SAMPLE TEST PAPERS
Resonance National Entrance (ResoNET)
For Yearlong Classroom Contact Programs (YCCPs)
of JEE (Advanced) Division

Practice, Persistence and Performance

For Class - X, XI, XII
SAMPLE TEST PAPER (STP)
FOR RESONET 2019
INDEX
TARGET : JEE MAIN + ADVANCED

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The sample test papers are only for reference and guidance. The sample papers given in the booklet are actually the papers of previous year’s Resonet conducted by Resonance for its various courses.

Note : Resonance reserves the right to change the pattern of selection test (ResoNET). Previous year papers do not guarantee that the papers for this year selection test will be on the same pattern. However, the syllabus of the test paper will be equivalent to the syllabus of qualifying school/board examination and as given on page no. 4.

For More Practice of RESONANCE NATIONAL ENTRANCE TEST (ResoNET) - 2019

Resonance selection test papers of last few years with answer key, hints & solutions are available on demand. Following sets of Practice Test Papers (PTPs), in hard copy, are available with us :

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<tr>
<td>1</td>
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Students can buy these Online Test papers at http://elpd.resonance.ac.in

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HOW TO PREPARE FOR THE RESONANCE NATIONAL ENTRANCE TEST (ResoNET)

- **For Class-X appearing students (Class-X to Class-XI Moving):**
  
  Study thoroughly the books of Science (Physics & Chemistry) and Maths of Classes IX & X. (NCERT & Respective Board)

- **For Class-XI appearing students (Class-XI to Class-XII Moving):**
  
  1. Study thoroughly the books of Physics, Chemistry and Maths of Class XI (Respective Board).
  2. Refer to the following books (only Class-XI syllabus) to increase the level of competence:
     
     - **For Physics** : Concepts of Physics by H.C. Verma Vol. I & II, NCERT Books
     - **For Maths** : Higher Algebra By Hall & Knight; Co-ordinate Geometry By S.L. Loney ; Plane Trigonometry By S.L. Loney, Problem book in high school by A.I. Prilepko

- **For Class-XII appearing students (Class-XII to Class-XIII Moving):**
  
  1. Study thoroughly the books of Physics, Chemistry and Maths of Classes XI & XII (Respective Board).
  2. Refer to the following books (Class-XI & Class-XII syllabus) to increase the level of competence:
     
     - **For Physics** : Concepts of Physics by H.C. Verma Vol-I & II
     - **For Maths** : Higher Algebra By Hall & Knight; Co-ordinate Geometry By S.L. Loney; Plane Trigonometry By S.L. Loney, Differential Calculus By G.N. Berman; Integral Calculus By Shanti Narayan; Vector Algebra By Shanti Narayan ; A Das Gupta (subjective).

**Note:** For further practice, a set of several Practice Test Papers (PTPs) of Resonance may be procured from the institute. For this, the details are available on Page No.1.
SAMPLE TEST PAPER

GENERAL INSTRUCTIONS IN THE EXAMINATION HALL
(परीक्षा भवन के लिए सामान्य निर्देश)

1. This booklet is your Question Paper. (यह पुस्तिका आपका प्रश्न–पत्र है)
2. The Question Paper Code is printed on the top right corner of this sheet. (प्रश्न–पत्र कोड इस पृष्ठ के ऊपर दाएं कोने में छपा हुआ है)
3. Blank papers, clip boards, log tables, slide rule, calculators, mobile or any other electronic gadgets in any form are not allowed to be used. (खाली कागज, विलय बोर्ड, लघुगणक सारणी, स्लाइड रुल, कैल्कुलेटर, मोबाइल या अन्य किसी इलेक्ट्रॉनिक उपकरण के किसी भी रूप में उपयोग की आज्ञा नहीं है)
4. Write your Name & Application Form Number in the space provided in the bottom of this booklet. (इस पृष्ठ के नीचे दिये गये रिक्त स्थान में अपना नाम व आवेदन फॉर्म संख्या अवश्य भरें)
5. Before answering the paper, fill up the required details in the blank space provided in the Objective Response Sheet (ORS). (प्रश्न–पत्र हल करने से पहले, ORS–शीट में दिये गये रिक्त स्थानों में पूरे गये विवरणों को भरें)
6. Do not forget to mention your paper code and Application Form Number neatly and clearly in the blank space provided in the Objective Response Sheet (ORS) / Answer Sheet. (उत्तर–पुस्तिका में दिये गये रिक्त स्थान में अपने प्रश्न–पत्र का कोड व अपना आवेदन फॉर्म संख्या स्पष्ट रूप से लिखा ना भूलें)
7. No rough sheets will be provided by the invigilators. All the rough work is to be done in the blank space provided in the question paper. (निरीक्षक के द्वारा कोई रूट शीट नहीं दी जायेगी। रूट कार्य प्रश्न–पत्र में दिये गये खाली स्थान में ही करना है)
8. No query related to question paper of any type is to be put to the invigilator. (निरीक्षक से प्रश्न–पत्र से सम्बन्धित किसी प्रकार का कोई प्रश्न ना करें)

QUESTION PAPER (प्रश्न पत्र)

9. Marks distribution of questions is as follows. (प्रश्नों के प्राप्तांकों का निम्न प्रकार से है)

<table>
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<th>Subject</th>
<th>Nature of Questions</th>
<th>No. of Questions</th>
<th>Marks</th>
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<td>PART-III</td>
<td>CHEMISTRY</td>
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Total: 100 Total: 300

Name: ________________________ Application Form Number: _______________
Syllabus for ResoNET

CLASS - X (CHEMISTRY)

Basic : Cooling by evaporation. Absorption of heat. All things occupy space, possess mass. Definition of matter ; Elementary idea about bonding.

Solid, liquid and gas : characteristics - shape, volume, density; change of state - melting, freezing, evaporation, condensation, sublimation.

Elements, compounds and mixtures : Heterogeneous and homogeneous mixtures; Colloids and suspension.

Mole concept : Equivalence - that x grams of A is chemically not equal to x grams of B ; Partical nature, basic units : atoms and molecules ; Law of constant proportions ; Atomic and molecular masses; Relationship of mole to mass of the particles and numbers ; Valency ; Chemical formulae of common compounds.

Atomic structure : Atoms are made up of smaller particles : electrons, protons, and neutrons. These smaller particles are present in all the atoms but their numbers vary in different atoms. Isotopes and isotobars.

Gradients in properties : Mendeleev periodic table.

Acids, bases and salts : General properties, examples and uses.

Types of chemical reactions : Combination, decomposition, displacement, double displacement, precipitation, neutralisation, oxidation and reduction in terms of gain and loss of oxygen and hydrogen.

Extractive metallurgy : Properties of common metals ; Brief discussion of basic metallurgical processes.

Compounds of Carbon : Carbon compounds ; Elementary idea about bonding ; Saturated hydrocarbons, alcohols, carboxylic acids (no preparation, only properties). Soap - cleansing action of soap.

CLASS - X (MATHEMATICS)

Number Systems:
Natural Numbers, Integers, Rational number on the number line. Even - odd integers, prime number, composite numbers, twin primes, divisibility tests, Co-prime numbers, LCM and HCF of numbers.

Representation of terminating/non-terminating recurring decimals, on the number line through successive magnification. Rational numbers as recurring/terminating decimals. Ratio and proportions.

Polynomials:

Standard form of a quadratic equation ax^2 + bx + c = 0, (a ≠ 0). Relation between roots and coefficient of quadratic and relation between discriminant and nature of roots.

Linear Equation:
Linear equation in one variable and two variable and their graphs. Pair of linear equations in two variables and their solution and inconsistency

Arithmetic Progressions (AP):
Finding the nth term and sum of first n terms.

Trigonometry:
Trigonometric ratios of an acute angle of a right-angled triangle, Relationships between the ratios. Trigonometric ratios of complementary angles and trigonometric identities. Problems based on heights and distances.

Coordinate Geometry:
The cartesian plane, coordinates of a point, plotting points in the plane, distance between two points and section formula (internal). Area of triangle. Properties of triangle and quadrilateral. (Square, Rectangle rhombus, parallelogram).

Geometry:
Lines : Properties of parallel and perpendicular lines.

Triangle:
Area of a triangle, Properties of triangle, similarity and congruency of triangles.

Medians, Altitudes, Angle bisectors and related centres.

Geometrical representation of quadratic polynomials.

Circle:
Properties of circle, Tangent, Normal and chords.

Mensuration:
Area of triangle using Heron’s formula and its application in finding the area of a quadrilateral.

Area of circle : Surface areas and volumes of cubes, cuboids, spheres (including hemispheres) and right circular cylinders/cones and their combinations.

Statistics:
Mean, median, mode of ungrouped and grouped data.

Probability:
Classical definition of probability, problems on single events.

Logarithm & exponents:
Logarithms and exponents and their properties.

Interest:
Problem based on simple interest, compound interest and discounts.

Mental Ability:
Problem based on data interpretation, family relations, Logical reasoning.

Direct & Indirect variations:
Ratios & proportions, Unitary method, Work and time problems.

CLASS - X (PHYSICS)

Mechanics: Uniform and non-uniform motion along a straight line ; Concept of distance and displacement, Speed and velocity, acceleration and relation ship between these ; Distance-time and velocity - time graphs.

Newton’s Law of motion ; Relationship between mass, momentum, force and acceleration ; work done by a force ; Law of conservation of energy.

Law of gravitation, acceleration due to gravity.

Electricity and magnetism:
Ohm’s law ; Series and parallel combination of resistances ; Heating effect of current.

Magnetic field near a current carrying straight wire, along the axis of a circular coil and inside a solenoid ; Force on current carrying conductor ; Fleming’s left hand rule ; Working of electric motor ; Induced potential difference and current

Electric generator : Principle and working ; Comparison of AC and DC ; Domestic electric circuits.

Optics:
Rectilinear propagation of light ; Basic idea of concave mirror and convex lens ; Laws of refraction ; Dispersion.
**SAMPLE TEST PAPER**

**CLASS - XI (CHEMISTRY)**

**Some Basic Concepts of Chemistry** :
- Particulate nature of matter, 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.

**Structure of Atom** :
- Discovery of electron, proton and neutron.
- Atomic number, isotopes and isobars.
- Thompson’s model and its limitations, Rutherford’s model and its limitations.
- Concept of shells and sub-shells, dual nature of matter and light, de Broglie’s relationship.
- Heisenberg uncertainty principle, concept of orbitals, quantum numbers.
- Aufbau principle, Pauli exclusion principle and Hund’s rule.
- Electronic configuration of atoms, stability of half filled and completely filled orbitals.

**Classification of Elements and Periodicity in Properties** :
- Significance of classification, brief history of the development of periodic table.
- Trends in properties of elements - atomic radii, ionic radii, inert gas radii, ionization enthalpy, electron gain enthalpy, electronegativity, valence.

**Chemical Bonding and Molecular Structure** :
- Valence electrons, ionic bond, covalent bond, bond parameters.
- Lewis structure, polar character of covalent bond, covalent bond theory, resonance.
- Geometry of covalent molecules, VSEPR theory, concept of hybridization involving s, p and d orbitals.
- Shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), hydrogen bond.

**States of Matter** :
- Gases and Liquids:
  - Three states of matter, intermolecular interactions, type of bonding, melting and boiling points.
  - Role of gas laws in elucidating the concept of the molecule, Boyle’s law, Charles’ law, Gay Lussac’s law.
  - Avogadro’s law, ideal behavior, empirical derivation of gas equation, Avogadro’s number, ideal gas equation, deviation from ideal behavior, Liquification of gases, critical temperature.

