7. The candidate should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet.
8. Use of white fluid for correction is not permissible on the Answer Sheet.
9. Each candidate must show on demand his/her Admit Card to the Invigilator.
10. No candidate, without special permission of the Superintendent or Invigilator, would leave his/her seat.
11. The candidates should not leave the Examination Hall without handing over their Answer Sheet to the Invigilator on duty and sign the Attendance Sheet twice. Cases where a candidate has not signed the Attendance Sheet second time will be deemed not to have banded over the Answer Sheet and dealt with as an unfair means case.
12. Use of Electronic/Manual Calculator is prohibited.
13. The candidates are governed by all Rules and Regulations of the Board with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of the Board.
14. No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.

15. The candidates will write the correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.

Physics

1. Planck's constant (h), speed of light in vacuum (c) and Newton's gravitational constant (G) are three fundamental constants. Which of the following combinations of these has the dimension of length?

(1) $\sqrt{hG}$

(2) $\frac{c^{3/2}\sqrt{hG}}{5/2}$

(3) $c\sqrt{\frac{hc}{G}}$

(4) $\sqrt{\frac{Gc}{h^{3/2}}}$

2. Two cars P and Q start from a point at the same time in a straight line and their positions are represented by $x_P(t) = at + bt^2$ and $x_Q(t) = ft - t^2$. At what time do the cars have the same velocity?

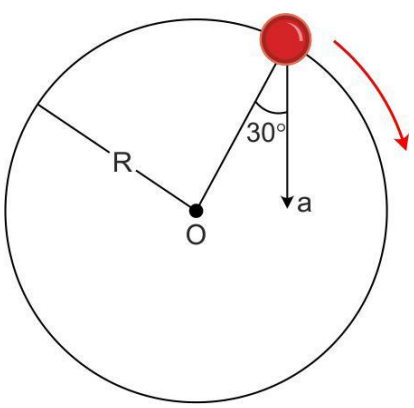
(1) $\frac{a-f}{1+b}$

(2) $\frac{a+f}{2(b-1)}$

(3) $\frac{a+f}{2(1+b)}$

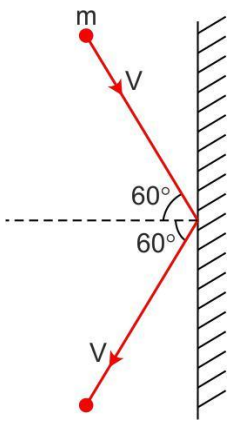
(4) $\frac{f-a}{2(1+b)}$

3. In the given figure, a = 15 m/s^2 represents the total acceleration of a particle moving in the clockwise direction in a circle of radius R = 2.5 m at a given instant of time. The speed of the particle is



(1) 4.5 m/s
(2) 5.0 m/s
(3) 5.7 m/s
(4) 6.2 m/s

4. A rigid ball of mass m strikes a rigid wall at 60° and gets reflected without loss of speed as shown in the figure below. The value of impulse imparted by the wall on the ball will be



(1) mV
(2) 2mV
(3) $\frac{mV}{2}$
(4) $\frac{mV}{3}$

5. A bullet of mass 10 g moving horizontally with a velocity of 400 m s^{-1} strikes a wooden block of mass 2 kg which is suspended by a light inextensible string of length 5 m. As a result, the centre of gravity of the block is found to rise a vertical distance of 10 cm. The speed of the bullet after it emerges out horizontally from the block will be
(1) 100 m s^{-1}
(2) 80 m s^{-1}
(3) 120 m s^{-1}
(4) 160 m s^{-1}

6. Two identical balls A and B having velocities of 0.5 m/s and –0.3 m/s, respectively collide elastically in one dimension. The velocities of B and A after the collision respectively will be
(1) –0.5 m/s and 0.3 m/s
(2) 0.5 m/s and –0.3 m/s
(3) –0.3 m/s and 0.5 m/s
(4) 0.3 m/s and 0.5 m/s

7. A particle moves from a point $-2\hat{i} + 5\hat{j}$ to $4\hat{j} + 3\hat{k}$ when a force of $4\hat{i} + 3\hat{j}$ N is applied. How much work has been done by the force?

(1) 8 J

(2) 11 J

(3) 5 J

(4) 2 J

8. Two rotating bodies A and B of masses m and 2m with moments of inertia I_A and I_B ($I_B > I_A$) have equal kinetic energy of rotation. If L_A and L_B be their angular momenta respectively, then

(1) $L_A = \frac{L_B}{2}$

(2) $L_A = 2L_B$

(3) $L_B > L_A$

(4) $L_A > L_B$

9. A solid sphere of mass m and radius R is rotating about its diameter. A solid cylinder of the same mass and same radius is also rotating about its geometrical axis with an angular speed twice that of the sphere. The ratio of their kinetic energies of rotation ($E_{sphere} / E_{cylinder}$) will be

(1) 2:3

(2) 1:5

(3) 1:4

(4) 3:1

10. A light rod of length l has two masses m_1 and m_2 attached to its two ends. The moment of inertia of the system about an axis perpendicular to the rod and passing through the centre of mass is

(1) $\frac{m_1 m_2}{m_1 + m_2} l^2$

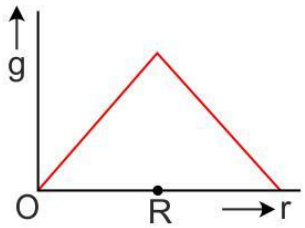
(2) $\frac{m_1 + m_2}{m_1 m_2} l^2$

(3) $(m_1 + m_2) l^2$

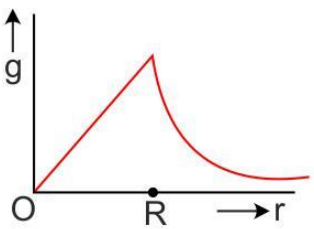
(4) $\sqrt{m_1 m_2}\, l^2$

11. Starting from the centre of the Earth having radius R, the variation of g (acceleration due to gravity) is shown by

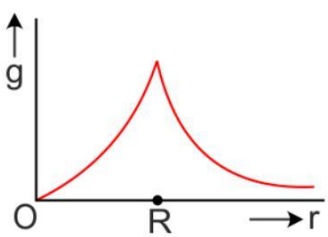
(1)



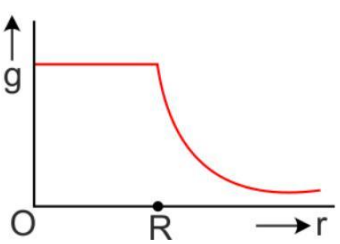
(2)



(3)



(4)



12. A satellite of mass m is orbiting the Earth (of radius R) at a height h from its surface. The total energy of the satellite in terms of g_0, the value of acceleration due to gravity at the Earth's surface, is

(1) $\frac{mg R^2}{2(R+h)}$

(2) $\frac{mg R_2}{(\quad)}$

(3) $\frac{2mg R^2}{0}$

(4) $-\frac{2,g R^2}{0}$

13. A rectangular film of liquid is extended from (4 cm $\times$ 2 cm) to (5 cm $\times$ 4 cm). If the work done is 3×10^{-4} J, the value of the surface tension of the liquid is

(1) 0.250 Nm^{-1}

(2) 0.125 Nm^{-1}

(3) 0.2 Nm^{-1}

(4) 8.0 Nm^{-1}

14. Three liquids of densities ρ_1, ρ_2 and ρ_3 (with $\rho_1 > \rho_2 > \rho_3$), having the same value of surface tension T, rise to the same height in three identical capillaries. The angles of contact θ_1, θ_2 and θ_3 obey

(1) $2^{\pi} > \theta_1 > \theta_2 > \theta_3 \geq 0$

(2) $0 \leq \theta_1 < \theta_2 < \theta_3 < 2^{\pi}$

(3) $2^{\pi} < \theta_1 < \theta_2 < \theta_3 < \pi$

(4) $\pi > \theta_1 > \theta_2 > \theta_3 > 2^{\pi}$

15. Two identical bodies are made of a material for which the heat capacity increases with temperature. One of these is at 100 °C, while the other one is at 0 °C. If the two bodies are brought into contact, then, assuming no heat loss, the final common temperature is

(1) 50 °C

(2) More than 50 °C

(3) Less than 50 °C but greater than 0 °C

(4) 0 °C

16. A body cools from a temperature 3T to 2T in 10 minutes. The room temperature is T. Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next of 10 minutes will be

(1) $\frac{7}{4}$ T

(2) $2^{\frac{3}{}}$ T

(3) $3^{\frac{4}{}}$ T

(4) T

17. One mole of an ideal monatomic gas undergoes a process described by the equation PV^3 = constant. The heat capacity of the gas during this process is

(1) $\frac{3}{2}R$

(2) $\frac{5}{2}R$

(3) 2R

(4) R

18. The temperature inside a refrigerator is t_2 °C and the room temperature is t_1 °C. The amount of heat delivered to the room for each joule of electrical energy consumed ideally will be

(1) $\frac{t_1}{t_1 - t_2}$

(2) $\frac{t_1 + 273}{t_1 - t_2}$

(3) $\frac{t_2 + 273}{t_1 - t_2}$

(4) $\frac{t_1 + t_2}{t_1 + 273}$

19. A given sample of an ideal gas occupies a volume V at a pressure P and absolute temperature T. The mass of each molecule of the gas is m. Which of the following gives the density of the gas?

(1) $P/(kT)$

(2) $Pm/(kT)$

(3) $P/(kTV)$

(4) mkT

20. A body of mass m is attached to the lower end of a spring whose upper end is fixed. The spring has negligible mass. When the mass m is slightly pulled down and released, it oscillates with a time period of 3 s. When the mass m is increased by 1 kg, the time period of oscillations becomes 5 s. The value of m in kg is :

(1) $\frac{3}{4}$

(2) $3\frac{4}{}$

(3) $\frac{16}{9}$

(4) $\frac{9}{16}$

21. The second overtone of an open organ pipe has the same frequency as the first overtone of a closed pipe L meter long. The length of the open pipe will be

(1) L

(2) 2L

(3) $\frac{L}{2}$

(4) 4L

22. Three sound waves of equal amplitudes have frequencies (n – 1), n, (n + 1). They superimpose to give beats. The number of beats produced per second will be

(1) 1

(2) 4

(3) 3

(4) 2

23. An electric dipole is placed at an angle of 30° with an electric field intensity 2×10^5 N/C. It experiences a torque equal to 4 Nm. The charge on the dipole, if the dipole length is 2 cm, is

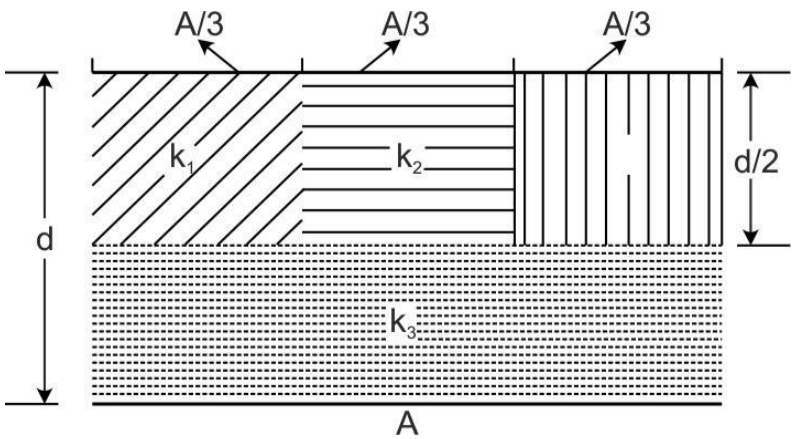
(1) 8 mC

(2) 2 mC

(3) 5 mC

(4) 7 μC

24. A parallel- plate capacitor of area A, plate separation d and capacitance C is filled with four dielectric materials having dielectric constant k_1, k_2, k_3 and k_4 as shown in the figure below. If a single dielectric material is to be used to have the same capacitance C in this capacitor, then its dielectric constant k is given by



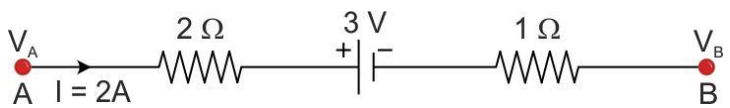
(1) $k = k_1 + k_2 + k_3 + 3k_4$

(2) $k = \frac{2}{3}(k_1 + k_2 + k_3) + 2k_4$

(3) $\frac{2}{k} = \frac{3}{k_1 + k_2 + k_3} + \frac{1}{k_4}$

(4) $\frac{1}{k} = \frac{1}{k_1} + \frac{1}{k_2} + \frac{1}{k_3} + \frac{3}{2k_4}$

25. The potential difference (V_A – V_B) between the points A and B in the given figure is



(1) –3 V
(2) +3 V
(3) +6 V
(4) +9 V

26. A filament bulb (500 W, 100 V) is to be used in a 230 V main supply. When a resistance R is connected in series, it works perfectly and the bulb consumes 500 W. The value of R is

(1) 230 Ω
(2) 46 Ω
(3) 26 Ω
(4) 13 Ω

27. A long wire carrying a steady current is bent into a circular loop of one turn. The magnetic field at the centre of the loop is B. It is then bent into a circular coil of n turns. The magnetic field at the centre of this coil of n turns will be

(1) nB

(2) n^2B

(3) 2nB

(4) $2n^2B$

28. A bar magnet is hung by a thin cotton thread in a uniform horizontal magnetic field and is in equilibrium state. The energy required to rotate it by 60° is W. Now the torque required to keep the magnet in this new position is

(1) $\frac{W}{\sqrt{3}}$

(2) $\sqrt{3}W$

(3) $\frac{\sqrt{3}}{2}$ W

(4) $\frac{2W}{\sqrt{3}}$

29. An electron is moving in a circular path under the influence of a transverse magnetic field of 3.57×10^{-2} T. If the value of e/m is 1.76×10^{11} C/kg, the frequency of revolution of the electron is

(1) 1 GHz

(2) 100 MHz

(3) 62.8 MHz

(4) 6.28 MHz

30. Which of the following combinations should be selected for better tuning of an L-C-R circuit used for communication?

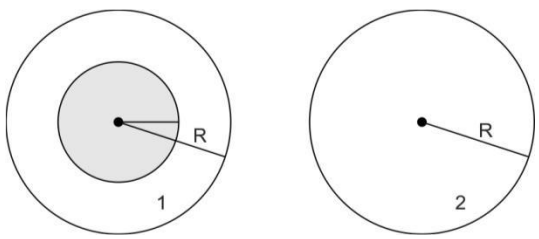
(1) R = 20 Ω, L = 1.5 H, C = 35 μF

(2) R = 25 Ω, L = 2.5 H, C = 45 μF

(3) R = 15 Ω, L = 3.5 H, C = 30 μF

(4) R = 25 Ω, L = 1.5 H, C = 45 μF

31. A uniform magnetic field is restricted within a region of radius r. The magnetic field changes with time at a rate $\frac{d\vec{B}}{dt}$. Loop 1 of radius R > r encloses the region r and loop 2 of radius R is outside the region of magnetic field as shown in the figure below. Then the e.m.f. generated is



(1) Zero in loop 1 and zero in loop 2

(2) $-\frac{d\vec{B}}{dt}(\pi r^2)$ in loop 1 and $-\frac{d\vec{B}}{dt}(\pi r^2)$ in loop 2

(3) $-\frac{d\vec{B}}{dt}(\pi R^2)$ in loop 1 and zero in loop 2

(4) $-\frac{d\vec{B}}{dt}(\pi r^2)$ in loop 1 and zero in loop 2

32. The potential differences across the resistance, capacitance and inductance are 80 V, 40 V and 100 V respectively in an L-C-R circuit. The power factor of this circuit is

(1) 0.4
(2) 0.5
(3) 0.8
(4) 1.0

33. A 100 Ω resistance and a capacitor of 100 Ω reactance are connected in series across a 220 V source. When the capacitor is 50% charged, the peak value of the displacement current is

(1) 2.2 A
(2) 11 A
(3) 4.4 A
(4) $11\sqrt{2}$ A

34. Two identical glass $\left(\mu_g = \frac{3}{2}\right)$ equiconvex lenses of focal length f each are kept in contact. The space between the two lenses is filled with water $\left(\mu_w = \frac{4}{3}\right)$. The focal length of the combination is

(1) $\frac{f}{3}$

(2) f

(3) $\frac{4f}{3}$

(4) $\frac{3f}{4}$

35. An air bubble in a glass slab with refractive index 1.5 (near normal incidence) is 5 cm deep when viewed from one surface and 3 cm deep when viewed from the opposite face. The thickness (in cm) of the slab is

(1) 8

(2) 10

(3) 12

(4) 16

36. The interference pattern is obtained with two coherent light sources of intensity ratio n. In the interference pattern, the ratio, $\frac{I_{max} - I_{min}}{I_{max} + I_{min}}$ will be