- Liquid State - Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations)

**Thermodynamics** :
- Concepts of system, types of systems, surroundings, work, heat, energy, extensive and intensive properties, state functions.
- First law of thermodynamics - internal energy and enthalpy, heat capacity and specific heat, measurement of ΔU and ΔH.
- Hess’s law of constant heat summation, enthalpy of bond dissociation, combustion, formation, atomization, sublimation, phase transition, ionization, and dilution.

- Introduction of entropy as a state function, free energy change for spontaneous and non-spontaneous processes, equilibrium.

**Equilibrium** :
- Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of mass action, equilibrium constant, factors affecting equilibrium.
- Le Chatelier’s principle.
- Ionic equilibrium - ionization of acids and bases, strong and weak electrolytes, degree of ionization concept of pH.
- Hydrolysis of Salts (elementary idea), buffer solutions, solubility product, common ion effect (with illustrative examples).

**Redox Reactions** :
- Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, applications of redox reaction.

**Hydrogen** :
- Position of hydrogen in periodic table, 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 and structure.

**s-Block Elements (Alkali and Alkaline Earth Metals)** :
- Group 1 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.

**Preparation and properties of some important compounds** :
- Sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogen carbonate.
- CaO, CaCO₃, and industrial use of lime and limestone, Ca.

**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 - physical and chemical properties, some important compounds.
- Boron hydrides.
- Aluminium - uses, reactions with acids and alkalis.

- Group 14 elements:
  - General introduction, electronic configuration, occurrence, variation of properties, oxidation states.
  - Trends in chemical reactivity, anomalous behaviour of first element.
- Carbon - catenation, allotropes, physical and chemical properties.
- Uses of some important compounds - oxides.
- Important compounds of silicon and a few uses - silicon tetrachloride, silicones, silicates and zeolites.

**Principles of qualitative analysis** :
- Determination of one anion and one cation in a given salt.
- Cations - Pb⁺², Cu⁺², As³⁻, Al³⁺, Fe³⁺, Mn²⁺, Ni²⁺, Zn²⁺, Co²⁺, Ca²⁺, Sr²⁺, Ba²⁺, Mg²⁺, NH₄⁺
- Anions - CO₃⁻², SO₄²⁻, PO₄³⁻, NO₃⁻, NO₂⁻, NO₂⁻.
- (Note: Insoluble salts excluded)

**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 - free radicals, carboxyls, carbonation, electrophiles and nucleophiles.
- Types of organic reactions.

**Classification of Hydrocarbons** :
- Alkanes - Nomenclature, isomerism, conformations (ethane only), physical properties.
- Chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.

**Alkenes** :
- Nomenclature, structure of double bond (ethene only).
- Geometrical isomerism, physical properties.
- Methods of preparation.
- Chemical reactions - addition of hydrogen, halogen.
- Water, hydrogen halides (Markovnikov’s addition and peroxide effect).
- Oxidation, mechanism of electrophilic addition.

**Alkynes** :
- Nomenclature, structure of triple bond (ethyne).
- Physical properties.
- Methods of preparation.
- Chemical reactions - acyclic character of alkynes, addition reaction of - hydrogen, halogens.

**Aromatic hydrocarbons** :
- Introduction, IUPAC nomenclature.
- Benzene - resonance, aromaticity, chemical properties.
- Mechanism of electrophilic substitution - nitration sulphonation.
- Halogenation, Friedel Craft’s alkylation and acylation.
- Carcinogenicity and toxicity.
Solution of trigonometric equations.

Complex Number
Algebra of complex numbers, addition, multiplication, conjugation, polar representation, properties of modulus and principal argument, triangle inequality, cube roots of unity, geometric interpretations.

Quadratic equations
Quadratic equations with real coefficients, formation of quadratic equations with given roots, symmetric functions of roots.

Sequence & Series
Arithmetic, geometric and harmonic progressions, arithmetic, geometric and harmonic means, sums of finite arithmetic and geometric progressions, infinite geometric series, sums of squares and cubes of the first n natural numbers.

Logarithm & exponents
Logarithms and exponents and their properties. Exponential and logarithmic series.

Binomial Theorem
Binomial theorem for a positive integral index, properties of binomial coefficients. Binomial theorem for any index.

Permutations and combinations
Problem based on fundamental counting principle, Arrangement of alike and different objects, Circular permutation, Combination, formation of groups.

Straight Line
Cartesian coordinates, distance between two points, section formulae, shift of origin. Equation of a straight line in various forms, angle between two lines, distance of a point from a line; Lines through the point of intersection of two given lines equation of the bisector of the angle between two lines, concurrency of lines; Centroid, orthocentre, incentre and circumcentre of a triangle.

Conic Sections
Equation of a circle in various forms, equations of tangent, normal and chord. Parametric equations of a circle, intersection of a circle with a straight line or a circle, equation of a through normal and chord. Parametric equations of a circle, intersection of two circles and those of a circle with a straight line.

Equations of a parabola, ellipse and hyperbola in standard form, their foci, directrices and eccentricity, parametric equations, equations of tangent and normal locus problems.

Mental Ability
Problem based on data interpretation, family relations & Logical reasoning.

CLASS - XI (MATHMATICS)

Functions
Sets and their representations. Empty, finite and infinite sets, Subsets, Union and intersection of sets, Venn diagrams. Pictorial representation of a function domain, co-domain and range of a function domain and range of constant, identity, polynomial, rational, modulus, signum and greatest integer functions with their graphs. Sum, difference, product and quotients of functions.

Trigonometric Functions
Measuring angles in radians and in degrees and conversion from one measure to another. Signs of trigonometric functions and sketch of their graphs. Addition and subtraction formulae, formulae involving multiple and sub-multiple angles. General solution of trigonometric equations.

Complex Number
Algebra of complex numbers, addition, multiplication, conjugation, polar representation, properties of modulus and principal argument, triangle inequality, cube roots of unity, geometric interpretations.

Quadratic equations
Quadratic equations with real coefficients, formation of quadratic equations with given roots, symmetric functions of roots.

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Mental Ability
Problem based on data interpretation, family relations & Logical reasoning.

CLASS - XI (PHYSICS)

Mechanics
Kinematics in one and two dimensions (Cartesian coordinates only); projectile; Uniform Circular motion; Relative velocity.

Newton’s laws of motion; Inertial and uniformly accelerated frames of reference; Static and dynamic friction; Kinetic and potential energy; Work and power; Conservation of linear momentum and mechanical energy.

Systems of particles; Centre of mass and its motion; Impulse; Elastic and inelastic collisions.

Law of gravitation; Gravitational potential and field; Acceleration due to gravity; Motion of planets and satellites in circular orbits; Escape velocity.

Rigid body, moment of inertia, parallel and perpendicular axes theorems, moment of inertia of uniform bodies with simple geometrical shapes; Angular momentum; Torque; Conservation of angular momentum; Dynamics of rigid bodies with fixed axis of rotation; Rolling without slipping of rings, cylinders and spheres; Equilibrium of rigid bodies; Collision of point masses with rigid bodies.

Linear and angular simple harmonic motions.

Hooke’s law, Young’s modulus.

Pressure in a fluid; Pascal’s law; Buoyancy; Surface energy and surface tension, capillary rise; Viscosity (Poiseuille’s equation excluded), Stoke’s law; Terminal velocity, Streamline flow, equation of continuity, Bernoulli’s theorem and its applications.

Waves
Wave motion (plane waves only), longitudinal and transverse waves; Superposition of waves; Progressive and stationary waves; Vibrations of strings and air columns;Resonance; Beats; Speed of sound in gases; Doppler effect (in sound).

Thermal physics
Thermal expansion of solids, liquids and gases; Calorimetry, Change in latent heat; Heat conduction in one dimension; Elementary concepts of convection and radiation; Newton's law of cooling; Ideal gas laws; Specific heats (Cv and Cp for monoatomic and diatomic gases); Isothermal and adiabatic processes, bulk modulus of gases; Equivalence of heat and work; First law of thermodynamics and its applications (only for ideal gases); Blackbody radiation; Absorptive and emissive powers; Kirchhoff’s law; Wien’s displacement law, Stefan’s law.

CLASS - XII (CHEMISTRY)

Physical Chemistry
General topics
Concept of atoms and molecules; Dalton’s atomic theory; Mole concept; Chemical formulae, Balanced chemical equations; Calculations (based on mole concept) involving common oxidation-reduction, neutralisation, and displacement reactions; Concentration in terms of mole fraction, molarity, molality and normality.

Gaseous and liquid states
Absolute scale of temperature, ideal gas equation; Deviation from ideality, van der Waals equation; Kinetic theory of gases, average, root mean square and most probable velocities and their relation with temperature; Law of partial pressures; Vapour pressure; Diffusion of gases.

Atomic structure and chemical bonding
Bohr model, spectrum of hydrogen atom, quantum numbers; Wave-particle duality, de Broglie hypothesis; Uncertainty principle; Qualitative quantum mechanical picture of hydrogen atom, shapes of s, p and d orbitals; Electronic configurations of elements (up to atomic number 36); Aufbau principle; Pauli’s exclusion principle and Hund’s rule; Orbital overlap and covalent bond; Hybridisation involving s, p, d and orbitals only; Orbital energy diagrams for homonuclear diatomic species; Hydrogen bond; Polarity in molecules, dipole moment (qualitative aspects only); VSEPR model and shapes of molecules (linear, angular, trigonal, square planar, pyramidal, square pyramidal, trigonal bipyramidal, tetrahedral and octahedral).

Energetics
First law of thermodynamics; Internal energy, work and heat, pressure-volume work; Enthalpy, Hess’s law; Heat of reaction, fusion and vapourisation; Second law of thermodynamics; Entropy; Free energy; Criterion of spontaneity.
Chemical equilibrium: Law of mass action; Equilibrium constant, Le Chatelier’s principle (effect of concentration, temperature and pressure); Significance of \( \Delta G \) and \( \Delta Go \) in chemical equilibrium; Solubility product, common ion effect, pH and buffer solutions; Acids and bases (Bronsted and Lewis concepts); Hydrolysis of salts.

Electrochemistry: Electrochemical cells and cell reactions; Standard electrode potentials; Nernst equation and its relation to DG; Electrochemical series, emf of galvanic cells; Faraday’s laws of electrolysis; Electrolytic conductance, specific, equivalent and molar conductivity, Kohlrausch’s law; Concentration cells.

Chemical kinetics: Rates of chemical reactions; Order of reactions; Rate constant; First order reactions; Temperature dependence of rate constant (Arrhenius equation).

Solid state: Classification of solids, crystalline state, seven crystal systems (cell parameters a, b, c), close packed structure of solids (cubic), packing in fcc, bcc and hcp lattices; Nearest neighbours, ionic radii, simple ionic compounds, point defects.

Solutions: Raoult’s law; Molecular weight determination from lowering of vapour pressure, elevation of boiling point and depression of freezing point.

Surface chemistry: Elementary concepts of adsorption (excluding adsorption isotherms); Collodion: types, methods, preparation and general properties; Elementary ideas of emulsions, surfactants and micelles (only definitions and examples).

Nuclear chemistry: Radioactivity: isotopes and isobars; Properties of rays; Kinetics of radioactive decay (decay series excluded), carbon dating; Stability of nuclei with respect to proton-neutron ratio; Brief discussion on fission and fusion reactions.

Inorganic Chemistry

Isolation/preparation and properties of the following non-metals: Boron, silicon, nitrogen, phosphorus, oxygen, sulphur and halogens; Properties of allotropes of carbon (only diamond and graphite), phosphorus, and sulphur.