(1) $\frac{\sqrt{n}}{n+1}$

(2) $\frac{2\sqrt{n}}{n+1}$

(3) $\frac{\sqrt{n}}{\left(n+1\right)^2}$

(4) $\frac{2\sqrt{n}}{\left(n+1\right)^2}$

37. A person can see clearly objects only when they lie between 50 cm and 400 cm from his eyes. In order to increase the maximum distance of distinct vision to infinity, the type and power of the correcting lens, the person has to use, will be

(1) Convex, + 2.25 diopter

(2) Concave, – 0.25 diopter

(3) Concave, – 0.2 diopter

(4) Convex, + 0.15 diopter

38. A linear aperture whose width is 0.02 cm is placed immediately in front of a lens of focal length 60 cm. The aperture is illuminated normally by a parallel beam of wavelength 5×10^{-5} cm. The distance of the first dark band of the diffraction pattern from the centre of the screen is

(1) 0.10 cm

(2) 0.25 cm

(3) 0.20 cm

(4) 0.15 cm

39. Electrons of mass m with de-Broglie wavelength λ fall on the target in an X-ray tube. The cutoff wavelength (λ_0) of the emitted X-ray is :-

(1) $\lambda_0 = \frac{2mc\lambda^2}{h}$

(2) $\lambda_0 = \frac{2h}{mc}$

(3) $\lambda_0 = \frac{2m^2c^2\lambda^3}{h^2}$

(4) $\lambda_0 = \lambda$

40. Photons with energy 5 eV are incident on a cathode C in a photoelectric cell. The maximum energy of emitted photoelectrons is 2 eV. When photons of energy 6 eV are incident on C, no photoelectrons will reach the anode A, if the stopping potential of A relative to C is:-

(1) +3 V

(2) +4 V

(3) -1 V

(4) -3 V

41. If an electron in a hydrogen atom jumps from the 3rd orbit to the 2nd orbit, it emits a photon of wavelength λ . When it jumps from the 4th orbit to the 3rd orbit, the corresponding wavelength of the photon will be :-

(1) $\frac{16}{25}\lambda$

(2) $\frac{9}{16}\lambda$

(3) $\frac{20}{7}\lambda$

(4) $\frac{20}{13}\lambda$

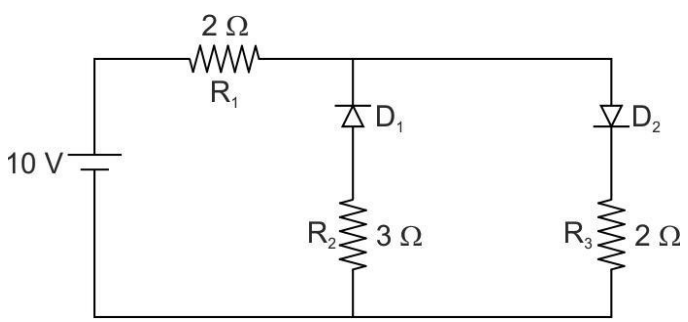
42. The half-life of a radioactive substance is 30 minutes. The time (in minutes) taken between 40% decay and 85% decay of the same radioactive substance is :-

(1) 15
(2) 30
(3) 45
(4) 60

43. For CE transistor amplifier, the audio signal voltage across the collector resistance of 2kΩ is 4 V. If the current amplification factor of the transistor is 100 and the base resistance is 1 kΩ, then the input signal voltage is :-

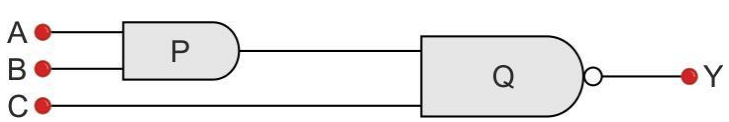
(1) 10mV
(2) 20mV
(3) 30mV
(4) 15mV

44. The given circuit has two ideal diodes connected as shown in the figure below. The current flowing through the resistance R_1 will be



(1) 2.5 A
(2) 10.0 A
(3) 1.43 A
(4) 3.13 A

45. What is the output Y in the following circuit, when all the three inputs A, B, C are first 0 and then 1?



(1) 0, 1
(2) 0, 0
(3) 1, 0
(4) 1, 1

Chemistry

46. Which one of the following compounds shows the presence of intramolecular hydrogen bond?

(1) H_2O_2
(2) HCN
(3) Cellulose
(4) Concentrated acetic acid

47. The molar conductivity of a 0.5 mol/dm^3 solution of $AgNO_3$ with electrolytic conductivity of 5.76×10^{-3} S cm^{-1} at 298 K is

(1) 2.88 S cm^2/mol
(2) 11.52 S cm^2/mol
(3) 0.086 S cm^2/mol
(4) 28.8 S cm^2/mol

48. The decomposition of phosphine (PH_3) on tungsten at low pressure is a first-order reaction. It is because the

(1) rate is proportional to the surface coverage
(2) rate is inversely proportional to the surface coverage
(3) rate is independent of the surface coverage
(4) rate of decomposition is very slow

49. The coagulation values in millimoles per litre of the electrolytes used for the coagulation of As_2S_3 are given below:

a. (NaCl) = 52,
b. II. ($BaCl_2$) = 0.69,
c. ($MgSO_4$) = 0.22

The correct order of their coagulating power is

(1) I > II > III
(2) II > I > III
(3) III > II > I
(4) III > I > II

50. During the electrolysis of molten sodium chloride, the time required to produce 0.10 mol of chlorine gas using a current of 3 amperes is

(1) 55 minutes
(2) 110 minutes
(3) 220 minutes
(4) 330 minutes

51. How many electrons can fit in the orbital for which n = 3 and *l* = 1?

(1) 2
(2) 6
(3) 10
(4) 14

52. For a sample of perfect gas when its pressure is changed isothermally from p_i to p_f, the entropy change is given by

(1) $\Delta S = nR \ln \left| \frac{p_f}{p_i} \right|$

(2) $\Delta S = nR \ln \left| \frac{p_i}{p_f} \right|$

(3) $\Delta S = nRT \ln \left| \frac{p_i}{p_f} \right|$

(4) $\Delta S = RT \ln \left| \frac{p_i}{p_f} \right|$

53. The van't Hoff factor (i) for a dilute aqueous solution of the strong electrolyte barium hydroxide is

(1) 0
(2) 1
(3) 2
(4) 3

54. The percentage of pyridine (C_5H_5N) that forms pyridinium ion ($C_5H_5N^+H$) in a 0.10 M aqueous pyridine solution (K_b for $C_5H_5N = 1.7 \times 10^{-9}$) is

(1) 0.0060%
(2) 0.013%
(3) 0.77%
(4) 1.6%

55. In calcium fluoride, having the fluorite structure, the coordination numbers for calcium ion (Ca^{2+}) and fluoride ion (F^-) are

(1) 4 and 2
(2) 6 and 6
(3) 8 and 4
(4) 4 and 8

56. If the E°cell for a given reaction has a negative value which of the following gives the correct relationships for the values of G° and K_{eq}?

(1) $\Delta G° > 0$; $K_{eq} < 1$
(2) $\Delta G° > 0$; $K_{eq} > 1$
(3) $\Delta G° < 0$; $K_{eq} > 1$
(4) $\Delta G° < 0$; $K_{eq} < 1$

57. Which one of the following is incorrect for ideal solution?
(1) $\Delta H_{mix} = 0$
(2) $\Delta U_{mix} = 0$
(3) $\Delta P = P_{obs} - P_{\text{calculated by Raoult's law}} = 0$
(4) $\Delta G_{mix} = 0$

58. The solubility of $AgCl_{(s)}$ with solubility product 1.6×10^{-10} in 0.1 M NaCl solution would be
(1) 1.25×10^{-5} M
(2) 1.6×10^{-9} M
(3) 1.6×10^{-11} M
(4) zero

59. Suppose the elements X and Y combine to form two compounds XY_2 and X_3Y_2. When 0.1 mole of XY_2 weighs 10 g and 0.05 mole of X_3Y_2 weighs 9 g, the atomic weights of X and Y are
(1) 40, 30
(2) 60, 40
(3) 20, 30
(4) 30, 20

60. The number of electrons delivered at the cathode during electrolysis by a current of 1 ampere in 60 seconds is (charge on electron = 1.60×10^{-19} C)
(1) 6×10^{23}
(2) 6×10^{20}
(3) 3.75×10^{20}
(4) 7.48×10^{23}

61. Boric acid is an acid because its molecule
(1) contains replaceable H^+ ion
(2) gives up a proton
(3) accepts OH^- from water releasing proton
(4) combines with proton from water molecule

62. AlF_3 is soluble in HF only in presence of KF. It is due to the formation of
(1) $K_3[AlF_3H_3]$
(2) $K_3[AlF_6]$
(3) AlH_3
(4) $K[AlF_3H]$

63. Zinc can be coated on iron to produce galvanized iron but the reverse is not possible. It is because
(1) zinc is lighter than iron
(2) zinc has lower melting point than iron
(3) zinc has lower negative electrode potential than iron
(4) zinc has higher negative electrode potential than iron

64. The suspension of slaked lime in water is known as
(1) Lime water
(2) Quicklime
(3) Milk of lime
(4) Aqueous solution of slaked lime

65. The hybridizations of atomic orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ respectively are
(1) sp, sp^3 and sp^2
(2) sp^2, sp^3 and sp
(3) sp, sp^2 and sp^3
(4) sp^2, sp and sp^3

66. Which of the following fluoro-compounds is most likely to behave as a Lewis base?
(1) BF_3
(2) PF_3
(3) CF_4
(4) SiF_4

67. Which of the following pairs of ions is isoelectronic and isostructural?
(1) CO_3^{2-}, NO_3^-
(2) ClO_3^-, CO_3^{2-}
(3) SO_3^{2-},NO_3^-
(4) ClO_3^-, SO_3^{2-}

68. In context with beryllium, which one of the following statements is incorrect?
(1) It is rendered passive by nitric acid.
(2) It forms Be_2C.
(3) Its salts rarely hydrolyze
(4) Its hydride is electron-deficient and polymeric.

69. Hot concentrated sulphuric acid is a moderately strong oxidizing agent. Which of the following reactions does not show oxidizing behavior?
(1) $Cu + 2H_2SO_4 \rightarrow CuSO_4 + SO_2 + 2H_2O$
(2) $3S + 2H_2SO_4 \rightarrow 3SO_2 + 2H_2O$
(3) $C + 2H_2SO_4 \rightarrow CO_2 + 2SO_2 + 2H_2O$
(4) $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

70. Which of the following pairs of d-orbitals will have electron density along the axes?
(1) d_z^2,d_{xz}
(2) d_{xz}, d_{yz}
(3) d_{z^2} , $d_{x^2-y^2}$
(4) d_{xy} , $d_{x^2-y^2}$

71. The correct geometry and hybridization for XeF4 are :

(1) Octahedral, sp^3d^2

(2) Trigonal bipyramidal, sp^3d

(3) Planar triangle, sp^3d^3

(4) Square planar, sp^3d^2

72. Among the following which one is a wrong statement?

(1) PH_5 and $BiCl_5$ do not exist

(2) pπ-dπ bonds are present in SO_2

(3) SeF_4 and CH_4 have same shape

(4) I_3^+ has bent geometry

73. The correct increasing order of trans-effect of the following species is :

(1) $NH_3 > CN^- > Br^- > C_6H_5^-$

(2) $CN^- > C_6H_5^- > Br^- > NH_3$

(3) $Br^- > CN^- > NH_3 > C_6H_5^-$

(4) $CN^- > Br^- > C_6H_5^- > NH_3$

74. Which one of the followng statements related to lanthanons is incorrect?

(1) Europium shows +2 oxidation state.

(2) The basicity decreases as the ionic radius decreases from Pr to Lu.

(3) All the lanthanons are much more reactive than aluminium

(4) Ce(+4) solutions are widely used as oxidizing agent in volumetric analysis

75. Jahn-Teller effect not observed in high spin complexes of :-

(1) d^7

(2) d^8

(3) d^4

(4) d^9

76. Which of the following can be used as halide component for Friedel-Crafts reaction?

(1) Chlorobenzene

(2) Bromobenzene

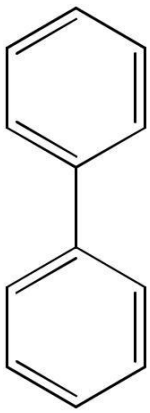
(3) Chloroethene

(4) Isopropyl chloride

77. In which of the following molecules, atoms are coplanar?

(1)

(2)



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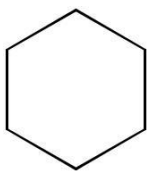

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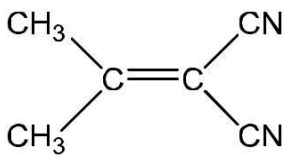
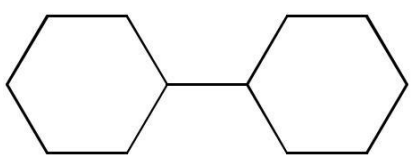
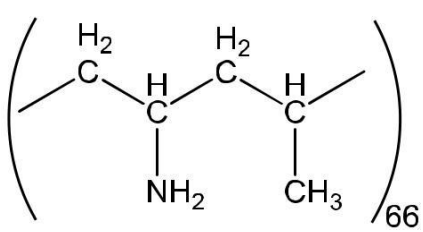


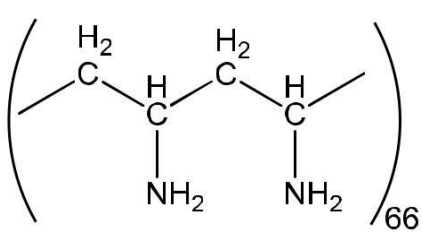


78. Which one of the following structures represents nylon 6,6 polymer?

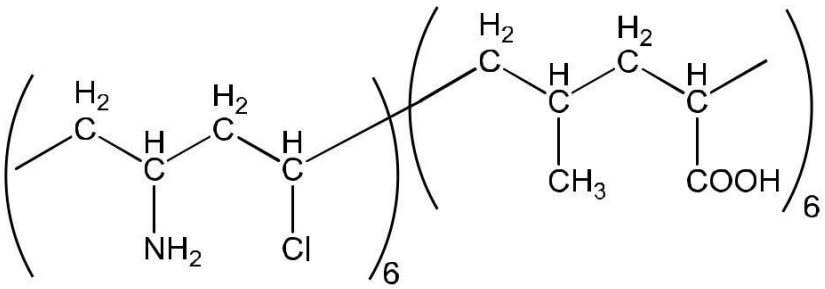
(1)



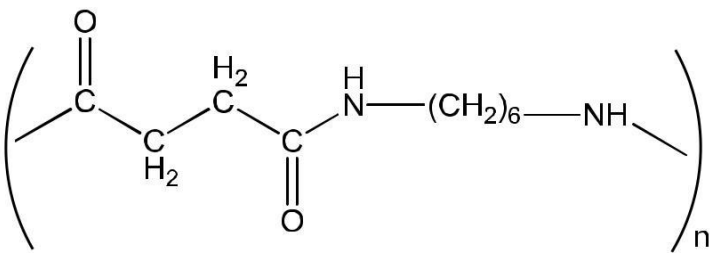
(2)



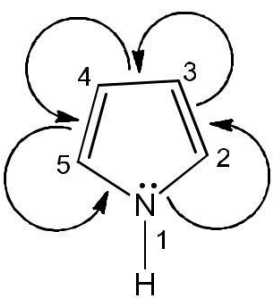
(3)



(4)



79. In pyrrole



the electron density is maximum on

(1) 2 and 3

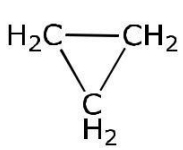
(2) 3 and 4

(3) 2 and 4

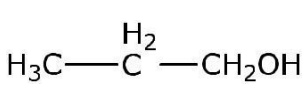
(4) 2 and 5

80. Which of the following compounds shall not produce propene by reaction with HBr followed by elimination or direct only elimination reaction?

(1)



(2)



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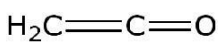
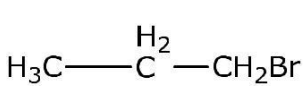
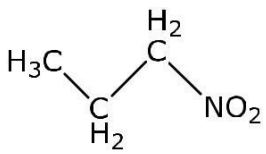


(4)

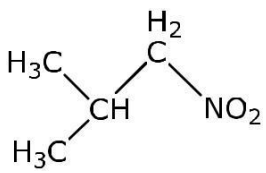


81. Which one of the following nitro-compounds **does not** react with nitrous acid?

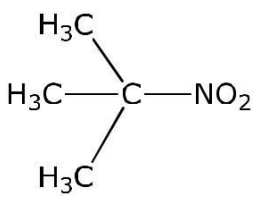
(1)



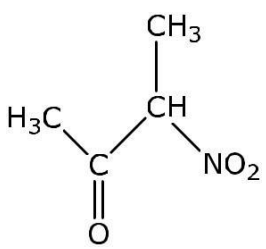
(2)



(3)



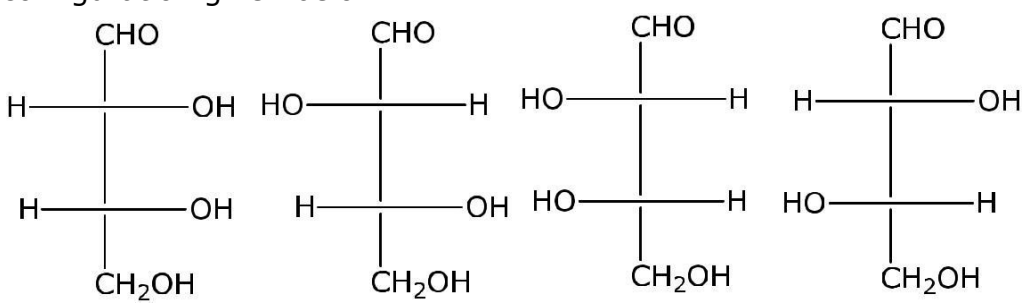
(4)



82. The central dogma of molecular genetics states that the genetic information flows from

(1) Amino acids → Proteins → DNA
(2) DNA → Carbohydrates → Proteins
(3) DNA → RNA → Proteins
(4) DNA → RNA → Carbohydrates

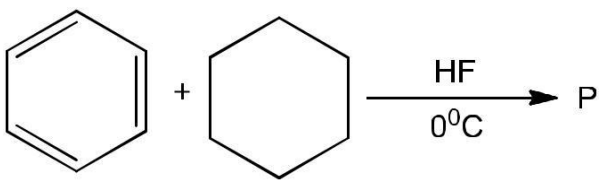
83. The **correct** corresponding order of names of following aldoses with configuration given below



respectively, is

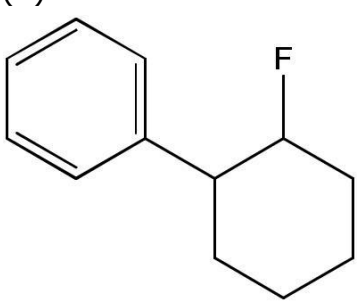
(1) L-erythrose, L-threose, L-erythrose, D-threose
(2) D-threose, D-erythrose, L-threose, L-erythrose
(3) L-erythrose, L-threose, D-erythrose, D-threose
(4) D-erythrose, D-threose, L-erythrose, L-threose

84. In the given reaction

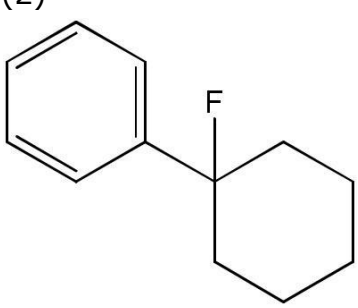


the product P is

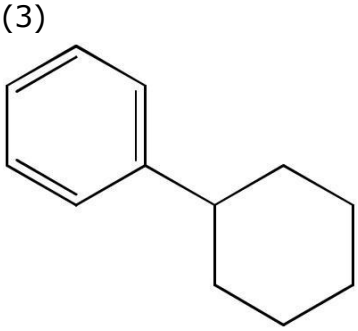
(1)



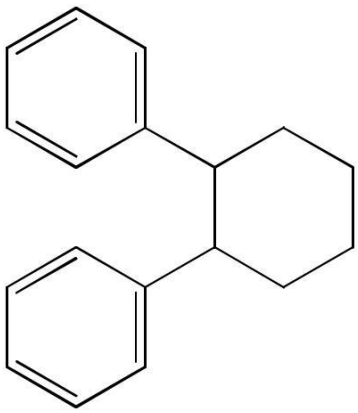
(2)



(3)

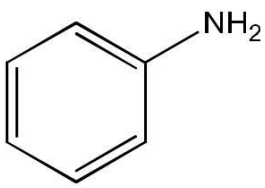


(4)

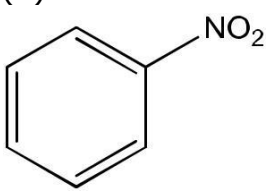


85. A given nitrogen containing aromatic compound aromatic A reacts with Sn/HCl, followed by HNO_2 to give an unstable compound B. B, on treatment with phenol, forms a beautiful coloured compound C with the molecular formula $C_{12}H_{10}N_2O$. The structure of the compound A is

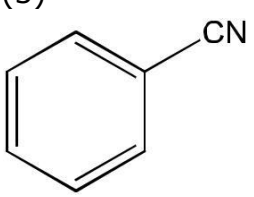
(1)



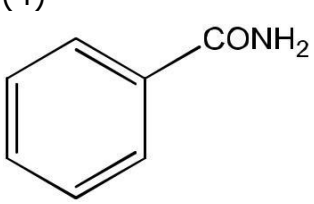
(2)



(3)



(4)



86. Consider the reaction

$CH_3\text{-}CH_2\text{-}CH_2\text{-}Br + NaCN \rightarrow CH_3 - CH_2 - CH_2 - CN + NaBr$

The reaction will be the fastest in

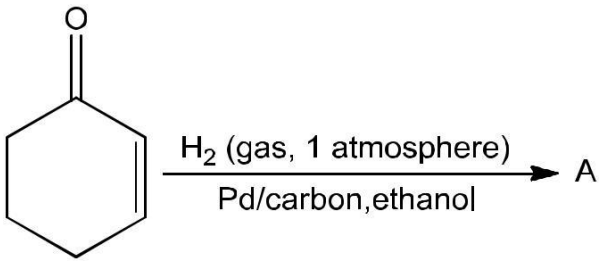
(1) ethanol

(2) methanol

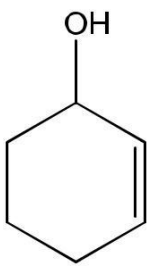
(3) N, N' –dimethylformamide (DMF)

(4) water

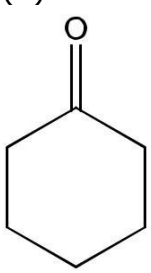
87. The correct structure of the product A formed in the reaction



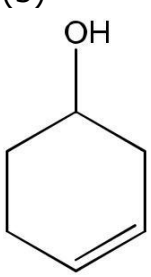
(1)



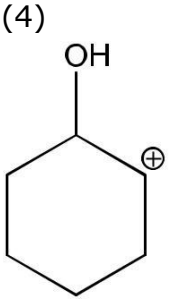
(2)



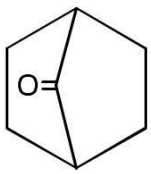
(3)



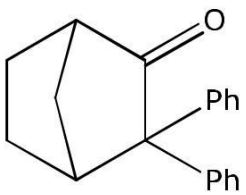
(4)



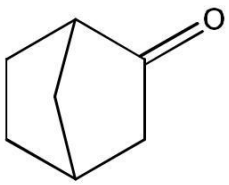
88. Which among the given molecules can exhibit tautomerism?



I



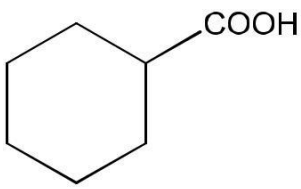
II



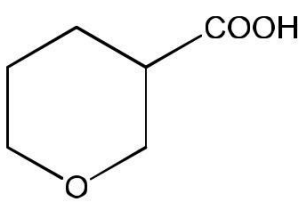
III

(1) III only
(2) Both I and III
(3) Both I and II
(4) (Both II and III

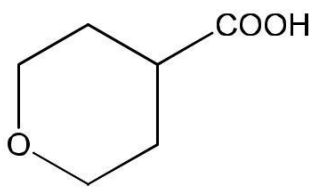
89. The correct order of the strengths of the carboxylic acids



(I)



(II)



(III)

(1) I> II >III
(2) II > III > I
(3) III > II > I
(4) II > I > II

90. The compound that will react most readily with gaseous bromine has the formula?

(1) C_3H_6
(2) C_2H_2
(3) C_4H_{10}
(4) C_2H_4

Biology

91. Which one of the following is **wrong** for fungi?

(5) They are eukaryotic.
(6) All fungi possess a purely cellulosic cell wall.
(7) They are heterotrophic.
(8) They are both unicellular and multicellular.

92. Methanogens belong to

(1) Eubacteria
(2) Archaebacteria
(3) Dinoflagellates
(4) Slime moulds

93. Select the **wrong** statement.
(1) The walls of diatoms are easily destructible.
(2) 'Diatomaceous earth' is formed by the cell wall of diatoms.
(3) Diatoms are chief producers in the ocean.
(4) Diatoms are microscopic and float passively in water.

94. The label of a herbarium sheet **does not** carry information on
(1) date of collection
(2) name of collector
(3) local names
(4) height of the plant

95. Conifers are adapted to tolerate extreme environmental conditions because of
(1) broad hardy leaves
(2) superficial stomata
(3) thick cuticle
(4) presence of vessels

96. Which one of the following statements is **wrong**?
(1) Algae increase the level of dissolved oxygen in the immediate environment.
(2) Algin is obtained from red algae, and carrageenan from brown algae.
(3) Agar-agar is obtained from *Gelidium* and *Gracilaria*.
(4) *Laminaria* and *Sargassum* are used as food.

97. The term 'polyadelphous' is related to
(1) gynoecium
(2) androecium
(3) corolla
(4) calyx

98. How many plants among *Indigofera*, *Sesbania*, *Salvia*, *Allium*, *Aloe*, mustard, groundnut, radish, gram and turnip have stamens with different lengths in their flowers?
(1) Three
(2) Four
(3) Five
(4) Six

99. Radial symmetry is found in the flowers of
(1) *Brassica*
(2) *Trifolium*
(3) *Pisum*
(4) *Cassia*

100. Free-central placentation is found in
(1) *Dianthus*
(2) *Argemone*
(3) *Brassica*
(4) *Citrus*

101. Cortex is the region found between
(1) epidermis and stele
(2) pericycle and endodermis
(3) endodermis and pith
(4) endodermis and vascular bundle

102. The balloon-shaped structures called tyloses
(1) lysozyme
(2) ribozyme
(3) ligase
(4) deoxyribonuclease

103. A non-proteinaceous enzyme is
(1) Stroma
(2) Lumen of thylakoids
(3) Inter membrane space
(4) Antennae complex

104. Select the **mismatch**.
(1) Gas vacuoles - Green bacteria
(2) Large central vacuoles - Animal cells
(3) Protists - Eukaryotes
(4) Methanogens - Prokaryotes

105. Select the **wrong** statement.
(1) Bacterial cell wall is made up of peptidoglycan.
(2) Pili and fimbriae are mainly involved in motility of bacterial cells.
(3) Cyanobacteria lack flagellated cells.
(4) Mycoplasma is a wall-less microorganism.

106. A cell organelle containing hydrolytic enzymes is
(1) lysosome
(2) microsome
(3) ribosome
(4) mesosome

107. During cell growth, DNA synthesis takes place in
(1) S Phase
(2) G_1 phase
(3) G_2 phase
(4) M phase

108. Which of the following biomolecules is common to respiration-mediated breakdown of fats, carbohydrates and proteins?
(1) Glucose-6-phosphate
(2) Fructose 1,6-bisphosphate
(3) Pyruvic acid
(4) Acetyl CoA

109. A few drops of sap were collected by cutting across a plant stem by a suitable method. The sap was tested chemically. Which one of the following test results indicates that it is phloem sap?
(1) Acidic
(2) Alkaline
(3) Low refractive index
(4) Absence of sugar

110. You are given a tissue with its potential for differentiation in an artificial culture. Which of the following pairs of hormones would you add to the medium to secure shoots as well as roots?
(1) IAA and gibberellins
(2) Auxin and cytokinin
(3) Auxin and abscisic acid
(4) Gibberellin and abscisic acid

111. Phytochrome is a
(1) flavoprotein
(2) glycoprotein
(3) lipoprotein
(4) chromoprotein

112. Which is essential for the growth of root tip?
(1) Zn
(2) Fe
(3) Ca
(4) Mn

113. The process which makes major difference between C_3 and C_4 plants is
(1) glycolysis
(2) Calvin cycle
(3) photorespiration
(4) respiration

114. Which one of the following statements is not correct?
(1) Offspring produced by the asexual reproduction are called clone.
(2) Microscopic, motile asexual reproductive structures are called zoospores.
(3) In potato, banana and ginger, the plantlets arise from the internodes present in the modified stem.
(4) Water hyacinth, growing in the standing water, drains oxygen from water that leads to the death of fishes.

115. Which one of the following generates new genetic combinations leading to variation?
(1) Vegetative reproduction
(2) Parthenogenesis
(3) Sexual reproduction
(4) Nucellar polyembryony

116. Match **Column-I** with **Column-II** and select the correct option using the codes given below:

Column-I	**Column-II**
a. Pistils fused together	(i) Gametogenesis
b. Formation of gametes	(ii) Pistillate
c. Hyphae of higher ascomycetes	(iii) Syncarpous
d. Unisexual female flower	(iv) Dikaryotic

Codes:

	a	**b**	**c**	**d**
(1)	(iv)	(iii)	(i)	(ii)
(2)	(ii)	(i)	(iv)	(iii)
(3)	(i)	(ii)	(iv)	(iii)
(4)	(iii)	(i)	(iv)	(ii)

117. In majority of angiosperms
(1) egg has a filiform apparatus
(2) there are numerous antipodal cells
(3) reduction division occurs in the megaspore mother cells
(4) a small central cell is present in the embryo sac

118. Pollination in water hyacinth and water lily is brought about by the agency of
(1) water
(2) insects or wind
(3) birds
(4) bats

119. The ovule of an angiosperm is technically equivalent to
(1) megasporangium

(2) megasporophyll
(3) megaspore mother cell
(4) megaspore

120. Taylor conducted the experiments to prove semiconservative mode of chromosome replication on
(1) *Vinca rosea*
(2) *Vicia faba*
(3) *Drosophila melanogaster*
(4) *E. coli*

121. The mechanism that causes a gene to move from one linkage group to another is called
(1) Inversion
(2) Duplication
(3) Translocation
(4) Crossing over

122. The equivalent of a structural gene is
(1) Mutation
(2) Cistron
(3) Operon
(4) Recon

123. A true breeding plant is
(1) One that is able to breed on its own
(2) Produced due to cross pollination among unrelated plants
(3) Near homozygous and produces offspring of its own kind
(4) Always homozygous recessive in its genetic constitution

124. Which of the following rRNAs acts as structural RNA as well as ribozyme in bacteria?
(1) 5S rRNA
(2) 18S rRNA
(3) 23S rRNA
(4) 5.8S rRNA

125. Stirred tank bioreactors have been designed for
(1) Purification of product
(2) Addition of preservatives to the product
(3) Availability of oxygen throughout the process
(4) Ensuring anaerobic conditions in the culture vessel

126. A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using

(1) *Eco R1*
(2) *Taq Polymerase*
(3) *Polymerase III*
(4) ligase

127. Which of the following is not a component of downstream processing?
(1) Separation
(2) Purification
(3) Preservation
(4) Expression

128. Which of the following restriction enzymes produce blunt ends?
(1) *Sal* I
(2) *Eco* RV
(3) *Xho* I
(4) *Hind* III

129. Which kind of therapy was given in 1990 to a four year old girl with adenosine deaminase (ADA) deficiency?
(1) Gene therapy
(2) Chemotherapy
(3) Immunotherapy
(4) Radiation therapy

130. How many hot spots of biodiversity in the world have been identified till date by Norman Myers?
(1) 17
(2) 25
(3) 34
(4) 43

131. The primary producers of deep-sea hydrothermal vent ecosystem are
(1) Green algae
(2) Chemosynthetic bacteria
(3) Blue green algae
(4) Coral reefs

132. Which of the following is corrent for *r*-selected species?
(1) Large number of progeny with small size
(2) Large number of progeny with large size
(3) Small number of progeny with small size
(4) Small number of progeny with large size

133. If '+' sign is assigned to beneficial interactions, '-' sign to detrimental and '0' sign to neutral interactions, then the population interaction represented by '+' '-' refers to

(1) Mutualism
(2) Amensalism
(3) Commensalism
(4) Parasitism

134. Which of the following is correctly matched?
(1) Aerenchyma – *Opuntia*
(2) Age pyramid – Biome
(3) *Parthenium hysterophorus* – Threat to biodiversity
(4) Stratification – population