Preparation and properties of the following compounds: Oxides, peroxides, hydroxides, carbonates, bicarbonates, chlorides and sulphates of sodium, potassium, magnesium and calcium; Boron: diborane, boronic acid and borox; Aluminium: alumina, aluminium chloride and alums; Carbon: oxides and oxyacid (carbonic acid); Silicon: silicenes, silicates and silicon carbide; Nitrogen: oxides, oxycacids and ammonia; Phosphorus: oxides, oxycacids (phosphorous acid, phosphoric acid) and phosphine; Oxygen: ozone and hydrogen peroxide; Sulphur: hydrogen sulphide, oxides, sulphurous acid, sulphuric acid and sodium thiosulphate; Halogens: hydrohalic acids, oxides, and oxyacid of chlorine, bleeding powder; Xenon fluorides.

Transition elements (3d series): Definition, general characteristics, oxidation states and their stabilities, colour (excluding the details of electronic transitions) and calculation of spin (only magnetic moment), Coordination compounds: nomenclature of mononuclear coordination compounds, cis-trans and ionisation isomerisms, hybridization and geometries of mononuclear coordination compounds (linear, tetrahedral, square planar and octahedral).

Preparation and properties of the following compounds: Oxides and chlorides of tin and lead; Oxides, chlorides and sulphates of Fe, Cu and Zn; Potassium permanganate, potassium dichromate, silver oxide, silver nitrate, silver thiosulphate.

Ores and minerals: Commonly occurring ores and minerals of iron, copper, tin, lead, magnesium, aluminium, zircon and silver.

Extractive metallurgy: Chemical principles and reactions only (industrial details excluded); Carbon reduction method (iron and tin); Self reduction method (copper and lead); Electrolytic reduction method (magnesium and aluminium); Cyanide process (silver and gold).

Principles of qualitative analysis: Groups I to V (only Ag, Hg, Cu, Pb, Bi, Fe, Cr, Al, Ca, Ba, Zn, Mn and Mg); Nitrate, halides (excluding fluoride), sulphate and sulphide.

Organic Chemistry

Concepts: Hybridisation of carbon; Sigma and pi-bonds; Shapes of simple organic molecules; Structural and geometrical isomerism; Optical isomerism of compounds containing up to two asymmetric centres. (R.S and E.Z nomenclature excluded); IUPAC nomenclature of simple organic compounds (only hydrocarbons, mono-functional and bi-functional compounds); Conformations of ethane and butane (Newman projections); Resonance and hyperconjugation; Keto-enol tautomerism; Determination of empirical and molecular formulae of simple compounds (only combustion methods); Hydrogen bonds: definition and their effects on physical properties of alcohols and carboxylic acids; Inductive and resonance effects on acidity and basicity of organic acids and bases; Polarity and inductive effects in alkyl halides; Reactive intermediates produced during homolytic and heterolytic bond cleavage; Formation, structure and stability of carboxylation, carbanions and free radicals.

Preparation, properties and reactions of alkanes: Homologous series, physical properties of alkanes (melting points, boiling points and density); Combustion and halogenation of alkanes; Preparation of alkanes by Wurtz reaction and dehydroxylation reactions.

Preparation, properties and reactions of alkenes and alkynes: Physical properties of alkenes and alkynes (boiling points, density and dipole moments); Acidity of alkenes; Acid catalysed hydration of alkenes and alkynes (excluding the stereochemistry of addition and elimination); Reactions of alkenes with K/MnO, and ozone; Reduction of alkenes and alkynes; Preparation of alkenes and alkynes by elimination reactions; Electrophilic addition reactions of alkenes with CHX, HX, HOX and H2O (X=halogen); Addition reactions of alkynes; Metal acylides.

Reactions of Benzene: Structure and aromaticity; Electrophilic substitution reactions: halogenation, nitration, sulphonation, Friedel-Crafts alkylation and acylation; Effect of ortho, meta and para directing groups in monosubstituted benzenes.

Phenols: Acidity, electrophilic substitution reactions (halogenation, nitration and sulphonation); Reimer-Tiemann reaction, Kolbe reaction.

Characteristic reactions of the following (including those mentioned above): Alkyl halides: rearrangement reactions of alkyl carbocation, Grignard reactions, nucleophilic substitution reactions; Alcohols: esterification, dehydrogenation and oxidation, reaction with sodium, phosphorus halides, ZnCl2/concentrated HCl, conversion of alcohols into aldehydes and ketones; Ethers: Preparation by Williamson’s Synthesis; Aldehydes and Ketones: oxidation, reduction, oxime and hydrazone formation; aldol condensation, Perkin reaction; Cannizzaro reaction; haliform reaction and nucleophilic addition reactions (Grignard addition); Carboxylic acids: formation of esters, acid chlorides and amides, ester hydrolysis; Amines: basicity of substituted anilines and aliphatic amines, preparation from nitro compounds, reaction with nitrous acid, azo coupling reaction of diazoniium salts of aromatic amines, Sandmeyer and related reactions of diazonium salts; carbylamine reaction; Haloarenes: nucleophilic aromatic substitution in haloarenes and substituted haloarenes (excluding Benzene mechanism and Cine substitution).
SAMPLE TEST PAPER

Mathematics:

- Carbohydrates: Classification; mono- and di-saccharides (glucose and sucrose); Oxidation, reduction, glycoside formation and hydrolysis of sucrose.
- Amino acids and peptides: General structure (only primary structure for peptides) and physical properties.
- Properties and uses of some important polymers: Natural rubber, cellulose, nylon, teflon and PVC.
- Practical organic chemistry: Detection of elements (N, S, halogens); Detection and identification of the following functional groups: hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketone), carboxyl, amino and nitro; Chemical methods of separation of mono-functional organic compounds from binary mixtures.

Class - XII (Mathematics)

- Complex Number and Quadratic equations:
  - Algebra of complex numbers, addition, multiplication, conjugation, polar representation, properties of modulus and principal argument, triangle inequality, cube roots of unity, geometric interpretations.
  - Quadratic equations with real coefficients, formation of quadratic equations with given roots, symmetric functions of roots.
- Sequence & Series:
  - Arithmetic, geometric and harmonic progressions, arithmetic, geometric and harmonic means, sums of finite arithmetic and geometric progressions, infinite geometric series, sums of squares and cubes of the first n natural numbers.
  - Logarithms and their properties. Permutations and combinations, Binomial theorem for a positive integral index, properties of binomial coefficients.
  - Binomial theorem for any index, exponential and logarithmic series.
- Matrices & Determinants:
  - Matrices as a rectangular array of real numbers, equality of matrices, addition, multiplication by a scalar and product of matrices, transpose of a matrix, determinant of a square matrix of order up to three, inverse of a square matrix of order up to three, properties of these matrix operations, diagonal, symmetric and skew-symmetric matrices and their properties, solutions of simultaneous linear equation in two or three variables.
- Probability:
  - Addition and multiplication rules of probability, conditional probability, baye’s theorem, independence of events, computation of probability of events using permutations and combinations.
- Straight Line:
  - Cartesian coordinates, distance between two points, section formulae, shift of origin. Equation of a straight line in various forms, angle between two lines, distance of a point from a line; Lines through the point of intersection of two given lines equation of the bisector of the angle between two lines, concurrency of lines; Centroid, orthocentre, incentre and circumcentre of a triangle.
- Conic Section:
  - Equation of a circle in various forms, equations of tangent, normal and chord. Parametric equations of a circle, intersection of a circle with a straight line or a circle, equation of a through the points of intersection of two circles and those of a circle and a straight line.
  - Equations of a parabola, ellipse and hyperbola in standard form, their foci, directrices and eccentricity, parametric equations, equations of tangent and normal locus problems.
- Three dimensions:
  - Direction cosines and direction ratios, equation of a straight line in space, equation of a plane, distance of a point from a plane

Physics:

- Vectors:
  - Addition of vectors, scalar multiplication, dot and cross products, scalar triple products and their geometrical interpretations. Position vector of a point dividing a line segment in a given ratio. Projection of a vector on a line.
- Function:
  - Real valued functions of a real variable, into, onto and one-to-one functions, sum, difference, product and quotient of two functions, composite functions, absolute value, polynomial, rational, trigonometric, exponential and logarithmic functions. Even and odd functions, inverse of a function, composite function.
- Limit, Continuity & Derivability:
  - Limit and continuity of a function, limit and continuity of the sum, difference, product and quotient of two functions, L’Hospital rule of evaluation of limits of functions even and odd functions, inverse of a function, continuity of composite function. Intermediate value property of continuous functions.
- Differentiation:
  - Derivative of a function, derivative of the sum, difference, product and quotient of two functions, chain rule, derivatives of polynomial, rational, trigonometric, inverse trigonometric, exponential and logarithmic functions. Derivatives of implicit functions, derivatives up to order two.
- Tangent & Normal:
  - Geometrical interpretation of the derivative, tangents and normal.
- Maxima & Minima:
  - Increasing and decreasing functions, maximum and minimum values of a function; rolle’s theorem and Lagrange’s Mean value theorem.
- Integral calculus:
  - Integration as the inverse process of differentiation, indefinite integrals of standard functions, integration by parts, integration by the methods of substitution and partial fractions.
- Trigonometry:
  - Trigonometric functions, their periodicity and graphs addition and subtraction formulae, formulae involving multiple and sub-multiple angles, general solution of trigonometric equations. Relations between sides and angles of a triangle, sine rule, cosine rule, half-angle formula and the area of a triangle, inverse trigonometric functions (principal value only).

Class - XII (Physics)

- General:
  - Units and dimensions, dimensional analysis; least count, significant figures; Methods of measurement and error analysis for physical quantities pertaining to the following experiments: Experiments based on using Vernier calipers and screw gauge (micrometer), Determination of g using simple pendulum, Young’s modulus by Searle’s method. Specific heat of a liquid using calorimeter, focal length of a concave mirror and a convex lens using u-v method, Speed of sound using resonance column, Verification of Ohm’s law using voltmeter and ammeter, and specific resistance of the material of a wire using meter bridge and post office box.
- Mechanics:
  - Kinematics in one and two dimensions (Cartesian coordinates only), Projectile Motion; Uniform Circular Motion; Relative Velocity.
  - Newton’s laws of motion; Inertial and uniformly accelerated frames of reference; Static and dynamic friction; Kinetic and potential energy; Work and power; Conservation of linear momentum and mechanical energy.
SAMPLE TEST PAPER

Systems of particles; Centre of mass and its motion; Impulse; Elastic and inelastic collisions.

Law of gravitation; Gravitational potential and field; Acceleration due to gravity; Motion of planets and satellites in circular orbits; Escape velocity.

Rigid body, moment of inertia, parallel and perpendicular axes theorems, moment of inertia of uniform bodies with simple geometrical shapes; Angular momentum; Torque; Conservation of angular momentum; Dynamics of rigid bodies with fixed axis of rotation; Rolling without slipping of rings, cylinders and spheres; Equilibrium of rigid bodies; Collision of point masses with rigid bodies.

Linear and angular simple harmonic motions.

Hooke's law, Young's modulus. Pressure in a fluid; Pascal's law; Buoyancy; Surface energy and surface tension, capillary rise; Viscosity (Poiseuille's equation excluded), Stoke's law; Terminal velocity, Streamline flow, equation of continuity, Bernoulli's theorem and its applications.

Waves : Wave motion (plane waves only), longitudinal and transverse waves, superposition of waves; Progressive and stationary waves; Vibration of strings and air columns; Resonance; Beats; Speed of sound in gases; Doppler effect (in sound).