135. Red list contains data or information on
(1) all economically important plants
(2) Plants whose products are in international trade
(3) threatened species
(4) marine vertebrates only

136. Which of the following sets of diseases is caused by bacteria?
(1) Cholera and tetanus
(2) Typhoid and smallpox
(3) Tetanus and mumps
(4) Herpes and influenza

137. Match Column-I with Column-II for housefly classification and select the correct option using the codes given below:

Column I	**Column II**
a. Family	(i) Diptera
b. Order	(ii) Arthropoda
c. Class	(iii) Muscidae
d. Phylum	(iv) Insecta

	a	**b**	**c**	**d**
(1)	(iii)	(i)	(iv)	(ii)
(2)	(iii)	(ii)	(iv)	(i)
(3)	(iv)	(iii)	(ii)	(i)
(4)	(iv)	(ii)	(i)	(iii)

138. Choose the correct statement
(1) All mammals are viviparous
(2) All cyclostomes do not possess jaws and paired fins
(3) All reptiles have a three chambered heart
(4) All Pisces have gills covered by an operculum

139. Study the four statements (A-D) given below and select the two correct ones out of them:

A. Definition of biological species was given by Ernst Mayr
B. Photoperiod does not affect reproduction in plants
C. Binomial nomenclature system was given by R. H. Whittaker
D. In unicellular organisms, reproduction is synonymous with growth The two correct statements are

(1) B and C
(2) C and D
(3) A and D
(4) A and B

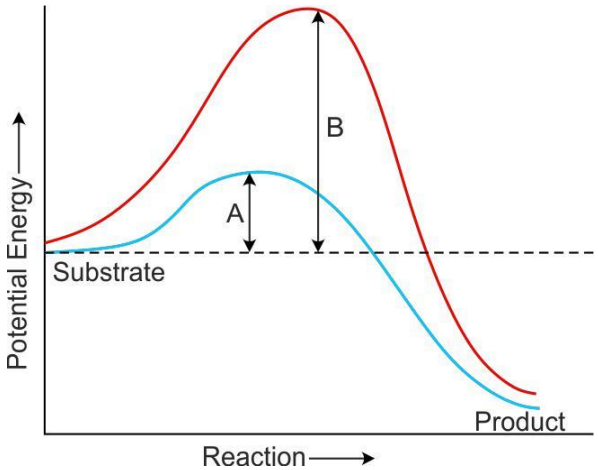
140. In male cockroaches, sperms are stored in which part of the reproductive system?
(1) Seminal vesicles
(2) Mushroom glands
(3) Testes
(4) Vas deferens

141. Smooth muscles are
(1) Involuntary, fusiform, non-striated
(2) Voluntary, multinucleate, cylindrical
(3) Involuntary, cylindrical, striated
(4) Voluntary, spindle shaped, uninucleate

142. Oxidative phosphorylation is
(1) Formation of ATP by transfer of phosphate group from a substrate to ADP
(2) Oxidation of phosphate group in ATP
(3) Addition of phosphate group to ATP
(4) Formation of ATP by energy released from electrons removed during substrate oxidation

143. Which of the following is the least likely to be involved in stabilizing the three dimensional folding of most proteins?
(1) Hydrogen bonds
(2) Electrostatic interaction
(3) Hydrophobic interaction
(4) Ester bonds

144. Which of the following describes the given graph correctly?



(1) Endothermic reaction with energy A in presence of enzyme and B in absence of enzyme
(2) Exothermic reaction with energy A in presence of enzyme and B in absence of enzyme
(3) Endothermic reaction with energy A in absence of enzyme and B in presence of enzyme
(4) Exothermic reaction with energy A in absence of enzyme and B in presence of enzyme

145. When cell has stalled DNA replication fork, which checkpoint should be predominantly activated?

(1) G_1/S
(2) G_2/M
(3) M
(4) Both G_2/M and M

146. Match the stages of meiosis in column I to their characteristic feature in column II and select the correct option using the codes given below:

Column I	Column II
a. Pachytene	i. Paring of homologous chromosomes
b. Metaphase I	ii. Termination of chiasmata
c. Diakinesis	iii. Crossing over takes place
d. Zygotene	iv. Chromosomes align at equatorial plate

Codes:

	a	**b**	**c**	**d**
(1)	(iii)	(iv)	(ii)	(i)
(2)	(i)	(iv)	(ii)	(iii)
(3)	(ii)	(iv)	(iii)	(i)
(4)	(iv)	(iii)	(ii)	(i)

147. Which hormones do stimulate the production of pancreatic juice and bicarbonate?

(1) Angiotensin and epinephrine
(2) Gastrin and insulin
(3) Cholecystokinin and secretin
(4) Insulin and Glucagon

148. The partial pressure of oxygen in the alveoli of the lungs is

(1) equal to that in the blood
(2) more than that in the blood
(3) less than that in the blood
(4) less than that of the carbon dioxide

149. Choose the correct statement.

(1) Nociceptors respond to changes in pressure
(2) Meissner's corpuscles are thermoreceptors
(3) Photoreceptors in the human eye are depolarized during darkness and become hyperpolarized in response to the light stimulus
(4) Receptors do not produce graded potentials

150. Grave's disease is caused due to

(1) hyposecretion of thyroid gland
(2) hypersecretion of thyroid gland
(3) hyposecretion of adrenal gland
(4) hypersecretion of adrenal gland

151. Name the ion responsible for unmasking of active sites for myosin for cross-bridge activity during muscle contraction.

(1) Calcium
(2) Magnesium
(3) Sodium
(4) Potassium

152. Name the blood cells, whose reduction in number can cause clotting disorder, leading to excessive loss of blood from the body.

(1) Erythrocytes
(2) Leucocytes
(3) Neutrophils
(4) Thrombocytes

153. Name a peptide hormone which acts mainly on hepatocytes, adipocytes and enhances cellular glucose uptake and utilization.

(1) Insulin
(2) Glucagon

(3) Secretin
(4) Gastrin

154. Osteoporosis, age-related disease of skeletal system, may occur due to
(1) immune disorder affecting neuro-muscular junction leading to fatigue
(2) high concentration of Ca^{++} and Na^{+}
(3) decreased level of estrogen
(4) accumulation of uric acid leading to inflammation of joints

155. Serum differs from blood in
(1) lacking globulins
(2) lacking albumins
(3) lacking clotting factors
(4) lacking antibodies

156. Lungs do not collapse between breaths and some air always remains in the lungs which can never be expelled because
(1) there is a negative pressure in the lungs
(2) there is negative intrapleural pressure pulling at the lung walls
(3) there is a positive intrapleural pressure
(4) pressure in the lungs is higher than the atmospheric pressure

157. The posterior pituitary gland is not a 'true' endocrine gland because
(1) it is provided with a duct
(2) it only stores and release hormones
(3) it is under the regulation of hypothalamus
(4) it secretes enzymes

158. The part of nephron involved in active reabsorption of sodium is
(1) distal convoluted tubule
(2) proximal convoluted tubule
(3) Bowman's capsule
(4) descending limb of Henle's loop

159. Which of the following is hormone-releasing IUD?
(1) LNG-20
(2) Multiload 375
(3) Lippes loop
(4) Cu7

160. Which of following incorrect regarding **vasectomy**?
(1) No sperm occurs in seminal fluid
(2) No sperms occurs in epididymis
(3) Vasa deferentia is cut and died
(4) Irreversible sterility

161. Embryo with more than 16 blastomeres formed due to *in vitro* fertilization is transferred into

(1) uterus
(2) fallopian tube
(3) fimbriae
(4) cervix

162. Which of the following depicts the **correct** pathway of transport of sperms?

(1) Rete testis → Efferent ductules → Epididymis → Vas deferens
(2) Rete testis → Epididymis → Efferent ductules → Vas deferens
(3) Rete testis → Vas deferens → Efferent ductules → Epididymis
(4) Efferent ductules → Rete testis → Vas deferens → Epididymis

163. Match Column-I with Column-II and select the correct option using the codes given below:

Column I	**Column II**
a. Mons pubis	(i) Embryo formation
b. Antrum	(ii) Sperm
c. Trophectoderm	(iii) Female external genitalia
d. Nebenkern	(iv) Graafian follicle

	a	**b**	**c**	**d**
(1)	(iii)	(iv)	(ii)	(i)
(2)	(iii)	(iv)	(i)	(ii)
(3)	(iii)	(i)	(iv)	(ii)
(4)	(i)	(iv)	(iii)	(iii)

164. Several hormones likes hCG, hPL, estrogen, progesterone are produced by

(1) Ovary
(2) Placenta
(3) Fallopian tube
(4) Pituitary

165. If a colour-blind man marries a woman who is homozygous for normal vision, the probability of their son being colour blind is

(1) 0
(2) 0.5
(3) 0.75
(4) 1

166. Genetic drift operates in:

(1) Small isolated population
(2) Large isolated population
(3) Non-reproductive population
(4) Slow reproductive population

167. In Hardy-Weinberg equation, the frequency of heterozygous individuals is represented by

(1) p^2
(2) $2pq$
(3) pq
(4) q^2

168. The chronological order of human evolution from early to the recent is

(1) *Australopithecus* → *Ramapithecus* → *Homo habilis* → *Homo erectus*
(2) *Ramapithecus* → *Australopithecus* → *Homo habilis* → *Homo erectus*
(3) *Ramapithecus* → *Homo habilis* → *Australopithecus* → *Homo erectus*
(4) *Australopithecus* → *Homo habilis* → *Ramapithecus* → *Homo erectus*

169. Which of the following is the **correct** sequence of events in the origin of life?

I. Formation of protobionts
II. Synthesis of organic monomers
III. Synthesis of organic polymers
IV. Formation of DNA-based genetic systems

(1) I, II, III, IV
(2) I, III, II, IV
(3) II, III, I, IV
(4) II, III, IV, I

170. A molecule that can act as a genetic material must fulfill the traits given below, except

(1) It should be able to express itself in the form of 'Mendelian characters'
(2) It should be able to generate its replica
(3) It should be unstable structurally and chemically
(4) It should provide the scope for slow changes that are required for evolution

171. DNA-dependent RNA polymerase catalyzes transcription on one strand of the DNA which is called the

(1) template strand
(2) coding strand
(3) alpha strand
(4) antistrand

172. Interspecific hybridization is the mating of

(1) animals within same breed without having common ancestors
(2) two different related species
(3) superior males and females of different breeds
(4) more closely related individuals within same breed for 4—6 generations

173. Which of the following is **correct** regarding AIDS causative agent HIV?

(1) HIV is enveloped virus containing one molecule of single-stranded RNA and one molecule of reverse transcriptase
(2) HIV is enveloped virus that contains two identical molecules of single-stranded RNA and two molecules of reverse transcriptase
(3) HIV is unenveloped virus
(4) HIV does not escape but attacks the acquired immune response

174. Among the following edible fishes, which one is a marine fish having rich source of omega-3 fatty acids?

(1) Mystus
(2) Mangur
(3) Mrigala
(4) Mackerel

175. Match Column-I with Column-II and select the correct option using the codes given below:

Column I	**Column II**
a. Citric acid	*(i) Trichoderma*
b. Cyclosporin A	*(ii) Clostridium*
c. Statins	*(iii) Apsergillus*
d. Butyric acid	*(iv) Monascus*

	a	**b**	**c**	**d**
(1)	(iii)	(i)	(ii)	(iv)
(2)	(iii)	(i)	(iv)	(ii)
(3)	(i)	(iv)	(ii)	(iii)
(4)	(iii)	(iv)	(i)	(ii)

176. Biochemical Oxygen Demand (BOD) may not be a good index for pollution for water bodies receiving effluents from

(1) Domestic sewage
(2) Dairy industry
(3) Petroleum industry
(4) Sugar industry

177. The principle of competitive exclusion was stated by

(1) C. Darwin
(2) G. F. Gause

(3) MacArthur
(4) Verhulst and Pearl

178. Which of the following National Parks is home to the famous musk deer or hangul?
(1) Keibul Lamjao National Park, Manipur
(2) Bandhavgarh National Park, Madhya Pradesh
(3) Eaglenest Wildlife Sanctuary, Arunachal Pradesh
(4) Dachigam National Park, Jammu & Kashmir

179. A lake which is rich in organic waste may result in
(1) Increased population of aquatic organisms due to minerals
(2) Drying of the lake due to algal bloom
(3) Increased population of fish due to lots of nutrients
(4) Mortality of fish due to lack of oxygen

180. The highest DDT concentration in aquatic food chain shall occur in
(1) Phytoplankton
(2) Seagull
(3) Crab
(4) Eel

NEET – 2016 (Phase 2)
(Physics, Chemistry and Biology)
Code – AA
Answer Key and Solution

Answer Key

1	**1**	2	**4**	3	**3**	4	**1**	5	**3**	6	**2**	7	**3**	8	**3**	9	**2**	10	**1**
11	**2**	12	**2**	13	**2**	14	**2**	15	**2**	16	**2**	17	**4**	18	**2**	19	**2**	20	**4**
21	**2**	22	**4**	23	**2**	24	**3**	25	**4**	26	**3**	27	**2**	28	**2**	29	**1**	30	**3**
31	**4**	32	**3**	33	**1**	34	**4**	35	**3**	36	**2**	37	**2**	38	**4**	39	**1**	40	**4**
41	**3**	42	**4**	43	**2**	44	**1**	45	**3**	46	**3**	47	**2**	48	**1**	49	**3**	50	**1**
51	**1**	52	**2**	53	**4**	54	**2**	55	**3**	56	**1**	57	**4**	58	**2**	59	**1**	60	**3**
61	**3**	62	**2**	63	**4**	64	**3**	65	**3**	66	**2**	67	**1,4**	68	**3**	69	**4**	70	**3**
71	**1**	72	**3**	73	**2**	74	**3**	75	**2**	76	**4**	77	**1**	78	**4**	79	**4**	80	**3**
81	**3**	82	**3**	83	**4**	84	**3**	85	**2**	86	**3**	87	**2**	88	**1**	89	**2**	90	**1**
91	**2**	92	**2**	93	**1**	94	**4**	95	**3**	96	**2**	97	**2**	98	**2**	99	**1**	100	**1**
101	**1**	102	**3**	103	**2**	104	**2**	105	**2**	106	**1**	107	**1**	108	**4**	109	**2**	110	**2**
111	**4**	112	**3**	113	**3**	114	**3**	115	**3**	116	**4**	117	**3**	118	**2**	119	**3**	120	**2**
121	**3**	122	**2**	123	**3**	124	**3**	125	**3**	126	**4**	127	**4**	128	**2**	129	**1**	130	**3**
131	**2**	132	**1**	133	**4**	134	**3**	135	**3**	136	**1**	137	**1**	138	**2**	139	**3**	140	**1**
141	**1**	142	**4**	143	**4**	144	**2**	145	**1**	146	**1**	147	**3**	148	**2**	149	**3**	150	**2**
151	**1**	152	**4**	153	**1**	154	**3**	155	**3**	156	**2**	157	**2**	158	**2**	159	**1**	160	**2**
161	**1**	162	**1**	163	**2**	164	**2**	165	**1**	166	**1**	167	**2**	168	**2**	169	**3**	170	**3**
171	**1**	172	**2**	173	**2**	174	**4**	175	**2**	176	**3**	177	**2**	178	**4**	179	**4**	180	**2**

Physics

1. $\frac{\sqrt{hG}}{c^{3/2}}$

Let the length be related to h, c and G as $l = h^x c^y G^z$

Now, we know that the dimensions of Planck's constant h are $[h] = [M^1L^2T^{-1}]$.

Similarly, the dimensions of speed of light c are $[c] = [M^0L^1T^{-1}]$ and that of Newton's gravitational constant G are $[M^{-1}L^3T^{-2}]$.

Now, the dimensions of length are $[M^0L^1T^0]$

Therefore, we get

$$[l] = [h]^x [c]^y [G]^z$$

$$\therefore [M^0L^1T^0] = [M^1L^2T^{-1}]^x [M^0L^1T^{-1}]^y [M^{-1}L^3T^{-2}]^z$$

$$\therefore [M^0L^1T^0] = [M^{x-z}L^{2x+y+3z}T^{-x-y-2z}]$$

Comparing the powers, we get

$x - z = 0$ ..... (1)

$2x + y + 3z = 1$ ..... (2)

$-x - y - 2z = 0$ ..... (3)

From equation (1), we get

$x = z$ ..... (4)

From equations (3) and (4), we get

$-x - y - 2x = 0$

$\therefore y = -3x$ ..... (5)

Hence, from equations (2) and (5), we get

$2x - 3x + 3x = 1$

$\therefore x = \frac{1}{2}$

$\therefore z = \frac{1}{2}$

$\therefore y = -\frac{3}{2}$

Hence, the equation for length is

$$l = h^{\frac{1}{2}} c^{-\frac{3}{2}} G^{\frac{1}{2}} = \frac{\sqrt{hG}}{c^{3/2}}$$

2. $\frac{f-a}{2(1+b)}$

The positions of both the cars P and Q are

$x_P(t) = at + bt^2$

$x_Q(t) = ft - t^2$

Therefore, the velocities are:

$v_P = \frac{dx}{dt}_P = a + 2bt$

$v_Q = \frac{dx}{dt}_Q = f - 2t$

The cars are to have the same velocity. So, we get

$v_P = v_Q$

$\therefore a + 2bt = f - 2t$

$\therefore 2bt + 2t = f - a$

$\therefore 2t(b+1) = f - a$

$\therefore t = \frac{f-a}{2(1+b)}$

3. 5.7 m/s

The total acceleration of the particle is a = 15 m/s^2.

The angle made by the acceleration with the radius is $\theta = 30°$

Therefore, the centripetal acceleration is

$a_c = a\cos\theta = 15\cos 30 = \frac{15\sqrt{3}}{2}$

The centripetal acceleration is

$a_c = \frac{v^2}{R}$

$\therefore v^2 = Ra_c$

$\therefore v^2 = 2.5 \times \frac{15\sqrt{3}}{\sqrt{}} = \_32.47\_2$

$\therefore v = \sqrt{32.47} = 5.7$ m/s

4. mV

The momentum of the ball can be divided into components as

$\Delta V = V_f - V_i$

$\therefore \Delta V = \left(-V\cos 60\hat{i} - V\sin 60\hat{j}\right) - \left(V\cos 60\hat{i} - V\sin 60\hat{j}\right)$

$\therefore \Delta V = -2V\cos 60\hat{i}$

Impulse is related to change in velocity as

$I = |\Delta P| = m|\Delta V| = m(2V\cos 60) = 2mV \times \frac{1}{2} = mV$

5. 120 m/s

The system is shown below.

The bullet strikes the stationary block and then leaves the block horizontally. Hence, applying the law of conservation of linear momentum, we get

$mu + M(0) = Mv_1 + mv_2$

Now, the block is raised by a height h, and hence, it gains potential energy. This potential energy results in kinetic energy of the block.

$Mgh = \frac{1}{2} Mv_1^2$

$\therefore v_1 = \sqrt{2gh}$

$\therefore mu = M\sqrt{2gh} + mv_2$

$\therefore v_2 = \frac{mu - M\sqrt{2gh}}{m}$

$\therefore v_2 = \frac{10 \times 10^{-3} \times 400 - \left(2 \times \sqrt{2 \times 9.8 \times 0.1}\right)}{10 \times 10^{-3}}$

$\therefore v_2 = \frac{4 - 2.8}{10 \times 10^{-3}} = 120 \text{ m/s}$

6. 0.5 m/s and –0.3 m/s

Initially v_A = 0.5 m/s and v_B = –0.3 m/s

They are ideas and they collide elastically. Therefore their velocities will be interchanged after collision.

v_B = 0.5 m/s and v_A = –0.3 m/s

7. 5 J

The displacement of the particle is

$\vec{s}_2 - \vec{s}_1 = 4\hat{j} + 3\hat{k} - \left(-2\hat{i} + 5\hat{j}\right) = 2\hat{i} - \hat{j} + 3\hat{k}$ Therefore, the work done is

$W = \vec{F} \cdot \vec{s}$

$\therefore W = \left(4\hat{i} + 3\hat{j}\right) \cdot \left(2\hat{i} - \hat{j} + 3\hat{k}\right)$

$\therefore W = 4 \times 2 + 3 \times (-1) = 8 - 3 = 5\ J$

8. $L_B > L_A$

The kinetic energy of rotating bodies is $K = \frac{L^2}{2I}$

$\because K_A = K_B$

$\therefore \frac{L^2_A}{2I_A} = \frac{L^2_B}{2I_B}$

$\therefore \frac{L^2_A}{L^2_B} = \frac{I_A}{I_B}$

It is given that $I_B > I_A$

$\therefore L_B > L_A$

9. 1:5

For the sphere:

Mass = m; radius = R

For the cylinder:

Mass = m; radius = R

Moment of inertia of the sphere is

$I_{sphere} = \frac{2}{5}mR^2$

Moment of inertia of the cylinder is

$I_{cylinder} = \frac{1}{2}mR^2$

Now, the kinetic energy is

$E = \frac{1}{2} I\omega^2$

$\therefore \frac{E_{sphere}}{E_{cylinder}} = \frac{\frac{1}{2} I_{sphere} \omega^2_{sphere}}{\frac{1}{2} I_{cylinder} \omega^2_{cylinder}}$

$\therefore \frac{E_{sphere}}{E_{cylinder}} = \frac{\frac{1}{2}\left(\frac{2}{5}mR^2\right)\omega^2}{\frac{1}{2}\left(\frac{1}{2}mR^2\right)\omega^2} = \frac{\left(\frac{2}{5}\right)}{\left(\frac{1}{2}\right) \times 4} = \frac{2 \times 2}{5 \times 4} = \frac{4}{20} = \frac{1}{5}$

10. $\frac{m_1 m_2 l^2}{m_1 + m_2}$

The system is as shown below.

The distance r1 of mass m1 from the centre of mass is

$$r_1 = \frac{m_2 l}{m_1 + m_2}$$

Similarly, the distance r2 of mass m2 from the centre of mass is

$$r_2 = \frac{m_1 l}{m_1 + m_2}$$

Therefore, the moment of inertia of the system about an axis passing through the centre of mass is

$$I_{CM} = m_1 r_1^2 + m_2 r_2^2$$

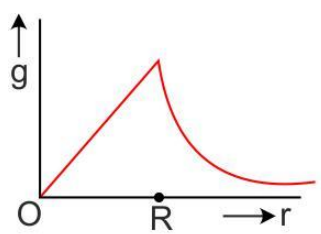
$$\therefore I_{CM} = m_1 \left(\frac{m_2 l}{m_1 + m_2}\right)^2 + m_2 \left(\frac{m_1 l}{m_1 + m_2}\right)^2$$

$$\therefore I_{CM} = \frac{m_1 m_2^2 l^2}{(m_1 + m_2)^2} + \frac{m_2 m_1^2 l^2}{(m_1 + m_2)^2}$$

$$\therefore I_{CM} = \frac{m_1 m_2 l^2}{(m_1 + m_2)} (m_2 + m_1)$$

$$\therefore I_{CM} = \frac{m_1 m_2}{m_1 + m_2} l^2$$

11.



The acceleration due to gravity at points inside the surface of the Earth is

$$g = \left(\frac{GM}{R^2}\right) r$$

Similarly, the acceleration due to gravity at points outside the surface of the Earth is

$$g = \frac{GM}{r^2}$$

Hence, for the region $0 < r \leq R$, $g \propto r$

For the region $R > 0$, $g \propto \frac{1}{r^2}$

Hence, the graph that represents the variation of g is as shown in option (2).

12. $-\frac{mg\,R^2}{2(R+h)}$

The total energy of the satellite is

$$E = -\frac{GMm}{2r} = -\frac{GMm}{2(R+h)}$$

The acceleration due to gravity at the surface of the Earth is

$$g_0 = \frac{GM}{R^2}$$

$$\therefore GM = g_0R^2$$

Therefore, the total energy is

$$= -\frac{mg\,R^2}{2(R+h)} E$$

13. $0.125\ Nm^{-1}$

The work done against surface tension is $W = T(2\Delta A)$

$\Delta A = (5 \times 10^{-2} \times 4 \times 10^{-2}) - (4 \times 10^{-2} \times 2 \times 10^{-2}) \therefore \Delta A = 20 \times 10^{-4} - 8 \times 10^{-4} = 12 \times 10^{-4}\ m^2$

$$\therefore T = \frac{W}{2\Delta A} = \frac{3 \times 10^{-4}}{2 \times 12 \times 10^{-4}} = \frac{1}{8} = 0.125\ Nm^{-1}$$

14. $0 \le \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$

The height in capillary is

$$h = \frac{2T\cos\theta}{\rho g r}$$

Here, T is the surface tension
θ is the angle of contact
ρ is the density
r is the radius of the capillary

It is given that r, h and T for all the three liquids is the same.
Therefore, we have

$$\frac{\cos\theta}{\rho} = \text{Cons tant}$$

$$\therefore \frac{\cos\theta_1}{\rho_1} = \frac{\cos\theta_2}{\rho_2} = \frac{\cos\theta_3}{\rho_3}$$

Given $\rho_1 > \rho_2 > \rho_3$

$\therefore \cos\theta_1 > \cos\theta_2 > \cos\theta_3$

$\therefore \theta_1 < \theta_2 < \theta_3$

As the water rises in the capillary, θ must be acute.

$\therefore 0 \le \theta_1 < \theta_2 < \theta_3 < \frac{\pi}{2}$

15. More than 50 °C

The heat capacity of the material increases with temperature.

Let s_c be the heat capacity of the cold body while s_h be the heat capacity for the hot body. Therefore, $s_h > s_c$

Let θ be the final temperature.

From the principle of calorimetry, we have

Heat lost by the hot body = heat gained by the cold body

$\therefore ms_h(100-\theta) = ms_c(\theta - 0)$

$\therefore s_h(100-\theta) = s_c\theta$

$\therefore 100s_h - s_h\theta = s_c\theta$

$\therefore \theta = \frac{100s_h}{s_c + s_h} = \frac{100}{\frac{s_c}{s_h} + 1}$

$\because s_h > s_c \Rightarrow \frac{s_c}{s_h} < 1$

$\therefore 1 + \frac{s_c}{s_h} < 2$

$\therefore \theta > \frac{100}{2} \Rightarrow \theta > 50°$

16. $2^{\frac{3}{2}}T$

Given that Newton's law of cooling is applicable.

$T_1 = 3T$, $T_2 = 2T$ and T = Room temperature

Applying the Newton's law of cooling, we get

$$\frac{T_1 - T_2}{t} = k\left(\frac{T_1 + T_2}{2} - T\right)$$

$$\frac{3T - 2T}{t} = k\left(\frac{5T}{2} - \frac{2T}{2}\right)$$

$$\frac{T}{10} = k\left(\frac{3T}{2}\right) \quad .....(\text{Equation 1})$$

Let the temperature of the body at the end of 10 minutess.

be T'.

Applying Newton's law of cooling, we get

$$\frac{2T - T'}{10} = k\left(\frac{2T + T'}{2} - T\right)$$

$$\Rightarrow \frac{2T - T'}{10} = k\left(\frac{T'}{2}\right) \quad .....(\text{Equation 2})$$

Solving equation 1 and 2, we get

$$T' = \frac{3}{2}T$$

17. R

Heat capacity in polytropic process is

$$C = C_v + \frac{R}{1-K}$$

Given that PV^3 = Cons tant

$\Rightarrow K = 3$

Also, given that gas is monoatomic f = 3.

$$\therefore C = \frac{fR}{2} + \frac{R}{1-K}$$

$$= \frac{3R}{2} + \frac{R}{1-3}$$

$$= \frac{3R}{2} - \frac{R}{2}$$

$\therefore C = R$

18. $\frac{t_1 + 273}{t_1 - t_2}$

Let the heat delivered be $Q_1$and the energy consumed be W

Coefficient of performance of refrigerator, $(\beta) = \frac{t_2 + 273}{t_1 - t_2} = \frac{Q_2}{W}$

$$\Rightarrow \frac{t_2 + 273}{t_1 - t_2} = \frac{Q_1 - W}{W} = \frac{Q_1}{W} - 1$$

$$\Rightarrow \frac{Q_1}{W} = 1 + \frac{t_2 + 273}{t_1 - t_2} = \frac{t_1 + 273}{t_1 - t_2}$$

$$\therefore \frac{Q_1}{W} = \frac{t_1 + 273}{t_1 - t_2}$$

19. $\frac{Pm}{(kT)}$

Gas equation is

$PV = nRT$

$$P\left(\frac{M}{\rho}\right) = nRT$$

$$P = \frac{\rho RT}{M} = \frac{\rho k N_A T}{m N_A}$$

$$\Rightarrow P = \frac{\rho}{m} kT$$

$$\Rightarrow \rho = \frac{mP}{kT}$$

20. $\frac{16}{9}$

Given that $T = 2\pi\frac{m}{k} = 3$ s ..... Equation 1 ( )

The mass is increased by 1, i.e. m+1

$\therefore T' = 2\pi\sqrt{\frac{m+1}{k}} = 5$ s ..... (Equation 2)

Dividing and squaring equation 1 and 2, we get

$\frac{m}{m+1} = \frac{9}{25}$

$\Rightarrow 25m = 9m + 9$

$\Rightarrow m = \frac{16}{9}$ kg

21. 2L

In open organ pipe:

Second overtone is

$\frac{3}{2}\lambda = \ell_o$

$\Rightarrow \lambda = \frac{2\ell_o}{3}$ ..... (Equation 1)

In closed organ pipe:

First overtone is

$\frac{3}{4}\lambda = \ell_c$

$\Rightarrow \lambda = \frac{4\ell_c}{3} = \frac{4L}{3}$ ..... (Equation 2) From equation 1 and 2, we get

$\frac{\ell_o}{3} = \frac{4L}{3}$

$\Rightarrow \ell_o = 2L$

22. 1

When the three waves superpose at a point, then from the superposition principle, the resultant particle displacement at that point is given

$y = y_1 + y_2$

$= a \sin[2\pi(v - 1)t] + a \sin(2\pi vt) + a \sin[2\pi(v + 1)t]$

Now $\sin[2\pi(v - 1)t] + \sin[2\pi(v + 1)t] = 2\cos 2\pi t \sin 2\pi vt$

$\therefore y = a \sin(2\pi vt) + 2a \cos 2\pi t \sin 2\pi vt$

$\rightarrow y = a \sin 2\pi vt (1 + 2a \cos 2\pi t)$

Or $y = a(1 + 2a \cos 2\pi t) \sin 2\pi vt$

Or $y = A \sin 2\pi vt$

Where $A = a(1 + 2a \cos 2\pi t)$ = Resultant amplitude

We know that, resultant intensity is directly proportional to the square of the resultant amplitude.

Now A^2 will be maximum when cos $2\pi t$ = +

1 or $2\pi t = 0, 2\pi, 4\pi$, ... etc.

or t = 0, ls, 2s,... etc.

Time period of beats = time interval between two consecutive maxima = 1 s.

Hence the beat frequency is 1 Hz, i.e. one beat is heard per second.

23. 2 mC

$\tau = PE \sin\theta$

$\tau = q\ell E \sin\theta$

Given that $\tau = 4$ Nm, $E = 2 \times 10^5$, $\theta = 30°$ and $\ell = 0.02$ m

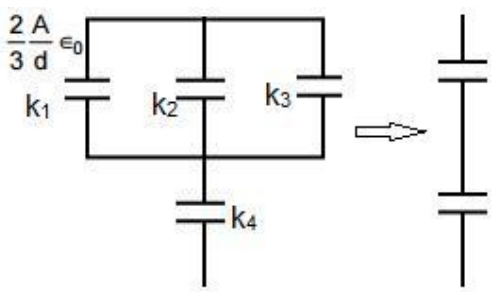
Substituting the values, we get

$\Rightarrow 4 = q \times 0.02 \times 2 \times 10^5 \times \frac{1}{2}$

$\therefore q = 2 \times 10^{-3}$ coulomb

$\therefore q = 200$ mC

24. $\frac{2}{k} = \frac{3}{k_1 + k_2 + k_3} + \frac{1}{k_4}$



Let the capacitance of three dielectric materials having dielectric constant k_1, k_2, k_3 be C_1 and that of dielectric constant k_4 be C_2.

$\frac{1}{C} = \frac{1}{C_1} + \frac{1}{C_2}$

$\frac{d}{A\varepsilon_0 k} = \frac{d/2}{A3\varepsilon_0 (k_1 + k_2 + k_3)} + \frac{d/2}{A\varepsilon_0 k_4}$

$\frac{2}{k} = \frac{3}{k_1 + k_2 + k_3} + \frac{1}{k_4}$

25. 9 V

Using Ohms law, we get

$V_A - (2 \times 2) - 3 - 2 =$

$V_B \therefore V_A - V_B = 9V$

26. $26\ \Omega$

Let the resistance of the bulb be R_b

We know that $P = \frac{V^2}{R_b}$

$\rightarrow R_b = \frac{V^2}{P} =$

$\therefore R_b = 20\ \Omega$

When a resistance 'R' is connected, the

bulb works perfectly.

This is possible only when the bulb consumes 100V.

Given that the main supply is of 230 V.

Thus, the voltage across the resistance R is 230 – 100 = 130 V Potential drop is the direct ratio of the resistances.