Thermal physics : Thermal expansion of solids, liquids and gases; Calorimetry, latent heat; Heat conduction in one dimension; Elementary concepts of convection and radiation; Newton's law of cooling; Ideal gas laws; Specific heats (Cv and Cp for monoatomic and diatomic gases); Isothermal and adiabatic processes, bulk modulus of gases; Equivalence of heat and work; First law of thermodynamics and its applications (only for ideal gases); Blackbody radiation: absorptive and emissive powers; Kirchhoff's law; Wien's displacement law, Stefan's law.

Electricity and magnetism : Coulomb's law; Electric field and potential; Electrical potential energy of a system of point charges and of electrical dipoles in a uniform electrostatic field; Electric field lines; Flux of electric field; Gauss's law and its application in simple cases, such as, to find field due to infinitely long straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell.

Capacitance; Parallel plate capacitor with and without dielectrics; Capacitors in series and parallel; Energy stored in a capacitor.

Electric current; Ohm's law; Series and parallel arrangements of resistances and cells; Kirchhoff's laws and simple applications; Heating effect of current.

Biot–Savart's law and Ampere's law; Magnetic field near a current-carrying straight wire, along the axis of a circular coil and inside a long straight solenoid; Force on a moving charge and on a current-carrying wire in a uniform magnetic field.

Magnetic moment of a current loop; Effect of a uniform magnetic field on a current loop; Moving coil galvano-meter, voltmeter, ammeter and their conversions.

Electromagnetic induction: Faraday's law, Lenz's law; Self and mutual inductance; RC, LR and LC circuits with d.c. and a.c. sources.

Optics: Rectilinear propagation of light; Reflection and refraction at plane and spherical surfaces; Total internal reflection; Deviation and dispersion of light by a prism; Thin lenses; Combinations of mirrors and thin lenses; Magnification.

Wave nature of light: Huygen's principle, interference limited to Young's double-slit experiment.

Modern physics : Atomic nucleus; Alpha, beta and gamma radiations; Law of radioactive decay; Decay constant; Half-life and mean life; Binding energy and its calculation; Fission and fusion processes; Energy calculation in these processes.

Photoelectric effect; Bohr's theory of hydrogen-like atoms; Characteristic and continuous X-rays; Moseley's law; de Broglie wavelength of matter waves.
SAMPLE TEST PAPER
(For Class-X Appearing / Passed Students)

COURSE: VIKAAS (JA) & VIPUL (JB)

TARGET: JEE MAIN + ADVANCED 2021

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PART - I (MATHEMATICS) भाग - I (राशि)

Straight Objective Type (Maximum Marks : 150)

This section contains FIFTY single choice questions. Each question has four choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

1. Which one of the following is a true statement ?
   (A) The difference of two natural numbers is always a natural number
   (B) The difference of two integers is always an integer
   (C) The quotient of two rational numbers is always rational
   (D) None of these

2. $7x^2 - 5x^2$ is a :
   (A) binomial
   (B) Trinomial
   (C) monomial
   (D) None of these

3. In a coordinate plane, a point P (2, –2) shifted to a new position $P'$, whose coordinates are ($x$, 2).
   The point has moved in the :
   (A) I$^{st}$ quadrant
   (B) II$^{nd}$ quadrant
   (C) III$^{rd}$ quadrant
   (D) IV$^{th}$ quadrant

4. Euclid stated that all right angles are equal to each other in the form of
   (A) an axiom
   (B) a definition
   (C) a postulate
   (D) a proof

5. Ray OS stands on a line POQ. Ray OR and ray OT are angle bisectors of $\angle POS$ and $\angle SOQ$, respectively. If $\angle POS = x$, find $\angle ROT$.
   (A) $60^\circ$
   (B) $80^\circ$
   (C) $90^\circ$
   (D) None of these

6. It is given that $\triangle ABC \cong \triangle FDE$ and $AB = 5$ cm, $\angle B = 40^\circ$ and $\angle A = 80^\circ$. Then which of the following is true?
   (A) $DF = 5$ cm, $\angle F = 60^\circ$
   (B) $DF = 5$ cm, $\angle E = 60^\circ$
   (C) $DE = 5$ cm, $\angle E = 60^\circ$
   (D) $DE = 5$ cm, $\angle D = 40^\circ$
7. Find the area of quadrilateral ABCD in which AB = 9 cm, BC = 40 cm, CD = 28 cm, DA = 15 cm and ∠ABC = 90°. The answer is...

8. x = 2 and y = 1 do not satisfy the equation: x = 2, y = 1. Does the equation hold true for these values?

9. The figure formed by joining the mid-points of the sides of a quadrilateral ABCD, taken in order, is a square only if...

10. ABCD is a trapezium with parallel sides AB = a cm and DC = b cm. E and F are the mid-points of the non-parallel sides. The ratio of ar (ABFE) and ar (EFCD) is...

11. A regular hexagon is inscribed in a circle with centre O. Each side subtend angle at the centre is...

12. Find the value of 56.08 148 + 14. What is the solution?

13. A cone is 8.4 cm high and the radius of its base is 2.1 cm. It is melted and recast into a sphere. The radius of the sphere is...
20. In figure, lines XY and MN intersect at O. If POY = 90° and a : b = 2 : 3, then the angle c is:
(A) 126° (B) 128° (C) 130° (D) None of these

21. For a quadrilateral ABCD, which of the following option is correct?
(A) AB + BC + CD + DA < 2(BD + AC) (B) AB + BC + CD + DA > 2(BD + AC) (C) AB + BC + CD + DA < \frac{1}{2}(BD + AC) (D) None of these

22. The perimeter of a rhombus is 20 cm and one of its diagonal is 6 cm. Find the length of the other diagonal.
(A) 8 cm (B) 9 cm (C) 10 cm (D) 11 cm

23. A dealer purchases 12 apples for Rs 10 and sells 10 apples for Rs 12. His gain percentage is:
(A) 40% (B) 44% (C) 48% (D) 52%

24. D and E are the mid-points of the sides AB and AC respectively of \triangle ABC. DE is produced to F. To prove that CF is equal and parallel to DA, we need an additional information which is:
(A) \angle DAE = \angle EFC (B) AE = EF (C) DE = EF (D) \angle ADE = \angle ECF

25. In figure, ABCD is a parallelogram. Points P and Q on BC trisects BC in three equal parts. Then ar(APQ) = ar(ABCD) = \frac{1}{4} ar(ABCD) (B) \frac{1}{2} ar(ABCD) (C) \frac{1}{6} ar(ABCD) (D) \frac{1}{3} ar(ABCD)

26. In figure, a square is inscribed in a circle of radius 8\sqrt{2} cm. Then the length of the square is
(A) 16 cm (B) 12 cm (C) 10 cm (D) 8 cm

27. The rational form of 2.7435 is:
(A) \frac{27161}{9999} (B) \frac{27161}{9990} (C) \frac{27161}{9900} (D) \frac{27161}{9000}

28. The radii of two cylinders are in the ratio of 2:3 and their heights are in the ratio of 5:3. The ratio of their volumes is:
(A) 10 : 17 (B) 20 : 27 (C) 17 : 27 (D) 20 : 37

29. Let \bar{x} be the mean of x_1, x_2, ..., x_n and \bar{y} be the mean of y_1, y_2, ..., y_n. If \bar{Z} is the mean of x_1, x_2, ..., x_n, y_1, y_2, ..., y_n, then \bar{Z} is equal to
(A) \bar{x} + \bar{y} (B) \frac{\bar{x} + \bar{y}}{2} (C) \frac{\bar{x} + \bar{y}}{n} (D) \frac{\bar{x} + \bar{y}}{2n}
30. A bag contains 5 red balls and some blue balls. If the probability of drawing a blue ball is double that of a red ball, find the number of blue balls in the bag.

If the probability of drawing a blue ball is double that of a red ball, let the number of blue balls be $x$. Then,

\[ \frac{5}{5 + x} = \frac{1}{2} \]

Solving for $x$,

\[ 10 = 5 + x \]

\[ x = 5 \]

Therefore, there are 5 blue balls in the bag.

(A) 10 (B) 5 (C) 15 (D) 20

31. \[ \frac{10 + 8^3}{\sqrt{12} \times 3^{1/2}} = ? \]

\[ \frac{10 + 512}{\sqrt{12} \times 3^{1/2}} = \frac{522}{\sqrt{12} \times 3^{1/2}} \]

\[ \frac{522}{\sqrt{12} \times 3^{1/2}} = \frac{522}{2 \times 3^{1/2}} \]

\[ \frac{522}{2 \times 3^{1/2}} = \frac{261}{3^{1/2}} \]

\[ \frac{261}{3^{1/2}} = \frac{261}{\sqrt{3}} \]

\[ \frac{261}{\sqrt{3}} = 87 \sqrt{3} \]

(A) 6 (B) 10 + \sqrt{3} (C) 10 + \sqrt{3} (D) 10 + \sqrt{3}

32. If \( f(x) = x^3 - x^2 + x + 1 \) then value of

\[ \frac{f(1) + f(-1)}{2} \]

\[ \frac{f(1) + f(-1)}{2} = \frac{(1^3 - 1^2 + 1 + 1) + ((-1)^3 - (-1)^2 + (-1) + 1)}{2} \]

\[ \frac{1 + 1}{2} = \frac{2}{2} = 1 \]

Therefore, the value of \( \frac{f(1) + f(-1)}{2} \) is 1.

(A) 5 (B) 2 (C) 0 (D) -2

33. In a coordinate plane, a point A (–6, –5) shifts 5 units towards the right in a horizontal direction and reaches at point B. The coordinates of point B are:

(A) (–6, 0) (B) (–1, –5) (C) (–5, –5) (D) (–1, 0)

34. If APB and CQD are two parallel lines, then the bisectors of the angles APQ, BPQ, CQP and PQD form

(A) a square (B) a rhombus (C) a rectangle (D) any other parallelogram

35. In figure, if PQ \( \perp \) PS, PO || SR, \( \angle SQR = 28^\circ \) and \( \angle QRT = 65^\circ \), then the values of x and y respectively are:

(A) 43\(^\circ\), 47\(^\circ\) (B) 53\(^\circ\), 37\(^\circ\) (C) 37\(^\circ\), 53\(^\circ\) (D) 50\(^\circ\), 40\(^\circ\)

36. ABC is a right triangle such that AB = AC and bisector of angle C intersects the side AB at D. Then AC + AD =

\[ \frac{1}{2} BC \quad \text{or} \quad \frac{1}{4} BC \quad \text{or} \quad \frac{1}{4} BC \quad \text{or} \quad \text{(D) None of these} \]

37. An isosceles triangle have equal sides 12 cm and base is 18 cm. Then the height of the triangle corresponding to the base (in cm) is:

(A) \( \frac{24}{13} \) cm (B) \( \frac{12}{13} \) cm (C) \( \frac{12}{13} \) cm (D) None of these

38. The two solutions of the lines \( \pi x + y = 9 \).

(A) (0, 0), (0, 9) (B) (0, 9), (9/\( \pi \), 0) (C) (1/\( \pi \), 1), (–1/\( \pi \), –10) (D) (–1, 9+\( \pi \)), (1, 9+\( \pi \))

39. E is the mid-point of a median AD of \( \triangle ABC \) and BE is produced to meet AC at F. Then AE =

\[ \frac{1}{2} AC \quad \text{or} \quad \frac{1}{4} AC \quad \text{or} \quad \frac{1}{4} AC \quad \text{(D) None of these} \]

40. In figure, ABCD and AEFD are two parallelograms. Then ar (PEA) =

(A) ar (QFD) (B) \( \frac{1}{2} \) ar (QFD) (C) \( \frac{1}{3} \) ar (QFD) (D) None of these
41. In the given figure, O is the centre of the circle, AB and CD are two chords such that OL is perpendicular to AB and OM is perpendicular to CD. \( \angle AOB = 50^\circ \), AL = DM = 2 cm. The measure of \( \angle COD \) is:

- (A) 50°
- (B) 70°
- (C) 90°
- (D) 130°

42. If \( a + b + c = 9 \) and \( ab + bc + ca = 26 \), then the value of \( a^3 + b^3 + c^3 - 3abc \) is:

- \( \frac{2}{5} \)
- \( \frac{1}{2} \)
- \( \frac{5}{7} \)
- (D) zero

43. The number of planks of dimensions \( (4 m \times 50 cm \times 20 cm) \) that can be stored in a pit which is 16 m long, 12 m wide and 4 m deep is:

- (A) 16 m
- (B) 12 m
- (C) 8 m
- (D) 6 m

44. The following observations have been arranged in ascending order. If the median of the data is 63, find the value of \( x \).