$\Rightarrow \frac{R}{R_b} = \frac{130}{100}$

$\Rightarrow \frac{R}{20} = \frac{130}{100}$

$\therefore R = 26\ \Omega$

27. n^2B

Given that the long wire carrying a steady current is bent into a circular loop of one turn.

$\rightarrow$Length of the wire = Circumference of the wire

$\rightarrow l=2\pi R$ …… (where R is the radius of the single loop)

Let the radius of the circular coil of n turns be 'r'.

$\therefore l=n(2\pi r)$

$\Rightarrow r = \frac{R}{n}$ ..... (Equation 1)

For one turn, the magnetic field is

$B = \frac{\mu_o i}{2R}$

$\therefore$ Magnetic field for n turns is

$B' = \frac{\mu_o ni}{2r}$

Substituting the value of r from equation 1, we get

$B' = \frac{\mu_o n^2 i}{2R} = n^2\left(\frac{\mu_o i}{2R}\right)$

$\rightarrow B' = n^2B$

28. $\sqrt{3}W$

Given that The energy required to rotate it by 60° is 'W'.

$\rightarrow W = \mu B\left(\cos 0 - \cos 60^\circ\right)$

$\rightarrow W = \frac{\mu}{2} B$ ..... (Equation 1)

Torque, $\tau = \mu B\left(\sin 60^\circ\right) = \mu B\frac{\sqrt{3}}{2}$ or $\tau = \frac{\mu}{\sqrt{2}} B\ (\sqrt{3})$

From equation 1, we get

$\tau = W\sqrt{3}$

29. 1 GHz

Given that $B = 3.57 \times 10^{-2}$ T and $\frac{e}{m} = 1.76 \times 10^{11}$ C / kg

Frequency of revolution of electrons is

$f = \frac{eB}{2\pi m}$

$\rightarrow f = \frac{1.76 \times 10^{11}\ C / kg \times 3.57 \times 10^{-2}}{T\ 2 \times 3.14}$

$\therefore f = 10^9 Hz = 1$ GHz

30. $R = 15\ \Omega$, $L = 3.5$ H, $C = 30\ \mu F$

For better tuningthe Q – factor must be high.

$Q = \frac{\omega_\circ L}{R}$

$\rightarrow Q = \frac{1}{\sqrt{LC}}\frac{L}{R}$

$\therefore Q = \frac{1}{R}\sqrt{\frac{L}{C}}$

From the above equaiton it is clear that the value of

R and C should be small and L should be large.

Thus, $R = 15\ \Omega$, $L = 3.5$ H, $C = 30\ \mu F$

31. Loop1 $\varepsilon_{induction} = -\frac{d\vec{B}}{dt}(\pi r^2)$, Loop 2 $\varepsilon_{induction} = 0$

For loop 1,

$\varepsilon_{induction}$ is given by $-A\left(\frac{dB}{dt}\right)\cos 0°$

$A(circle) = \pi r^2$

$\therefore \varepsilon_{induction} = -\frac{d\vec{B}}{dt}(\pi r^2)$

For loop 2,

As there is no flux linked to loop 2 its $\varepsilon_{induction} = 0$

32. P.F = 0.8

In L-C-R Circuit,

$\tan\phi = \frac{V_L - V_C}{V_R}$

Substituting the given values we get,

$\tan\phi = \frac{100 - 40}{3\ 80\ 4} =$

$\therefore \phi = 37°$

The power factor of the circuit is given by,

P.F = c os ϕ = cos37°

= 0.7986 □ 0.8

33. $(i_d)_{max} = 2.2$ A

The peak value of the displacement current is same as

the amplitude of the displacement current.

In this case of amplitude, the charge on the capacitor has no direct effect.

As the values of resistance and reactance of capacitors are numerically same (i.e 100 Ω) and in L-C-R series combination ,

we can relate,

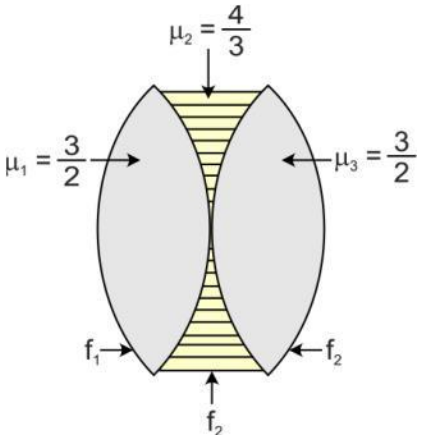
$(i_d)_{max} = (i_c)_{max} = i_0$

i_0 is given by

$i_0 = \frac{\varepsilon_0}{Z} = \frac{220\sqrt{2}}{\sqrt{100^2 + 100^2}} = \frac{220\sqrt{2}}{100\sqrt{2}}$

$(i_d)_{max} = 2.2$ A

34. $\frac{3f}{4}$



By optical geometry of the given two equiconvex lenses, $f_1 = f_3 = R = f$ ...(given)

the above relation is

$$f_1 = f_3 = \frac{R}{2\left(\frac{4}{3} - 1\right)}$$

$$f_2 = \frac{-R}{2\left(\frac{4}{3} - 1\right)} = \frac{-3}{2}R$$

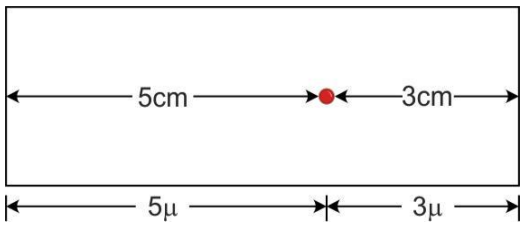
$$= -\frac{3}{2}f$$

The equivalent focal length is given by

$$\frac{1}{f_{equ}} = \frac{1}{f_1} + \frac{1}{f_2} + \frac{1}{f_3}$$

$$\therefore \frac{1}{f_{equ}} = \frac{1}{f} + \left(-\frac{2}{3f}\right) + \frac{1}{f} = \frac{3f}{4}$$

35. 12 cm



Considering the bubble to be located as shown in the figure

If a bubble is situated 5 cm away from the face the thickness factor with respect to refractive index acting acting from that side on this bubble = $5 \times \mu$ (in cm)

Similarly the bubble is 3 cm away from the opposite face, therefore the thickness factor with respect to refractive index acting on the bubble from this side is= $3 \times \mu$ (in cm)

Total thickness in terms of refractive index = $5\mu+3\mu=8\mu$ $\mu=1.5$ ...(given)
Thickness of slab = $8 \times 1.5 = 12$cm

36. $\frac{2\sqrt{n}}{(n+1)}$

Assuming the ratio of interference pattern as I_1 and I as it is obtained with coherent sources of intensity ratio $\frac{I_1}{I_2} = \frac{n}{1}$.

$$\therefore \frac{i_{max} - i_{min}}{i_{max} + i_{min}} = \frac{\left(\sqrt{I_1} + \sqrt{I_2}\right)^2 - \left(\sqrt{I_1} - \sqrt{I_2}\right)^2}{\left(\sqrt{I_1} + \sqrt{I_2}\right)^2 + \left(\sqrt{I_1} - \sqrt{I_2}\right)^2}$$

$$= \frac{4\sqrt{I_1 I_2}}{2(I_1 + I_2)}$$

Dividing throughout by I_2

$$= \frac{2\sqrt{\frac{I_1}{I_2}}}{\left(\frac{I_1}{I_2} + 1\right)}$$

$$\therefore \frac{I_{max} - I_{min}}{I_{max} + I_{min}} = \frac{2\sqrt{n}}{(n+1)}$$

37. Concave, - 0.25 D

The correction is required in the case of myopia,
thus the farthest point should be infinity '∞'
Given that,
v = -400 cm = -4
m u = - ∞

$$\therefore P = \frac{1}{f}$$

$$\therefore P = \frac{1}{v} - \frac{1}{u} = \frac{1}{-4} - \frac{1}{\infty} \quad \left(\frac{1}{\infty} = 0\right)$$

$$\therefore P = -\frac{1}{4} = -0.25 \text{ D}$$

The negative sign indicates the concavity.

38. 0.15 cm

Given that,
Focal length f = D = 60 cm
width of linear aperture a = 0.02 cm $= 2 \times 10^{-4}$ m Wavelength $\lambda = 5 \times 10^{-5}$ cm = 5×10^{-7} m
The equation for first minima is,

$$y = \frac{\lambda}{a} D$$

substiuting the given values,

$$y = \frac{5 \times 10^{-7} \times 60}{2 \times 10^{-4}} = 0.15 \text{ cm}$$

39. $\lambda_0 = \frac{2mc\lambda^2}{h}$

De Broglie wavelength is given by,

$$\lambda = \frac{h}{p} \Rightarrow p = \frac{h}{\lambda}$$

$$\text{Also } E = \frac{p^2}{2m} = \frac{h^2}{2m\lambda^2} \quad ...(1)$$

But, in case of X-ray

$$E = \frac{hc}{\lambda_0} \quad ...(2)$$

Equating equation 1 and 2 we get,

$$\frac{h^2}{2m\lambda^2} = \frac{hc}{\lambda_0}$$

$$\therefore \lambda_0 = \frac{2mc\lambda^2}{h}$$

40. $-3eV$

We know that Energy of photon E is,

$E = \phi + K$ ...(1)

$5 = \phi + 2$

$\therefore \phi = 3eV$

Applying equation 1 in the second case we get,

$6 = 3 + K$

$K = 3eV$

As A is at negative potential with respect to C we write, $\therefore K = -3eV$

41. $\lambda' = \frac{20\lambda}{7}$

For transition from third orbit to second orbit, wavelength is λ $\therefore$ transition from fouth orbit to third orbit, wavelength is λ' is

$$\frac{\frac{1}{\lambda}}{\frac{1}{\lambda'}} = \frac{R_H Z^2\left(\frac{1}{2^2} - \frac{1}{3^2}\right)}{R_H Z^2\left(\frac{1}{3^2} - \frac{1}{4^2}\right)}$$

$\therefore \frac{\lambda}{\lambda'} = \frac{20}{7}$

$\lambda' = \frac{20\lambda}{7}$

42. 60 min

The decay of a radioactive substance happens from 40% to 85%

$\therefore$ the remaining substance after the above decay would be 60% to 15% respectively.

It is given that the half life of this substance is 30 mins therefore time taken betwwen decay 40% to 85% i.e remaining 60% to 15% will be :-

60% to 30% = one half life = 30 min

and 30% to 15% =one half life=30 min

$\therefore$ total time = 60min

43. 20 mV

For transistor as an amplifier, we have

$$\frac{V_{out}}{V_{in}} = \beta \frac{R_0}{R_i}$$

Given : $v_{out} = 4$ V; $R_0 = 2\ k\Omega = 2 \times 10^3$ Ω; $\beta = 100$; $R_i = 1\ k\Omega = 1 \times 10^3\ \Omega$

$$\therefore v_{in} = \frac{v_{out} R_i}{\beta R_0} = \frac{4 \times 10^3}{100 \times 2 \times 10^3}$$

$\therefore v_{in} = 0.02$ V $= 20$ mV

44. 2.5 A

The diode D_1 is reverse biased. Hence, no current will flow through it. Diode D_2 is forward biased. So, the current will flow through R_1 and R_3 only. Hence, the current is

$$I = \frac{V}{R_1 + R_3} = \frac{10}{2+2} = \frac{10}{4} = 2.5 \text{ A}$$

45. 1, 0

The gate P is an AND gate and Q is a NAND gate.
Therefore, the truth table is as follows.

A	B	P = AB	C	$Y = \overline{(AB)C}$
0	0	0	0	1
1	1	1	1	0

Chemistry

46. In case of acetic acid, HCN and H_2O_2 intermolecular hydrogen bonding is present while in cellulose intermolecular hydrogen bond present.

47. Molar conductivity $= 5.76 \times 10^{-3} \times \frac{1000}{0.5} = 1.152 \times 10 = 11.52\ Scm^2\ mol^{-1}$

48. Unimolecular surface reactions can be given as

So we can conclude that, rate of reaction is directly proportional to surface coverage as, $r = K_2\theta_A$.

Where, θ_A is surface coverage of A.

49. The minimum amount of an electrolyte (in millimoles) that must be added to one litre of a colloidal solution so as to bring about complete coagulation or flocculation is called the coagulation or flocculation value of the electrolyte. So, smaller the flocculation value of an electrolyte; greater is its coagulating or precipitating power.

$$\text{Coagulation power} \propto \frac{1}{\text{Coagulation value}}$$

So, the order is III > II > I

50. Electrolysis of molten sodium chloride:

At cathode: $2\,Na^{+} + 2e \rightarrow 2Na$

At anode: $2Cl^{-} \rightarrow Cl_2 + 2e$

1 mole of $Cl_2 \equiv 2F$

0.1 mole of $Cl_2 \equiv 0.2F$

$0.2 \times 96500 = 3 \times t$

$t = 6433.33$ sec $= 107.22$ min.

51. $n=3, l=1 \Rightarrow 3p$

Total 2 electrons can fit in the orbital of 3p.

52.

$$\Delta S = nC \ln \frac{T_f}{T_i} + nR \ln \frac{P_i}{P_f}$$

For isothermal $T_i = T_f$, $\ln 1 = 0$

$$\Delta S = nR \ln \frac{P_i}{P_f}$$

53. $Ba(OH)_{2(S)} \rightarrow Ba^{+2}_{(aq)} + 2OH^{-}$

$Ba(OH)_2$ is strong electrolyte, so its 100% dissociation occurs in solution.

Van't Hoff factor (i) = Total number of ions present in solution = 3

54. Pyridine is a weak base.

$$K_b = \frac{C\alpha^2}{1-\alpha}$$

$1 - \alpha \approx 1$

$K_b = C\alpha^2$

$$\alpha = \sqrt{\frac{1.7 \times 10^{-9}}{0.1}} = 1.30 \times 10^{-4}$$

So,

% of $\alpha = 0.013\%$

55. In CaF_2, the coordination numbers for Ca^{+2} is 8 and for F^{-} it is 4.

56.

$E^0_{cell} = -ve$

$\therefore \Delta G^0 > 0$

and $\Delta G^0 = -2.203RT \log K_{eq}$

$\therefore K_{eq} < 1$

57. For ideal solutions:

$\Delta H_{mix} = 0$

$\Delta U_{mix} = 0$

$\Delta S_{mix} \neq 0$

We know that,

$\Delta G_{mix} = \Delta H_{mix} - T\Delta S_{mix}$

$\Delta G_{mix} \neq 0$

$\therefore$ Incorrect answer is $\Delta G_{mix} = 0$

58.

$AgCl_{(S)} \rightleftharpoons Ag^+_{(aq)} + Cl^-_{(aq)}$

$K_{sp} = 1.6 \times 10^{-10} = [Ag^+][Cl^-] = S(0.1 + S)$

$1.6 \times 10^{-10} = [Ag^+][0.1]$

$[Ag^+] = 1.6 \times 10^{-9}$

59.

Consider the atomic weight of X be W_X and Y be W_Y

$n_{XY_2} = 0.1 = \frac{10}{W_X + 2W_Y}$

$W_X + 2W_Y = 100...(i)$

$n_{X_3Y_2} = 0.05 = \frac{9}{3W_X + 2W_Y}$

$3W_X + 2W_Y = 180...(ii)$

By solving eq. (i) and (ii) we get, $W_X = 40$ and $W_Y = 30$

60. $Q = ne$

$i \times t = n \times e$

$n = \frac{60}{1.6 \times 10^{-19}} = 3.75 \times 10^{20}$ electrons

61. $H_3BO_3 + 2H_2O \rightleftharpoons [B(OH)_4]^- + H_3O^+$

62. $AlF_3 + 3KF \rightleftharpoons K_3[AlF_6]$

63. Iron cannot be coated on zinc. This is because zinc has higher negative electrode potential than iron.

$E^0Zn^{+2}/Zn = -0.76$ V

$E^0Fe^{+2}/Fe = -0.41$ V

$E^0Fe^{+3}/Fe = -0.04$ V

64. The suspension of slaked lime in water is known as milk of lime.

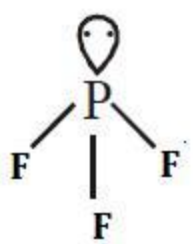
65. The hybridizations of atomic orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ are as follows:

NO_2^+ = sp (Linear)

NO_3^- = sp^2 (Trigonal planar)

NH_4^+ = sp^3 (Tetrahedral)

66. PF_3 is a Lewis base since it has one lone pair of electrons on P atom.



BF_3 is a Lewis acid whereas CF_4 and SiF_4 have octet configuration.

67. In SO_3^{2-} and ClO_3^- , the number of electrons is 42 and they have pyramidal shape.

In CO_3^{2-} and NO_3^-, the number of electrons is 32 with trigonal planar shape.