- (A) 29, 32, 34, 48, 50, \( x \), \( x + 2 \), 72, 78, 84, 95
- (B) 60
- (C) 58
- (D) None of these

45. Mr. and Mrs. Gulati stays in a house along with their seven children. The female to male ratio in the family is 1 : 2. The probability that all the children are of same sex will be:

- (A) 305.44 cm³
- (B) 303.44 cm³
- (C) 301.44 cm³
- (D) 300.44 cm³

46. If \( x - y = 4 \) and \( xy = 21 \) then \( x^3 - y^3 = \)

- (A) 36
- (B) 25
- (C) -225
- (D) -36

47. The radius of a sphere is increased by 10%. Then the percentage increase in volume will be approximately.

- (A) 30.1 %
- (B) 33.1 %
- (C) 31.5 %
- (D) 36.33 %

48. In a mathematics test given to 15 students, the following marks (out of 100) are recorded:

\[ 41, 39, 48, 52, 46, 62, 54, 40, 96, 52, 98, 40, 42, 52, 60 \]

Find the mean, median and mode of this data.

- (A) 54.8, 52, 52
- (B) 56.8, 40, 52
- (C) 54.8, 52, 40
- (D) 56.8, 52, 40

49. Triangle ABC is inscribed in a circle with centre O. If \( \angle ACB = 40^\circ \), then \( \angle B \) is:

- (A) 1900
- (B) 1920
- (C) 1800
- (D) 1840

50. A right triangle with sides 6 cm, 8 cm and 10 cm is revolved about the side 8 cm. Then the volume of the solid so formed. (Take \( \pi = 3.14 \))

- (A) 305.44 cm³
- (B) 303.44 cm³
- (C) 301.44 cm³
- (D) None of these

**PART - II (PHYSICS) भाग - II (मौलिक विज्ञान)**

**Straight Objective Type (Maximum Marks : 45)**

This section contains FIFTEEN single choice questions. Each question has four choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

51. A train 50 m long passes over a bridge at a velocity of 30 km/h. If it takes 36 s to cross the bridge, then the length of the bridge will be:

- (A) 25 m
- (B) 20 m
- (C) 300 m
- (D) 350 m

52. An athlete completes one round of a circular track of radius \( R \) in 40 s. His displacement at the end of 2 minutes will be:

- (A) 2\( \pi \)R
- (B) 6\( \pi \)R
- (C) 2R
- (D) zero

53. An automobile moving at a speed of 72 km/h is brought to rest in 2 seconds by application of brakes. How much distance does the automobile covers in these 2 seconds?

- (A) 25 m
- (B) 20 m
- (C) 15 m
- (D) 10 m
54. A book is placed on the table as shown in figure. If force F is applied on it then the angle between the applied force and normal force by the table on the book is:

\[ \text{If the angle is } \theta \text{ then } \sin \theta = \frac{F}{N} \]

(A) 0°  (B) 45°  (C) 90°  (D) 180°

55. Block A is moving with a certain acceleration along a frictionless horizontal surface. When a second block B is placed on top of block A, the acceleration of the combined block drops to 1/5 the original value. What is the ratio of the mass of A to the mass of B:

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

56. A body of mass 4 kg moving on a horizontal surface with an initial velocity of 6 ms\(^{-1}\) comes to rest after 3 seconds. If one wants to keep the body moving on the same surface with the velocity of 6 ms\(^{-1}\), the force required is:

(A) 8 N  (B) 4 N  (C) 80 N  (D) 16 N

57. Two solid spheres of same radius (R) and of same material are placed in such a way that their centres are 2R apart. The gravitational force between them is directly proportional to:

(A) \(R^2\)  (B) \(R^{-2}\)  (C) \(R^4\)  (D) \(R^{-4}\)

58. The weight of a boy on the surface of moon is 300 N. The weight of this boy on the surface of earth is:

(A) 300 N  (B) 5 N  (C) 50 N  (D) 1800 N

59. If the value of 'g' (acceleration due to gravity) at a height above the surface of earth is the same as at a depth d below it, then (Assume that h and d < < R earth radius):

\[ g \text{ at height } h = g \text{ at depth } d \]

(A) \(h = d\)  (B) \(h = d/2\)  (C) \(h = \frac{d}{2}\)  (D) \(d = h^2\)

60. A solid of density 'D' has weight 'W'. If it is completely immersed in a liquid of density 'd', then apparent weight of the solid is:

\[ W \left(1 - \frac{d}{D}\right) \]

(A) \(W \left(\frac{d}{D}\right)\)  (B) \(W \left(1 - \frac{D}{d}\right)\)  (C) \(W \left(1 + \frac{D}{d}\right)\)  (D) \(W \left(1 + \frac{d}{D}\right)\)

61. If a force of 10 N acts on two surfaces (area in the ratio 1 : 2), then the ratio of thrusts will be:

(A) \(\frac{10}{2}\)  (B) \(\frac{5}{1}\)  (C) \(\frac{5}{2}\)  (D) \(\frac{1}{2}\)

62. A body at rest has mass 10 kg. It is moved by a horizontal force of 5 N on a horizontal surface the work done by the force in 8 second is:

(A) 40 J  (B) 85 J  (C) 70 J  (D) 100 J

63. If the kinetic energy of a body is increased by 100 %, then the change in momentum of the body is:

\[ \Delta p = m \times 100\% \]

(A) \(4.17\%\)  (B) \(41.7\%\)  (C) \(141.7\%\)  (D) none of these (These in type of one another)

64. The moon is at a distance of \(4 \times 10^8\) m from the earth. A radar signal is transmitted from the earth to reach the moon in about:

(A) 2.6 s  (B) 1.3 s  (C) 5.2 s  (D) 6.5 s

65. During summer, an echo is heard :

(A) Later than during winter  (B) Rarely  (C) Sooner than during winter  (D) After same time as in winter

66. If a body of mass 4 kg moving on a horizontal surface with an initial velocity of 6 ms\(^{-1}\), the force required is:

(A) \(\frac{1}{2}\)  (B) \(\frac{1}{4}\)  (C) \(\frac{1}{5}\)  (D) \(\frac{1}{6}\)

67. If the gravitational force between two objects is directly proportional to the product of their masses and inversely proportional to the square of the distance between them, then the force of attraction between two objects of masses \(m_1\) and \(m_2\) separated by a distance \(r\) is:

\[ F \propto \frac{m_1 m_2}{r^2} \]

(A) \(\frac{m_1 m_2}{r^2}\)  (B) \(\frac{m_1 m_2}{r}\)  (C) \(\frac{m_1 m_2}{r^3}\)  (D) \(\frac{m_1 m_2}{r^4}\)
66. Which of the following is not matter?
(A) Lava of volcanic eruption  (B) Pain
(C) Thomson  (D) Somerfield

67. The particle size of solute in true solution is the order of –
(A) 10^{-4} m  (B) 10^{-7} m  (C) 10^{-9} m (D) 10^{-9} m

68. The formula unit mass of NaCl is :
NaCl का सूत्र इकाई तनाम कि है –
(A) 56.5 u  (B) 36.5 u  (C) 58.5 u  (D) 55.5 u

69. Electrons revolve in some definite circular orbits around the nucleus without emission of energy. This statement was given by :
(A) Rutherford  (B) Bohr
(C) Thomson  (D) Somerfield

70. What characteristics of substances enable us to determine that a given sample is pure or not?
(A) Boiling point  (B) Melting point
(C) Both A & B  (D) None of these

71. Which of the following statements is not correct ?
(A) A compound is a pure substance.
(B) A compound is homogeneous in nature.
(C) A compound always contains two or more elements.
(D) A compound can be separated into its constituent elements by some physical process.

72. Atomicity of KMnO₄ is :
KMnO₄ की परमाणुता है –
(A) 5   (B) 7   (C) 6  (D) 8

73. Electrons were discovered by :
(A) Neil Bohr  (B) J.J. Thomson
(C) R.A. Mullikan  (D) E. Rutherford

74. When an ice cube melts, changes in ___ occurs.
I. State  II. Volume
III. Substance  IV. Mass
(A) I and II only  (B) I and III only
(C) II and III only  (D) III and IV only

75. The process of setting down of the particles of an insoluble solid in a liquid is called :
(A) decantation  (B) sedimentation
(C) filtration  (D) None of these

76. Which of the following weighs the most?
(A) 10^{22} molecules of H₂  (B) 1 mole of H₂O
(C) 10^{22} atoms of oxygen  (D) 1 mole of N₂

77. The isoelectronic species are :
(A) CO₂⁻, SO₃²⁻  (B) CO₂⁻, NO₃⁻
(C) SO₃²⁻, SO₄²⁻  (D) NO₃⁻, NO₂

78. Which of the following statement is correct?
(A) Interparticle spaces are maximum in the gaseous state of a substance.
(B) Particles which constitute the matter follow a zig zag path.
(C) Solid state is the most compact state of substance.
(D) All are correct
79. In which of the following, dispersed phase is a liquid and dispersion medium is a gas?
   (A) Cloud  (B) Smoke  (C) Gel  (D) Soap bubble

80. If the molecular mass of a compound is 74.5 then the compound is:
   (A) KCl  (B) HCl  (C) NaCl  (D) LiCl

81. The conclusion which follows from the two given statements is:
   I. Some doctors are rich.
   II. Some rich doctors are fools.

82. In a school, there were five teachers. A and B were teaching Hindi and English. C and B were teaching English and Geography. D and A were teaching Mathematics and History. E and B were teaching History and French.

83. Directions : (81 to 83) : Find the missing term.

Direction (Q.81 to 83) : पुण्य पद खाली करें।

84. If SPECIAL is coded as KZHBDOR then ORDINARY would be?

85. Five persons are sitting in a row. One of the two persons at the extreme ends is intelligent and other one is fair. A fat person is sitting to the right of a weak person. A tall person is to the left of the fair person and the weak person is to the left of the fair person.

86. Directions(86) : In the question below are given two statements followed by two conclusions numbered I and II. You have to take the given two statements to be true even if they seem to be at variance from commonly known facts. Read the conclusion and then decide which of the given conclusions logically follows from the two given statements, disregarding commonly known facts.

87. Directions : (87) Read the following information and answer the question based on it:

88. If the day before yesterday was Saturday, what day will fall on the day after tomorrow?

89. Which of the following dices is identical to the unfolded figure as shown here?

Directions: If the given two statements are assumed to be true, then the conclusions given below can be drawn:

(A) if only conclusion I follows
(B) if only conclusion II follows
(C) if neither conclusion I nor II follows
(D) if both conclusions I and II follow.

If the day before yesterday was Saturday, what day will fall on the day after tomorrow?

(A) A  (B) B  (C) C  (D) D

Who among the teachers was teaching maximum number of subjects?

(A) A  (B) B  (C) C  (D) D

86. Directions : (86) : In the question below are given two statements followed by two conclusions numbered I and II. You have to take the given two statements to be true even if they seem to be at variance from commonly known facts. Read the conclusion and then decide which of the given conclusions logically follows from the two given statements, disregarding commonly known facts.

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In a school, there were five teachers. A and B were teaching Hindi and English. C and B were teaching English and Geography. D and A were teaching Mathematics and History. E and B were teaching History and French.

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In a school, there were five teachers. A and B were teaching Hindi and English. C and B were teaching English and Geography. D and A were teaching Mathematics and History. E and B were teaching History and French.

(A) if only conclusion I follows
(B) if only conclusion II follows
(C) if neither conclusion I nor II follows
(D) if both conclusions I and II follow.
90. Which alphabet is opposite D?

D of the following letter is opposite to?

(A) E (B) C (C) F (D) A

91. If E = 5 & SAFE = 31, then PINK =?

(A) 51 (B) 40 (C) 50 (D) 52

100. In question no. 85 Which of the following persons is sitting at the centre?

(A) Intelligent (B) Fair (C) Tall (D) Tall

Directions (95) : In the question below are given two statements followed by two conclusions numbered I and II. You have to take the given two statements to be true even if they seem to be at variance from commonly known facts. Read the conclusion and then decide which of the given conclusions logically follows from the two given statements, disregarding commonly known facts.

95. Statements: All fish are tortoise. No tortoise is a crocodile.

Conclusions: I. No crocodile is a fish.

(A) If only conclusion I follows
(B) If only conclusion II follows
(C) If neither conclusion I nor II follows
(D) If both conclusions I and II follow.

96. In question no. 87 Which of the following pairs was teaching both Geography and Hindi?

(A) A and B (B) B and C (C) A and D (D) None of these

97. If 1st October is Sunday then 1st November of the same year will be?

(A) Monday (B) Tuesday (C) Wednesday (D) Thursday
SAMPLE TEST PAPER
(For Class-XI Appearing / Passed Students)
COURSE: VISHWAAS (JF)
TARGET: JEE MAIN + ADVANCED 2020

02

PART-I (MATHEMATICS) भाग - I (गणित)
Straight Objective Type (Maximum Marks: 120)
This section contains FOURTY single choice questions. Each question has four choices (A), (B), (C) and (D), out of which ONLY ONE is correct.
1. 10 different letters of an alphabet are given. Words with 5 letters are formed from these given letters, then the number of words which have atleast one letter repeated is:
(A) 69760 (B) 30240 (C) 99748 (D) none of these

2. If the last term in the expansion of \( \left( \frac{1}{3^{3/2}} \right)^n \) is
\[ \left( \frac{1}{3^{3/2}} \right)^5 \text{ then the 6th term is :} \]
(A) 210 (B) 420 (C) 105 (D) 212

3. The radius of the circle passing through the points (1, 2), (5, 2) & (5, -2) is:
(A) \( 5\sqrt{2} \) (B) \( 2\sqrt{5} \) (C) \( 3\sqrt{2} \) (D) \( 2\sqrt{2} \)

4. How many nine digit numbers can be formed using the digits 2, 2, 3, 3, 5, 5, 8, 8, 8 so that the odd digits occupy even positions?
(A) 2, 3, 3, 5, 5, 8, 8, 8 की सहायता से 9 अंकों की विनिमय संख्याएँ बनाई जा सकती हैं, जबकि विपरीत अंक सम स्थानों पर आये ?
(B) 7560 (C) 16 (D) 60

5. If the equations \( x^n + ax + 1 = 0 \) & \( x^n + ax^2 + 1 = 0 \) have a common root then value of \( a \) is:
(A) 0 (B) -1 (C) -2 (D) 2

6. Two circles have equations \( x^2 + y^2 - 4x - 6y - 7 = 0 \) and \( x^2 + y^2 - 2x - 3 = 0 \) then:
(A) They touch each other (B) They cut each other (C) One circle lies inside other (D) One circle lies completely outside of the other

7. Let \( A = \{1, 2, 3, 4\} \) & \( R \) be a relation in \( A \) given by \( R = \{(1,1), (2,2), (3,3), (4,4), (1,2), (2,1), (3,1), (1,3)\} \) then \( R \) is-
(A) reflexive & symmetric (B) reflexive & transitive (C) Identity & symmetric (D) reflexive, symmetric & transitive

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8. A box contains 100 tickets numbered 1, 2, ..., 100. Two tickets are chosen at random. It is given that the maximum number on the two chosen tickets is not more than 10, then the probability that the minimum number on them is 5 is:

(A) \(\frac{13}{14}\)  (B) \(\frac{1}{9}\)  (C) \(\frac{12}{15}\)  (D) \(\frac{4}{9}\)

9. An ellipse with foci (3, 1) and (1, 1) passes through the point (1, 3). Its eccentricity is \(\frac{\sqrt{2}}{2}\) if the point (1, 3) is drawn through the ellipse (3, 1) and (1, 1). Which of the following statements is not true?

(A) \((x-y)^2 z = 2\) is odd (B) \((x-z)^2 x = 2\) is even

10. Let \(x\), \(y\), \(z\) be distinct integers, \(x\) is even whereas \(y\), \(z\) are odd. Which of the following statements is true?

(A) \((x-y)^2 z = odd\)  (B) \((x-z)^2 x = even\)

11. If \(a = b - b^2 + b^3 - b^4 + .......\), \(|b| < 1\), then \(b\) is equal to

(A) \(\frac{1}{1-a}\)  (B) \(\frac{a}{1+a}\)  (C) \(\frac{a}{1+a}\)  (D) None of these

12. Circumcentre of the \(\triangle ABC\) where \(A(1,2)\), \(B(5,2)\) and \(C(5,-4)\) is

(A) \(\frac{5}{2}\)  (B) \(\frac{2}{2}\)  (C) \(\frac{3}{2}\)  (D) \(\frac{11}{3}\)

13. If \(2x^3 + 3\log_3 x = 27\), then \(x\) is equal to

\(\text{Var} \quad 2x^3 + 3\log_3 x = 27\) \(\text{to x}\) \(\text{eruns}\)

(A) \(2\)  (B) \(4\)  (C) \(8\)  (D) \(16\)

14. Set of values of \(x\) satisfying \(x^4 - 13x^2 + 36 < 0\) is \(x^4 - 13x^2 + 36 < 0\) to \(x\) \(\text{eruns}\)

(A) \(x \in (-\infty, -3) \cup (3, \infty)\)
(B) \(x \in (-\infty, 2) \cup (2, \infty)\)
(C) \(x \in (-\infty, 3) \cup (3, \infty)\)
(D) \(x \in (-\infty, -3) \cup (-2, 2) \cup (3, \infty)\)

15. Product of all the solutions of equation \(x^3 \log_{3} x - \frac{1}{\log_{3} x} = \sqrt{10}\), is

(A) \(1\)  (B) \(10\)  (C) \(100\)  (D) \(1000\)

16. If \(\sin \alpha\), \(\sin \beta - \cos \alpha\), \(\cos \beta + 1 = 0\), then the value of \(1 + \cot \alpha\) \(\tan \beta\) is

(A) \(0\)  (B) \(\frac{1}{2}\)  (C) \(2\)  (D) \(-1\)

17. If the number of terms whose values depend on \(x\) in the expansion of \((x^2 - 2 + \frac{1}{x^2})^n\)

\((x^2 - 2 + \frac{1}{x^2})^n\) \(\text{esr}\)

(A) \(2n + 1\)  (B) \(2n\)  (C) \(n\)  (D) \(n + 1\)

18. The number of ways in which \(30\) identical mangoes can be divided among four boys such that any number of mangoes can be given to any student, is \(30\) \(\text{eheue}\) \(4\) \(\text{eruns}\) \(\text{eruns}\)

(A) \(30\)  (B) \(30\)  (C) \(33\)  (D) \(33\)

19. The number of diagonals in a polygon of \(n\) sides is

(A) \(n(n - 3)\)  (B) \(\frac{n(n - 2)}{2}\)  (C) \(\frac{n(n - 1)}{2}\)  (D) \(\frac{n(n - 4)}{2}\)

20. If \(x = \cos \theta\), \(y = \sin \theta\), then \(x + y + z\) is

(A) \(-1\)  (B) \(0\)  (C) \(1\)  (D) \(2\)

21. The sum of real roots of \(|x|^2 + 3|x| - 10 = 0\) is

(A) \(1\)  (B) \(2\)  (C) \(3\)  (D) \(0\)
23. There are seven consecutive numbers sum of first five is 5n, then average of all of them is

\[ \text{average} = \frac{5n + 1 + 2 + 3 + 4}{7} = \frac{15n}{7} \]

24. \[ m = \frac{2}{7} \]

25. Number of integers between 100 and 1000 that are divisible by 7 is 128.

26. The shaded region in the given venn diagram represents:

(A) \( A \cup (B \cap C) \)

27. If \( A \) & \( B \) are the points (-3, 4) and (2, 1), then the co-ordinates of the point \( C \) on \( AB \) produced such that \( AC = 2BC \) are

(A) \((-4, 3)\)

28. The straight lines, \( (a + 2b) + y = (a + 3b) = a + b \) for different values of \( a \) & \( b \) pass through a fixed point whose co-ordinates are:

(A) \((0, -1)\)

29. Find the area of the triangle formed by the mid points of sides of the triangle whose vertices are \((2, 1), (-2, 3), (4, -3)\)

(A) \(1.5 \text{ sq. units} \)

30. Consider the two arithmetic progressions 3, 7, 11, ..., 407 and 2, 9, 16, ..., 709. The number of common terms of these two progressions is

(A) 0

31. The value of \( \binom{2n}{n} + \binom{2n}{n-1} \) equals to \( \binom{2n}{n} + \binom{2n}{n-1} + 1 \) for any \( n \) where \( n \) is

(A) \( 2 \)

32. The number of different seven digit numbers that can be formed using only three digits 1, 2, & 3 under the condition that the digit 2 occurs exactly twice in each number, is

(A) 672

33. If the line \( x - 1 = 0 \) is the directrix of the parabola \( y^2 - kx + 8 = 0 \), then one of the values of \( k \) is

(A) \( \frac{1}{8} \)

34. From a point \( R(5, 8) \) two tangents \( RP \) and \( RQ \) are drawn to a circle \( S = 0 \), whose radius is 5. If circumcentre of the triangle \( PQR \) is \((2, 3)\), then the equation of the circle \( S = 0 \) is:

(A) \( x^2 + y^2 + 2x + 4y - 20 = 0 \)

35. Directions: Find the missing numbers (?)

(A) 92

36. The equation of a hyperbola with co-ordinate axes as principal axes, if the distances of one of its vertices from the foci 3 & 1 can be:

(A) \( 3x^2 - y^2 = 3 \)

37. The locus of the middle points of chord of the hyperbola \( 3x^2 - 2y^2 + 4x - 6y = 0 \) parallel to \( y = 2x \) is

(A) \( 3x - 4y = 4 \)

38. The solution set of \( |x^2 - 4| + (x + 2)^2 + \sqrt{x^2 + 3x + 2} = 0 \) is

(A) \( x \in [-\infty, -2] \cup \{-1, \infty\} \)

39. \( \binom{2n}{n} + \binom{2n}{n-1} - 1 \) equals to \( \binom{2n}{n} + \binom{2n}{n-1} \) for any \( n \) where \( n \) is

(A) \( 2 \)

40. The shaded region in the given venn diagram represents:

(A) \( A \cup (B \cap C) \)

41. From a point \( R(5, 8) \) two tangents \( RP \) and \( RQ \) are drawn to a circle \( S = 0 \), whose radius is 5. If circumcentre of the triangle \( PQR \) is \((2, 3)\), then the equation of the circle \( S = 0 \) is:

(A) \( x^2 + y^2 + 2x + 4y - 20 = 0 \)

42. The equation of a hyperbola with co-ordinate axes as principal axes, if the distances of one of its vertices from the foci 3 & 1 can be:

(A) \( 3x^2 - y^2 = 3 \)

43. The shaded region in the given venn diagram represents:

(A) \( A \cup (B \cap C) \)
39. If \( x \) & \( y \) are real numbers and \( \frac{y}{x} = x \), then number of values of \( x \) that \( \frac{y}{x} \) cannot take, is

(A) 3 (B) 0 (C) 1 (D) 2

40. If 2576\( a \) 456\( b \) is divisible by 15 then

(A) 3 (B) 0 (C) 1 (D) 2

S1 : a may take value 5 ; S2 : a may take value 3
S3 : a may take value 9 ; S4 : a may take value 8

(A) S1 and S2 are true (B) S1 and S3 are true (C) S1, S2 and S4 are true (D) S1 and S4 are true

41. A body is falling freely under the action of gravity alone in vacuum. Which of the following quantities remain constant during the fall?