68. The salts of beryllium readily hydrolyze.

69. $CaF_2 + H_2SO_4 \rightarrow CaSO_4 + 2HF$

H_2SO_4 is not acting as an oxidising agent in the reaction. The oxidation number of all atoms remains the same.

70. d_z^2 , $d_{x^2-y^2}$ will have electron density along the axes.

71. In XeF_4,

Number of hybrid orbitals = $\frac{8+4}{2} = 6$

Hybridisation: sp^3d^2

Geometry: Octahedral

Shape: Square planar

72. SeF_4 with sp^3d hybridisation has see-saw shape.

CH_4 with sp^3 hybridisation has tetrahedral shape.

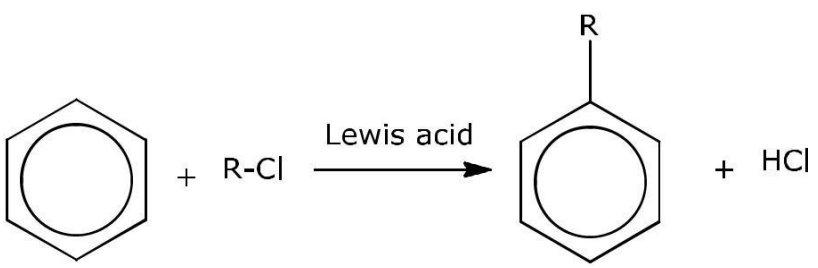
73. The correct increasing order of trans-effect of the following species

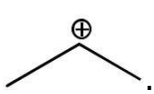
is: $CN^- > C_6H_5^- > Br^- > NH_3$

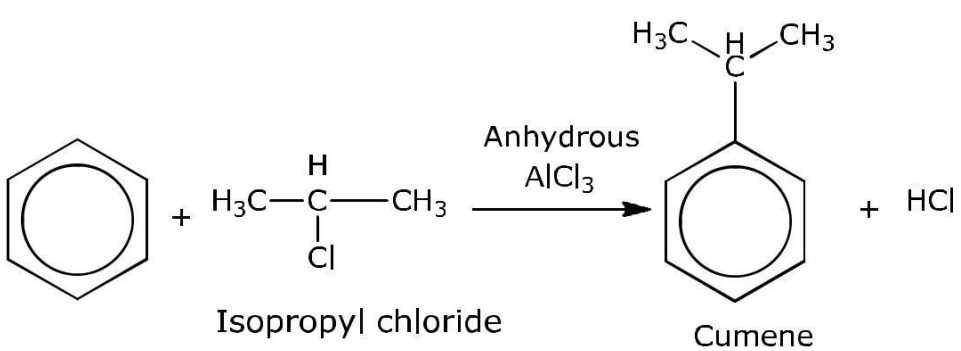
74. Lanthanon's are less reactive than aluminium due to high ionisation potential (lanthanoid contraction).

75. The high spin complexes with d^3, d^5, d^8, d^{10} electrons do not show John-Teller distortions.

76. Friedel Craft's reaction:

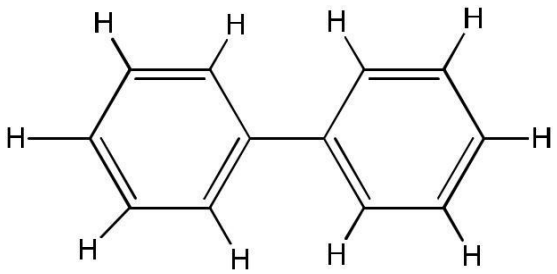


Isopropyl chloride can form  .



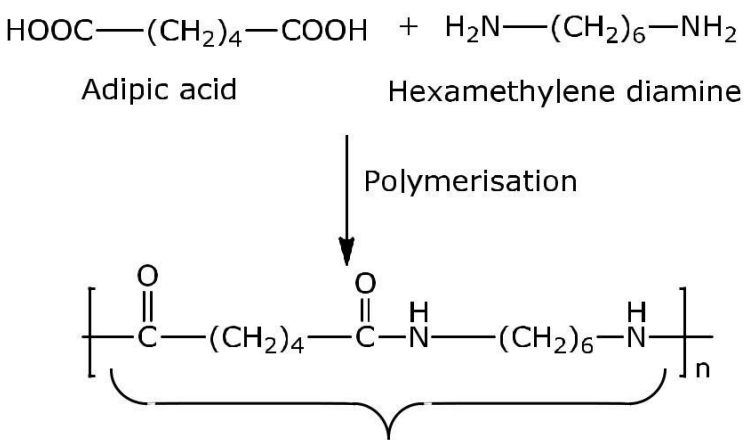
In chlorobenzene, bromobenzene, chloroethene lone pair of halogen are delocalised with π bonds, so attain double bond character.

77. Only diphenyl is coplanar. All carbon atoms are sp^2 hybridised.

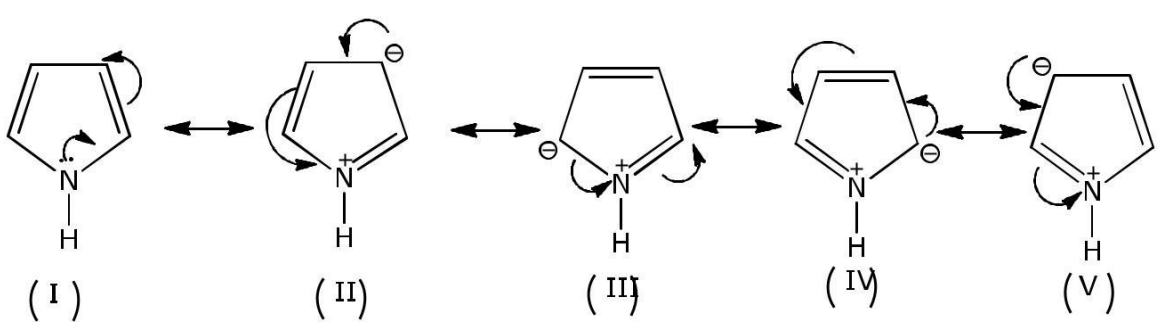


1,1'-biphenyl

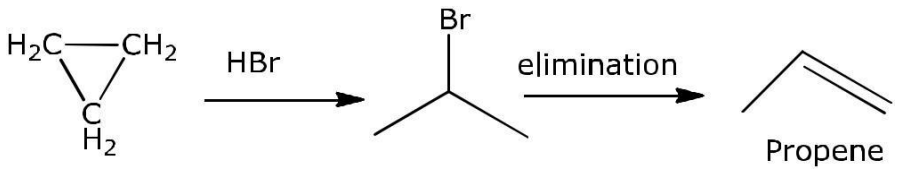
78.

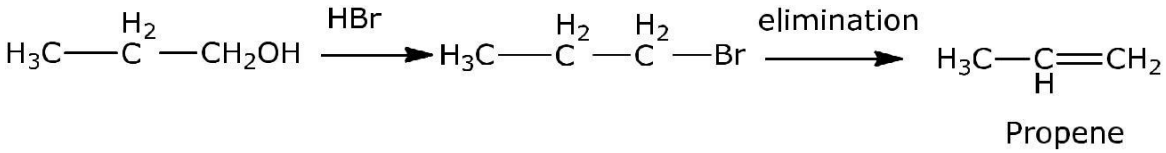


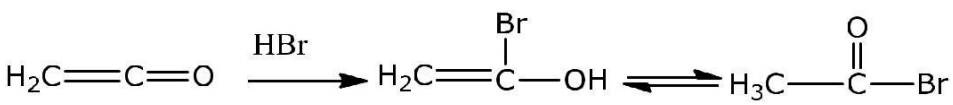
79. In pyrrole, the electron density is maximum on 2 and 5 carbon atoms. The resonance structures of pyrrole are as follows:

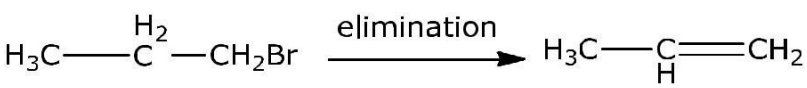


80.







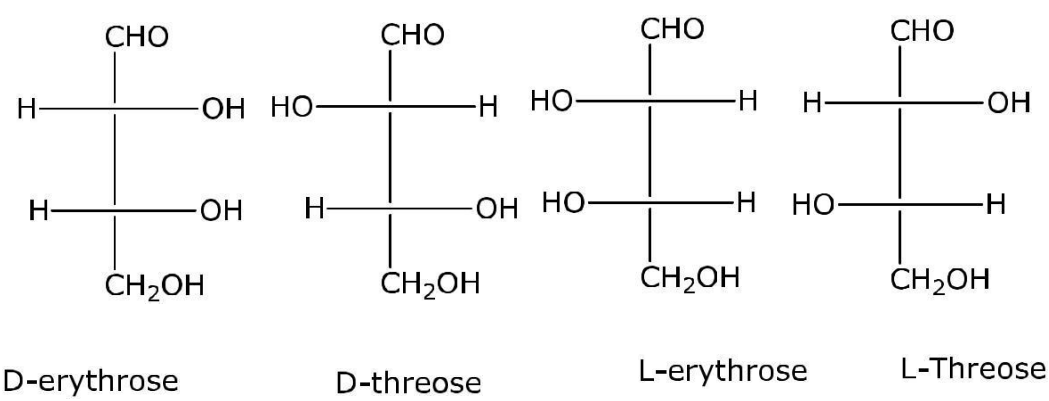


Thus, $H_2C{=}C{=}O$ can not form propene.

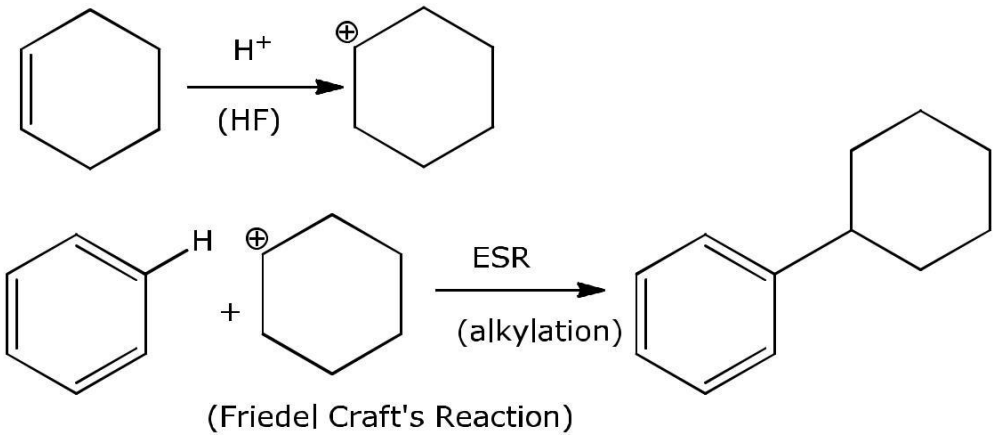
81. Tertiary nitro compound does not react with HNO_2 because of absence of α hydrogen atom.

82. DNA in copies as messenger RNA (mRNA) which in turn is the template for protein synthesis (uses r-RNA and t RNA)

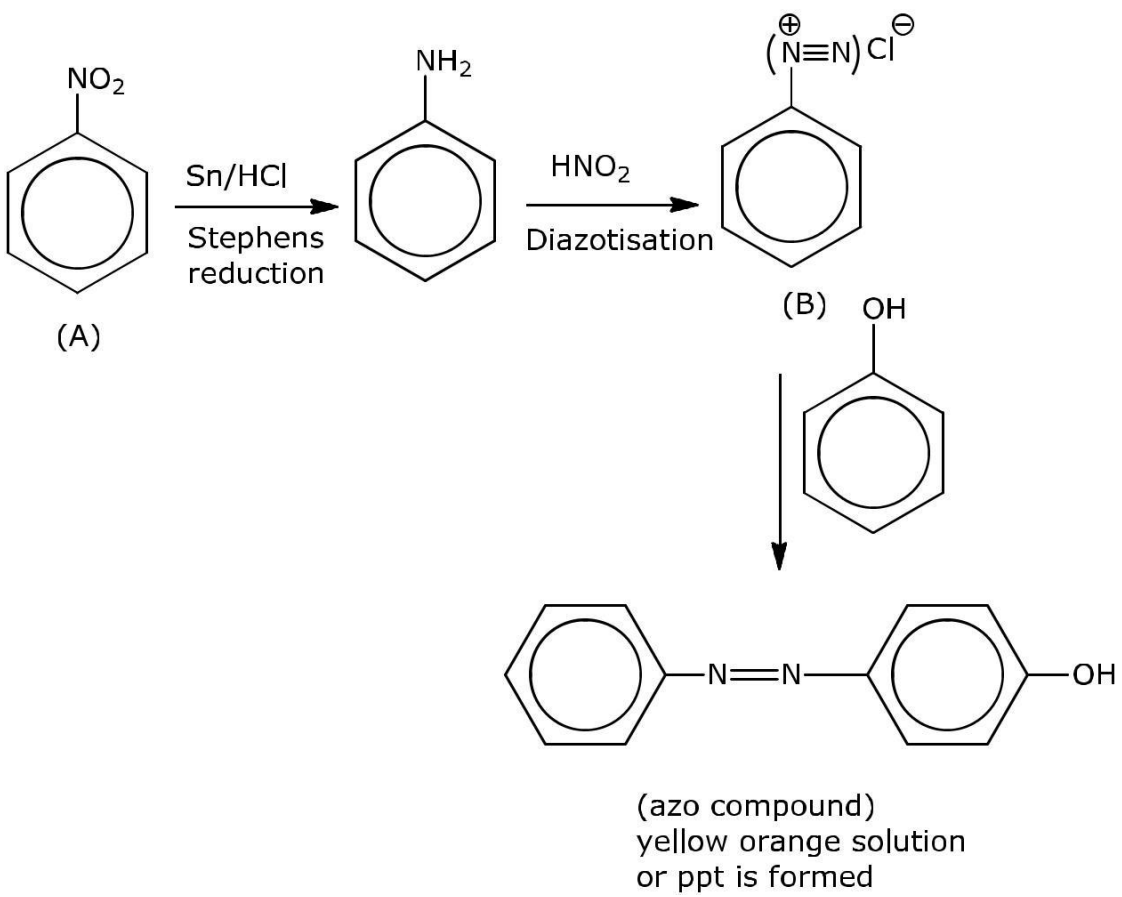
83.



84.



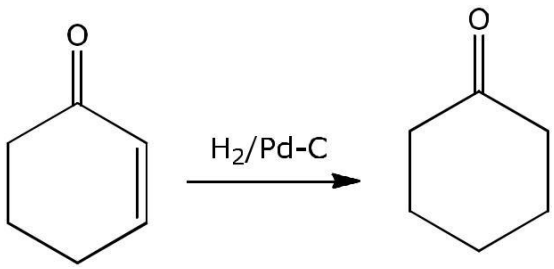
85.



86. $CH_3\text{-}CH_2\text{-}CH_2\text{-}Br + NaCN \rightarrow CH_3 - CH_2 - CH_2 - CN + NaBr$

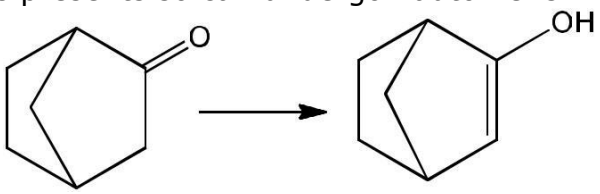
The above reaction follows SN_2 mechanism, which takes place in polar non-protic solvent such as N,N-dimethyl formamide that is DMF.

87.



During hydrogenation of unsaturated carbonyl compound by pd catalyst selective reduction is observed of double bond. Reduction take place at Non polar unsaturation. i.e., (-C=C-).

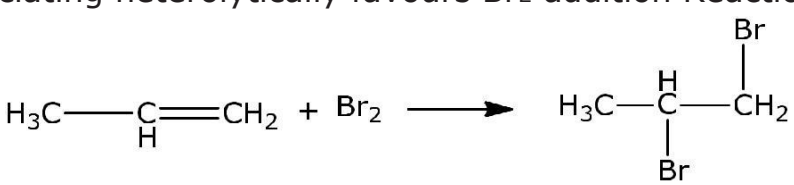
88. Tautomerism takes place with carbonyl compound having α-*H* atom.
α-*H* which is at Bridge head C will not get involved in Tautomerism.
Structure (I): *α-H* are at bridge head so no Tautomerism.
Structure (II): α-*H* is at bridge head and another *α-C* is not having *α-H* so no Tautomerism.
Structure (III): α-*H* is presents so can undergo Tautomerism.



Only option III will show Tautomerism.