(A) Kinetic energy (B) Potential energy
(C) Total mechanical energy (D) Total linear momentum.

42. In the system shown in figure acceleration of the two blocks is:

(A) 4 m/s\(^2\) (B) 2 m/s\(^2\) (C) zero (D) 10 m/s\(^2\)

43. A particle moves from position (3, 2, –6) to position (14, 13, 9) under the action of force \( 4\hat{i} + \hat{j} + 3 \hat{k} \) N. The work done by this force will be

(A) 100 J (B) 50 J (C) 200 J (D) 75 J

44. A hockey player is moving northward and suddenly turns westward with the same speed to avoid an opponent. The force that that acts on the player is

(A) frictional force along westward (B) muscle force along south-west
(C) frictional force along south-west (D) muscle force along north-east

45. An engine exerts a force \( \mathbf{F} = (20\hat{i} – 3\hat{j} + 5\hat{k}) \text{ N} \) and moves with velocity \( \mathbf{v} = (6\hat{i} + 20\hat{j} – 3\hat{k}) \text{ m/s} \). The power of the engine (in watt) is:

(A) 45 (B) 75 (C) 20 (D) 10

46. A block of mass 2 kg is kept on the floor. The coefficient of static friction is 0.4. If a force \( F \) of 2.5 Newtons is applied on the block as shown in the figure, the frictional force between the block and the floor will be

(A) 2.5 N (B) 5 N (C) 7.84 N (D) 10 N

47. A student attempts to pull himself up by tugging on his hair. He will not succeed

(A) As the force exerted is small (B) The frictional force while gripping is small. (C) Newton’s law of inertia is not applicable to living beings. (D) As the force applied is internal to the system.

48. The formula for centripetal acceleration in a circular motion is:

(A) \( \alpha \times \mathbf{r} \) (B) \( \mathbf{a} \times \mathbf{v} \)
(C) \( \mathbf{a} \times \mathbf{v} \) (D) \( \mathbf{a} \times \mathbf{r} \)

49. Current in 4\( \Omega \) resistance is:

(A) \( \frac{5}{3} \) A (B) \( \frac{5}{6} \) A
(C) \( \frac{2}{3} \) A (D) None of these
50. An electron is revolving around a proton. The total work done in one revolution by electric force on the electron will be zero if the trajectory of the electron is
(A) circular only
(B) elliptical only
(C) any closed curve
(D) not possible

51. The moment of inertia of a uniform ring of mass M and radius r about a tangent lying in its own plane is
(A) \(2 M r^2\)
(B) \(\frac{3}{2} M r^2\)
(C) \(\frac{2}{3} M r^2\)
(D) \(\frac{1}{2} M r^2\)

52. The distance moved by a particle in simple harmonic motion of amplitude A in one time period is
(A) A
(B) 2A
(C) 4A
(D) Zero

53. A simple pendulum of length \(l\) is suspended from the ceiling of an elevator that is accelerating upward with constant acceleration \(a\). For small oscillations, the period, \(T\), of the pendulum is
(A) \(2\pi\sqrt{\frac{l}{g}}\)
(B) \(2\pi\sqrt{\frac{l}{g-a}}\)
(C) \(2\pi\sqrt{\frac{l}{g+a}}\)
(D) \(2\pi\sqrt{\frac{a}{g(g+a)}}\)

54. The minimum charge on an object is
(A) 1 coulomb
(B) 1 stat coulomb
(C) \(1.6 \times 10^{-19}\) coulomb
(D) \(3.2 \times 10^{-19}\) coulomb

55. The tension in the spring is
(A) Zero
(B) 2.5 N
(C) 5 N
(D) 10 N

56. You are on a frictionless horizontal plane. How can you get off if no horizontal force is exerted by pushing against the surface?
(A) By jumping
(B) By spitting or sneezing
(C) By rolling your body on the surface
(D) By running on the plane

57. A physical quantity is a vector quantity if:
(A) it has a magnitude
(B) it has a direction
(C) it can be added by laws of vectors addition
(D) All of these

58. Inertia is that property of a body by virtue of which the body is
(A) Unable to change by itself the state of rest
(B) Unable to change by itself the state of uniform motion
(C) Unable to change by itself the direction of motion
(D) Unable to change by itself the state of rest and of uniform linear motion

59. Centre of mass is a point
(A) Which is geometric centre of a body
(B) From which distance of particles are same
(C) Where the whole mass of the body is supposed to concentrated
(D) Which is the origin of reference frame

60. A force 10 N acts on a body of mass 20 kg for 10 sec. Change in its momentum is
(A) 5 kg m/s
(B) 100 kg m/s
(C) 200 kg m/s
(D) 1000 kg m/s

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[Sample Test Paper Image]
PART- III (CHEMISTRY) B cage- III (रसायन विज्ञान)

Atomic masses (पदार्थ तुलना): (B) = 1, (D) = 2, (L) = 7, (C) = 12, (N) = 14, (O) = 16, (F) = 19, (Na) = 23, (Mg) = 24, (Al) = 27, (Si) = 28, (P) = 31, (S) = 32, (Cl) = 35.5, (K) = 39, (Ca) = 40, (Cr) = 52, (Ni) = 55, (Fe) = 56, (Mn) = 57, (Zn) = 65, (As) = 75, (Br) = 80, (Ag) = 108, (I) = 127, (Ba) = 137, (Hg) = 200, (Pb) = 207.

61. The increase in volume of air, when temperature of 600 ml of it, is increased from 27°C to 47°C under constant pressure, is

(A) 20 ml (B) 80 ml (C) 40 ml (D) 500 ml

62. Consider the ground state of Cr atom (Z = 24). The numbers of electrons with the azimuthal quantum numbers, \( \ell = 1 \) and 2 and are, respectively :

(A) 16 and 5 (B) 12 and 5 (C) 16 and 4 (D) 12 and 4.

64. Which of the following is correct for critical temperature ?

(A) It is the highest temperature at which liquid and vapour can coexist (B) Beyond the critical temperature, there is no distinction between the two phases and a gas cannot be liquefied by compression (C) At critical temperature (T_c) the surface tension of the gas and the liquid phases is zero (D) At critical temperature the gas and the liquid phases have different critical densities

65. The molarity of the solution containing 2.8% (mass / volume) solution of KOH is : (Given atomic mass of K = 39)

(A) 0.1 M (B) 0.5 M (C) 0.2 M (D) 1 M

66. A bulb of 40 W is producing a light of wavelength 620 nm with 80% of efficiency. Then the number of photons emitted by the bulb in 20 seconds are: (1eV = 1.6 × 10^{-19} J, hc = 12400 eV Å)

(A) 2 × 10^{17} (B) 10^{17} (C) 10^{21} (D) 2 × 10^{21}
73. IUPAC name of the compound

\[
\begin{array}{c}
CH_3 - NH - CH - CH_2 - CH - CH_3 \\
\end{array}
\]

is:

(A) 2-(N-methylamino)-4-methylpentane
(B) N-Methyl-4-methylpentan-2-amine
(C) 2-(N-methylamino)-3-isopropylpropane
(D) 2-(N-methylamino)-1, 4, 4-trimethylbutane

IUPAC name is:

(A) 2-(N-methylamino)-4-methylpentane

74. Which of the following compound having three carbon atoms in its main chain in IUPAC nomenclature?

(A) Lactic acid
(B) Acetic acid
(C) Formic acid
(D) Oxalic acid

75. Ammonical AgNO₃ give white ppt. after reaction with any compound then this reflects the presence of

(A) One – CHO group
(B) One triple bond
(C) Two ° hydrogen atoms
(D) A terminal alkyne

76. The prussian blue colour obtained during the test of nitrogen by Lassaigne's test is due to the formation of:

(A) Fe₄[Fe(CN)₆]₃
(B) Na₃[Fe(CN)₆]
(C) Fe(CN)₃
(D) Na₄(Fe(CN)₅NOS)

77. In above compound total number of 2° hydrogen atoms are:

(A) 3
(B) 18
(C) 6
(D) 9

78. Which compound is not the isomer of 3-Ethyl-2-methylpentane?

(A) 3-CH₃–CH₂–CH₂–CH(CH₃)CH₃
(B) 3-CH₃–CH₂–CH(CH₂CH₃)CH₃
(C) 3-CH₂–CH₂–CH₂–CH₂–CH(CH₃)₂
(D) 3-CH₂–CH₂–CH₂–CH₂–CH₂(CH₃)₂

79. Which of the following is the IUPAC nomenclature of ethyl methyl ketone?

(A) Propan-1-one
(B) Butanone
(C) Butan-1-one
(D) Propan-2-one

80. In Which of the following reaction Markownikoff's rule is applied?

(A) CH₃–CH=CH–CH₃ + HBr → CH₃–CH₂–CH₂–CH₃
(B) CH₃–CH=CH₂ + HBr → CH₃–CH₂–CH₂–CH₃
(C) CH₂=CH₂ + HBr → CH₃–CH₂
(D) CH₃–CH₂ + HBr → CH₃–CH₂–CH₃

PART-IV (MENTAL ABILITY)

Straight Objective Type (Maximum Marks : 60)

This section contains TWENTY single choice questions. Each question has four choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

81. Which term comes next in the series : YEB, WFD, UHG, SKI, ______?

(A) QOL
(B) QGL
(C) TOL
(D) QNL

82. The missing number in the following sequence is:

1, 3, 5, 7, 9, 11, 13, ______

(A) 15
(B) 17
(C) 19
(D) 21

83. The missing number (?) is

21, 27, 34, 7, 51, 61

(A) 57
(B) 42
(C) 83
(D) 24

84. Somesh left home for the bus stop 25 minutes earlier than usual. It takes 15 minutes to reach the stop. He reached the stop at 2.45 p.m. What time does he usually leave home for the bus stop?

(A) 2.30 p.m.
(B) 2.25 p.m.
(C) 2.40 p.m.
(D) 2.50 p.m.

85. If TOWER is coded as 81, what will be the code number for POWER?

(A) 21
(B) 41
(C) 71
(D) 51
86. A child went 90 m in the East to look for his father, then he turned right and went 20 m. After this he turned right and after going 30 m he reached to his uncle’s house. His father was not there. From there he went 100 m to his north and met his father. How far did he meet his father from the starting point?

(A) 70 m   (B) 100 m   (C) 140 m   (D) 260 m

87. Number of letters skipped in between adjacent letters in the series decreases by two. Which of the following series observes this rule?