89. When an electron withdrawing group is present close to –COOH, due to negative inductive effect losing H^+ becomes very easy. (I effect is distance dependent)
First is structure II where –O- is present close to –COOH (–I effect is maximum), after that structure III and then structure (I). That means the order is (II) > (III) > (I).

90. $Br - Br \rightarrow Br^+ + Br^-$
Alkene dissociating heterolytically favours Br_2 addition Reaction.



Biology

91. In fungi, the cell wall is made of chitin or cellulose or both. Purely cellulosic cell wall is found in oomycetes of phycomycetes in fungi.

92. Methanogens are archaebacteria which live anaerobically in marshy areas. They are obligate anaerobes and convert CO_2 to methane and produce biogas.

93. The cell wall of diatoms is mainly composed of cellulose impregnated with glass-like silica. The siliceous cell wall of diatoms is indestructible and does not decay easily.

94. The label of a herbarium sheet carries the name of the institution, scientific name of the plant, common or vernacular name of the plant, family, locality, date of collection, collection number and name of the collector. It does not carry any information regarding the height of the plant.

95. Presence of a thick cuticle, presence of sunken stomata to reduce transpiration, needle-like, scale-like or small and leathery leaves and sclerenchymatous hypodermis are some of the xerophytic characters of conifers which enable them to tolerate extreme environmental conditions.

96. Algin is obtained from *Laminaria*, a brown algae and carrageenan is extracted from *Chondrus*, a red algae.

97. The term 'polyadelphous' is related to androecium. In polyadelphous androecium, the filaments of all the stamensunite to form more than two groups and the anthers are free, e.g, *Citrus*.

98. *Salvia*, mustard, radish and turnip have stamens with different lengths in their flowers. *Salvia* shows didynamous while mustard, radish and turnip have tetradynamous stamens.

99. *Cassia*, *Trifolium* and *Pisum* have zygomorphic flowers with bilateral symmetry. *Brassica* has actinomorphic flowers with radial symmetry.

100. Free central placentation is found in *Dianthus*. *Argemone* and *Brassica* show parietal placentation while *Citrus* shows axile placentation.

101. In the T.S of a dicot stem, the sequence from the outside to the inside of the stem is epidermis, hypodermis, cortex, endodermis, stele along with pericycle, vascular bundles and pith. Hence, the cortex is present between the epidermis and stele.

102. Tyloses are bladder-like ingrowths of thin-walled parenchymatous cells into the xylem vessels and tracheids through pits. They block the passage of xylem elements and inhibit the transportation of water and minerals in the xylem.

103. Ribozyme is a non-proteinaceous enzyme. It is a ribonucleic acid (RNA) enzyme that catalyses a chemical reaction.

104. Animal cells do not contain a large central vacuole. The vacuole in animals is poorly developed or absent. Plant cells possess a large central vacuole.

105. Pili and fimbriae are not involved in the motility of bacterial cells. Flagella assist in the motility of the bacterial cells. Fimbriae provide attachment to the base and pili form conjugation tube during conjugation.

106. Lysosomes are single membrane, large vesicles which contain hydrolytic enzymes such as lipases, proteases and carbohydrases.

107. Synthesis or replication of DNA occurs on the template of the existing DNA strand during the S phase of interphase. Although, the enzyme DNA polymerase is synthesised in G_1 phase, it gets activated only in the S phase. Hence, DNA replication takes place in the S phase.

108. Acetyl CoA is a common intermediate produced during aerobic breakdown of fats, carbohydrates and proteins. It is involved in the metabolism of glucose and amino acids and degradation of fatty acids.

109. The phloem sap is more concentrated than xylem. The sap of phloem is alkaline with a pH between 8.0 to 8.4. the sap of xylem is acidic with a pH between 5.2 to 6.5.

110. Both auxin and cytokinin have been known for a long time to act either synergistically or antagonistically to control several significant developmental processes, such as the formation and maintenance of meristem in plants. The ratio of auxin and cytokinin regulates the growth of roots and shoots in plants. Low concentration of auxin and cytokinin promotes shoot growth while higher ratio promotes root growth.

111. A chromoprotein is a conjugated protein that contains a pigmented prosthetic group or cofactor. Phytochrome is a protein with a bilin chromophore.

112. Calcium, in the form of calcium pectate, is responsible for holding together the cell walls of plants. It is essential for the growth of the root tip. When calcium is deficient, new tissue such as root tips, young leaves, and shoot tips often exhibit distorted growth from improper cell wall formation.

113. Photorespiration occurs in all C_3 plants but rarely occurs in C_4 plants. Presence of excess O_2 in the surroundings inhibits photosynthesis in C_3 plants but has no inhibitory effect on the C_4 plants.

114. In potato, banana and ginger, plantlets always arise from the nodes of the stem or modified stem. The nodes hold one or more leaves, as well

as buds which can grow into branches. Adventitious roots may also be produced from the nodes.

115. Sexual reproduction involves meiosis and fusion of male and female gametes. This results in genetic combination of parental characters leading to variation. Variation is essential for evolution and survival of the species.

116.

Column-I	Column-II
a. Pistils fused together	(iii) Syncarpous
b. Formation of gametes	(i) Gametogenesis
c. Hyphae of higher ascomycetes	(iv) Dikaryotic
d. Unisexual female flower	(ii) Pistillate

117. In majority of angiosperms, reduction division occurs in the megaspore mother cell. The megaspore mother cell undergoes meiosis and forms a linear tetrad of four haploid megaspores. The process of meiotic formation of haploid megaspores from diploid megaspore mother cell is called megasporogenesis.

118. Pollination in water hyacinth and water lily is brought about by the agency of insects or wind.

119. In angiosperms, the ovule is an integumented megasporangium within which the meiosis and megaspore formation takes place.

120. The semiconservative mode of DNA replication in eukaryotic chromosomes was first demonstrated by Taylor in the root tip cells of *Vicia faba* in 1957.

121. The mechanism that causes a gene to move from one linkage group to another is called translocation.

The chromosomal aberration in which a part of the chromosome segment gets inverted by 180° is called inversion.

Duplication is the phenomenon of having an extra chromosome attached to its normal homologous chromosome so that a gene or set of genes is represented twice in the same chromosome.

Crossing over involves the mutual exchange of segments of genetic material between non-sister chromatids of two homologous chromosomes so as to produce recombinations or a new combination of genes.

122. The equivalent of a structural gene is a cistron. Each cistron consists of many codons. A codon species a single amino acid.

123. A true breeding plant is near homozygous and produces offspring of its own kind. It is a plant which on self pollination produces offspring with the same traits.

124. 23S rRNA acts as a structural RNA as well as a ribozyme in bacterial cell.

125. Stirred-tank bioreactors have been designed so as to facilitate even mixing and oxygen availability throughout the bioreactor.

126. A foreign DNA and plasmid cut by the same restriction endonuclease can be joined to form a recombinant plasmid using ligase enzyme. Their single-stranded free ends called sticky ends can be joined end to end by DNA ligases.

127. Downstream processing involves separation, purification and preservation of biotechnological products.

128. Eco RV, a type II restriction endonuclease isolated from certain strains of *Escherichia coli* has restriction sequence –

5' – GAT ATC – 3'

3' – CTA TAG – 5'

A blunt end may result from the breaking of double-stranded DNA.

129. The first clinical gene therapy was given in 1990 to a 4-year-old girl with adenosine deaminase (ADA) deficiency. ADA deficiency can cause SCID, which occurs because of a defect in the gene for the enzyme adenosine deaminase.

130. Norman Myers has identified a total of 34 hotspots of biodiversity covering a area less than 2% of the land surface with about 20% human inhabitation. Biodiversity hot spots have very high levels of species richness and high degree of endemism.

131. Chemosynthetic archaebacteria can survive in extreme environments such as the hydrothermal vent ecosystems. Therefore, they will be the primary producers of the deep-sea hydrothermal vent ecosystem.

132. r-selected species thrive in unstable environment. They are characterised by large number of progeny and small size of the organisms. They show early maturity and short life expectancy.

133.

Interaction	**Effect**	**Result of interaction**
Parasitism	+ , –	Parasite benefited, host harmed
Mutualism	+ , +	Beneficial to both, obligatory
Amensalism	0, –	One harmed, other unaffected
Commensalism	+, 0	Commensal benefited, other unaffected

134. *Parthenium hysterophorus* is an alien species in India. It is an exotic weed which grows rapidly and has adversely affected the proliferation of endemic species in the forests.

135. The Red List or Red Data Book has eight Red List categories of species namely extinct, extinct in the wild, critically endangered, endangered, vulnerable, lower risk, data deficient and not evaluated.

136. Cholera, typhoid and tetanus are caused by bacteria. Mumps, herpes, small pox and influenza are caused by viruses.

137.

Column I	Column II
a. Family	(iii)Muscidae
b. Order	(i)Diptera
c. Class	(iv)Insecta
d. Phylum	(ii)Arthropoda

138. Cyclostomata belong to the phylum chordate, subphylum vertebrata and superclass Agnatha which are characterised by being jawless and absence of fins.

139. Photoperiodism affects the flowering patterns in plants and the binomial nomenclature was suggested by Carl Linnaeus.

140. In male cockroaches the seminal vesicles stores the sperms.

141. Smooth muscles are involuntary muscles that are non striated and fusiform.

142. Oxidative phosphorylation occurs in the inner membrane of the mitochondria. During oxidative phosphorylation ATP is formed as electrons pass through the Electron transport Chain through redox reactions.

143. Ester bonds are seen in lipids and so they are least likely to be involved in the stabilization of proteins.

144. The graph shows an endothermic reaction where substrate is converted to product with energy A in presence of enzyme and energy B in absence of enzyme. It shows that the enzyme speeds up a reaction.

145. Stalled replication fork activates check point M and results in cancer formation.

146. Here, column shows the different stages of meiosis while column shows the processes which occurs in each stage. Crossing over in seen in the

pachytene stage, metaphase I shows chromosomes aligning at the equatorial plate, diakinesis is when chiasmata is terminated and zygotene stage is when the homologous chromosomes are paired.

147. The secretion of pancreatic juice and bicarbonate is regulated by cholecystokinin and secretin.

148. The partial pressure of oxygen in alveoli is more than that of the partial pressure of oxygen in blood only then the oxygen will diffuse in the blood.

149. Nociceptors are nerve cells which respond to pain. Meissner's corpuscles respond to light and receptors produce graded potentials.

150. Grave's disease is caused due to the hypersecretion of the thyroid gland. It is an immune system disorder which results in hyperthyroidism.

151. Calcium ions bind to troponin and tropomysoin on the actin filaments which changes the three dimensional shape of the actin–troponin–tropomyosin complex, and the active site for myosin present on the actin filament is exposed. Myosin then binds to the active site on the actin filament and forms the cross-bridge.

152. Thrombocytes are blood platelets which are responsible for the blood clotting. In case there number is reduced, the clotting of blood will not occur at normal rate and there could be the excessive loss of blood from the body.

153. Insulin is a peptide hormone made of 51 amino acids. When there is rise in blood glucose level, it is secreted by the β-cells of pancreas. Insulin promotes glycogenesis in liver. It also enhances the glucose uptake by the hepatocytes and adipocytes so that the blood glucose level is brought to normal.

154. Decreased levels of oestrogen during menopause cause bone resorption. Bone resorption overtakes the building of bones which makes the bones weak, porous and fragile. Oestrogen regulates the osteoclasts, the cells which build new bones. With decreased level of oestrogen, the number of these cells is also reduced.

155. Serum does not have clotting factors. It also does not contain blood corpuscles.

156. Lungs do not collapse between breaths and some air always remains in the lungs which can never be expelled because there is negative intrapleural pressure pulling at the lung walls.

It is the pressure created by the two opposing elastic forces pulling on the intrapleural space.

157. The hormones secreted by the posterior pituitary are synthesised by the neurons of in the hypothalamus. These hormones are stored in the axon ends present in the posterior pituitary and are released from there.

158. Sodium ions are actively reabsorbed in the distal convoluted tubule. In the proximal convoluted tubule sodium ions are reabsorbed by facilitated diffusion and cotransport.

159. LNG-20 is hormone releasing IUD. This makes the uterus unsuitable for implantation. It also makes the cervix hostile for the sperms. Multiload 375 is a copper releasing IUD and Lippes loop a type of inert IUD.

160. Vasectomy is the surgical removal of the part of vas deferens in males. Since the vas deferens is cut, the sterility becomes irreversible. The vasectomy prevents the sperms to reach the urethra and hence, the semen of the male undergone vasectomy will not contain any sperms. Epididymis is a passage between the testis and the vas deferens; hence even after vasectomy it will contain sperms.

161. Blastomere more than 8 celled stage is always transferred to the embryo during in-vitro fertilisation.

162. The correct pathway of sperms is

seminiferous tubule → tubulus rectus → rete testis → efferent ductile → epididymis → vas deferens → ejaculatory duct → urethra

163. In photosynthesis

Column I	Column II (Correct Match)
a. Mons pubis	(iii) Female external genitalia
b. Antrum	(iv) Graafian follicle
c. Trophectoderm	(i) Embryo formation
d. Nebenkern	(ii) Sperm

Mons pubis – It is a part of female external genitalia. It is a fatty tissue covered by skin and pubic hair.
Antrum – It is the follicular cavity of the Graafian follicle. It is filled with the follicular fluid.
Trophectoderm – It is a layer of blastocyst which divides into extraembryonic foetal membranes – chorion and amnion.
Nebenkern – The helical middle piece of the sperm.

164. The placenta is formed by the maternal and foetal tissues. hCG, hPL, estrogen, progesterone are produced by the placenta.

hCG (human chorionic gonadotropin) enlarges the corpus luteum.

hPL (human placental lactogen) stimulates the mammary glands

Estrogen and progesterone are responsible for the changes in females during pregnancy.

165. Colour-blindness is x-linked disorder. Since it is a cross between the colour blind father and homozygous female with normal vision, the genotype of the son will be XY. Hence the probability of the son being colour blind will be zero.

166. Genetic drift is the sudden and random changes occurring in the allele frequency in the small populations which are isolated.

167. The Hardy-Weinberg equation is:

$(p + q)^2 = p^2 + 2pq + q^2 = 1$ = Gene frequency of the total population, where,

p^2 = frequency of occurrence of individuals with homozygous dominant alleles (AA)

2pq = frequency of occurrence of heterozygous individuals (Aa)

q^2= frequency of occurrence of individuals with homozygous recessive alleles (aa)

168. The chronological order of human evolution from early to the recent is

Ramapithecus → *Australopithecus* → *Homo habilis* → *Homo erectus*

Ramapithecus: Earliset man-like primate, late Miocee and early Pliocene era They lived about 10-15 million years ago.

Australopithecus: First African ape man. Late Pliocene and early Pleistocene era. They lived about 5 million years ago.

Homo habilis: Pleistocene era. They lived about 3-5 million years ago.

Homo erectus: Pleistocene era. They lived about 1.7 million years ago

169. Synthesis of organic monomers → Synthesis of organic polymers → Formation of protobionts → Formation of DNA-based genetic systems

170. The features of genetic material are:

- It should be able to express in the form of Medelian characters
- It should be able to replicate
- It should structurally and chemically stable
- It should undergo gradual modifications required for evolution

171. DNA dependent RNA polymerase binds on the promoter site of the **template strand** and unwinds the DNA double helix for the initiation of transcription.

RNA is always transcribed in 5′ → 3′ direction, hence the 3′ to 5′ DNA strand is used which is called the **template strand**.

172. Interspecific hybridization takes place between the two different species which are normally from the same genus.

173. HIV virus is round in shape with an envelope. The envelop encloses one single strand of RNA and one strand of reverse transcriptase.

174. Mackerel is a marine fish and its has the rich content of omega-3-fatty acids.

175. The right side column I are the products obtained from the microbes commercially given in column II.

Column I	**Column II (Correct Match)**
a. Citric acid	(iii) *Apsergillus*
b. Cyclosporin A	(i) *Trichoderma*
c. Statins	(iv) *Monascus*
d. Butyric acid	(ii) *Clostridium*

176. Petroleum industries release huge amount of effluents every day which results in BOD.

177. Gause's competitive exclusion principle states that two closely related species competing for the same resources cannot co-exist indefinitely and the competitively inferior will be eliminated eventually.

178. Hangul or the musk deer is the native species to India. It is found in the valleys of Kashmir. The Dachigam National Park, Jammu & Kashmir is home to the musk deer.

179. Rich organic waste in a lake results in eutrophication. In eutrophication, the organic remains begin to deposit at the bottom of the lake. Silt and organic debris pile up, the lake grows shallower and warmer. It finally turns into a land.

180. The highest DDT concentration in an aquatic food chain shall occur in the sea gull. It is an example of biomagnification. Biomagnification is increase in the concentration of toxic substances at successive trophic levels.