(A) 2100  (B) 3100  (C) 1003  (D) 1002

88. In the following number series only one number is wrong.

(A) 8 m    (B) 100 m    (C) 140 m    (D) 260 m

89. In an Entrance Examination Ritu scored 66 percent marks, Smita scored 92 percent marks and Rina scored 634 marks. The maximum marks of the examination are 875. What are the average marks scored by all the three girls together?

(A) 400  (B) 13456  (C) 14456  (D) 15465

90. If a clock shows 3 : 45 then its mirror image will be?

(A) 6 : 45  (B) 30 metres West  (C) 30 metres East  (D) 45 metres East

91. If a clock shows 3 : 45 then its mirror image will be?

(A) 6 : 45  (B) 30 metres West  (C) 30 metres East  (D) 45 metres East

92. In a certain code, if TREE is coded as 7100, FROG as 2159, how is FREE coded in that code?

(A) 3100    (B) 1003    (C) 1002    (D) 3001

93. How many pairs of letter in the word ‘DABBLE’ have as many letters between them as in the Alphabet Series?

(A) 4  (B) 6  (C) 8  (D) 9

94. If South-East becomes North, North-East becomes West and so on. What will West become?

(A) North-East    (B) North-West    (C) South-East    (D) South-West

95. In a certain code, ‘nee tim see’ means ‘how are you’ and ‘blee nee see’ means ‘where are you’, then what is the code for ‘where’?

(A) nee  (B) tim  (C) see  (D) none of these

96. If the two sides of a triangle is 14 cm and 22 cm then which can be the third side of that triangle?

(A) 15 metres West  (B) 30 metres East  (C) 45 metres North  (D) More than three sides

97. A loan of Rs 21600 has to be paid in two equal annual installments. If the interest is charged at the rate of 16% per annum, compounded annually, then amount of each installment is $21600 - (A) 1002  (B) 2004  (C) 3006  (D) 4008

98. A takes 5 days more than B to do a certain job and 9 days more than C; A and B together can do the job in the same time as C. Then A alone can do the job in

(A) 16 days  (B) 10 days  (C) 15 days  (D) 20 days

99. If the two sides of a triangle is 14 cm and 22 cm then which can be the third side of that triangle?

(A) 12 cm  (B) 14 cm  (C) 16 cm  (D) 18 cm

100. If the two sides of a triangle is 14 cm and 22 cm then which can be the third side of that triangle?

(A) 15 cm  (B) 16 cm  (C) 13 cm  (D) 14 cm
1. Number of words which have at least one letter repeated = total words – number of words which have no letter repeated=10^5 – 10×9×8×7×6 = 69760

2. \[ \left( \frac{1}{\sqrt{2}} \right)^{4} \times 3^{\log_{2} 3} = 3^{\log_{2} 3} \times 3^{1/2} = 3^{\log_{2} 3 + 1/2} = \frac{3}{2} \]

3. \[ T_{4+1} = 10C_{4} \times \left( \frac{2}{3} \right)^{3} \times \left( -\frac{1}{\sqrt{2}} \right)^{4} = 210 \]

4. Even place

5. Total number of filling is \[ 4! \times \frac{5!}{2! \cdot 2!} = 60 \]

6. Let \( \alpha \) is common

\[ \alpha^3 + a \alpha + 1 = 0 \]

& \[ \alpha^4 + a \alpha^2 + 1 = 0 \]

\[ \Rightarrow \alpha (\alpha^2 + a \alpha) + 1 = 0 \]

\[ \Rightarrow \alpha(-1) + 1 = 0 \Rightarrow \alpha = 1 \]

\[ \therefore 1 + a + 1 = 0 \Rightarrow a = -2 \]

7. There are four even places and four odd digit number so total number of filling is 4! rest are also occupy in \[ \frac{5!}{2! \cdot 2!} \] ways

Hence total number of ways = \[ \frac{4! \cdot 5!}{2! \cdot 2!} \]

8. \[ R : R \] is symmetric if \( (1, 2), (2, 1) \in R \)

9. 3P + SP = 2a

\[ a = \sqrt{2} + 1 \]

10. \[ 2ae = SS' = 2 \Rightarrow e = \sqrt{2} - 1 \]

11. Clearly \( \Delta \) is right angle

12. \[ \Delta \] is right angle

13. \[ x^{\log_{2} 2} + x^{\log_{2} 3} = 27 \]

\[ \Rightarrow 2 \times 2^{x} + 2^{x} \times 3^{x} = 27 \]

\[ \Rightarrow 3^{x} = 9 = 3^2 \]

\[ \Rightarrow x = 2 \]

\[ \Rightarrow x = 4^2 = 16 \]

14. \[ x^4 - 13x^2 + 36 \leq 0 \]

\[ (x^2 - 4) (x^2 - 9) \leq 0 \]

\[ (x - 2) (x + 2) (x - 3) (x + 3) \leq 0 \]

\[ \therefore x \in (-\infty, -2) \cup (2, 3) \]
15. Taking log both the sides, we get:
\[ \log_{10} x - \frac{1}{\log_{10} x} = \frac{1}{\sqrt{10}} \]

16. Taking log both the sides, we get:
\[ \log_{10} x = \frac{2}{3} \]


27. Hindi.


Given \( \mathbf{F} = (20\hat{i} - 3\hat{j}) + 5\hat{k} \) N
\[
\mathbf{v} = (6\hat{i} + 20\hat{j} + 3\hat{k}) \text{m/s}
\]
Thus, after substituting for \( \mathbf{F} \) and \( \mathbf{v} \) in equation (i), it becomes.

\[
P = (20 - 3\hat{j}) \cdot (6\hat{i} + 20\hat{j} - 3\hat{k})
\]

\[
= (20\times6)\hat{i} \cdot \hat{i} + (-3\times20)\hat{j} \cdot \hat{j} + (5\times-3)\hat{k} \cdot \hat{k}
\]

\[
= 120 - 60 - 15 = 45
\]

47. As by an internal force momentum of the system can not be changed.

49. \[
R_{eq} = \frac{6 \times 2}{8} = \frac{3}{2} \Rightarrow \frac{5 \times 2}{3} = 10 \Rightarrow I_1 = \frac{2 \times 10}{3} = \frac{5}{6} A
\]

52. The total distance moved by particle in one time period is four times the amplitude.

53. \[
T = 2\pi \sqrt{\frac{\ell}{g_{eff}}} = 2\pi \sqrt{\frac{\ell}{g + a}}
\]

54. All other charges are its integral multiple.

55. 5N force will not produce any tension in spring without support of other 5N force. So here the tension in the spring will be 5N only.

56. Power = \[
\frac{n\times6.62 \times 10^{-34} \times 3 \times 10^8}{620 \times 10^{-9} \times 20} \Rightarrow n = 2 \times 10^{21}
\]

72. Steric number of Xe = 5 + 1 (bond pair + lone pair)

74. \[
\text{CH}_3\text{–CH–COOH} \quad \text{– Lactic acid}
\]

77. It has only six carbon atoms.

79. \[
\text{CH}_3\text{–C–CH}_2\text{–CH}_3 \quad \text{– Ethyl methyl ketone}
\]

\[
\text{CH}_3\text{–CH=CH}_2 + \text{HBr} \rightarrow \text{CH}_3\text{–CH–CH}_3
\]

80. Only (D) follows Markownikoff’s rule

56. Weight of KOH = 2.8 gram

Volume of solution = 100 ml

\[
M = \frac{2.8 \times 1000}{56 \times 100} = \frac{28}{56} = 0.5 M
\]
81. 

\[ \begin{array}{cccccc} 
1 & 2 & 3 & 4 & \text{YEB} & \text{WPD} \\
2 & -2 & 2 & 2 & \text{WNG} & \text{SWK} \\
3 & -2 & 2 & \text{QOL} & -2 & -2 \\
\end{array} \]

82. 

\[ \begin{array}{cccccc} 
2 & 3 & 1 & 7 & 8 & 9 \\
3 & 6 & 7 & 9 & 7 & 21 \\
4 & 9 & 7 & 12 & 13 & 21 \\
\end{array} \]

Required number = \[7 + 6 = 13\]

83. 

\[ 21 + 6 = 27 + 7 = 34 + 8 = 42 + 9 = 51 + 10 = 61 \]

84. 

\[ 2.45 + 0.10 = 2.55 \text{ pm} \]

85. By their natural position numbers, 

\[ \text{T} \rightarrow 20, \text{O} \rightarrow 15, \text{W} \rightarrow 23, \text{E} \rightarrow 5, \text{R} \rightarrow 18 \]

Hence, \[ \text{POWER} = (16 + 15 + 23 + 5 + 18) = 77 \]

86. 

\[ \text{Required distance} = \sqrt{AG^2 + EC^2} = \sqrt{(90 - 30)^2 + (100 - 20)^2} = \sqrt{60^2 + 80^2} = \sqrt{3600 + 6400} = \sqrt{10000} = 100 \text{ m} \]

87. 

The given series is 

\[ \text{H I J K L M N O P Q R S T U V W X Y Z A B C D E F} \]

Clearly, the letter series HQXCF the number of letter skipped in between adjacent letters in the series is decreases by two.

88. (A) Series is aabb/aaabbb/aa. 

Series E : aabb/aaabbb/aa.

89. 

\[ \begin{array}{cccc} 
7 \times 2 - 2 \times 1 & = 12 \\
12 \times 4 - 4 \times 2 & = 40 \\
40 \times 6 - 6 \times 3 & = 222 \\
222 \times 8 - 8 \times 4 & = 1744 \text{ and so on} \end{array} \]

90. 

\[ \frac{56 \times 875}{100} = 490 \]

\[ \frac{92 \times 875}{100} = 805 \]

Total marks कुल प्राप्ति = 490 + 805 + 634 = 1929

Average औसत = \[\frac{1929}{3} = 643\]

91. The mirror image of 3 : 45 is (11 : 60 – 3 : 45) = 8 : 15

92. T R E E \hspace{1cm} F R O G

7 1 0 0 \hspace{1cm} 2 1 5 9

Hence, F R E E \rightarrow 2 1 0 0

93. Letters in the given Word Letters in the Alphabet

दिए गये शब्द के अक्षर \अक्षरों की संख्या से अक्षरों की संख्या में अलग

\[ \begin{array}{cccc} 
A & B & A & B \\
B & D & A & B \\
C & B & D & E \\
D & B & E & C \\
E & B & D & C \\
\end{array} \]

94. It is clear from the diagrams that new name of West will become South-East.

95. Total amount = 21600 \[\left(1 + \frac{16}{100}\right)^2\]

Let the installment be \(x\). Then

\[ x + x \times \frac{16}{100} = 21600 \times \frac{16}{100} \times \frac{16}{100} \]

\[ x = 13456 \]

96. 

\[ \text{OE} = \text{AB} + \text{CD} = 30 + 15 = 45 \text{ m} \]

97. The movements of Raj are as shown in fig.

\[ \text{∴ Raj's distance from starting point A} = \text{AE} = (AD + DE) = (BC + DE) = (25 + 10) \text{ m} = 35 \text{ m.} \]

A

B

C

DE

10 m

20 m

25 m

\[ \text{So, E is to the East of A.} \]

Raj की मिली दूरी को दिखाया गया है। तब राज की नयी जगह का नाम सात-साती होता है। तब राज की प्राप्ति के बिंदु A से दूरी = \[\text{AE} = (AD + DE) = (BC + DE) = (25 + 10) \text{ m} = 35 \text{ m.} \]

हेच, E, A के दूरी में है जहां उत्तर (A) होता है।
SAMPLE TEST PAPER
(For Class-XII Appearing / Passed Students)
COURSE : VISHESH(JD) & VIJAY (JR)
TARGET : JEE MAIN + ADVANCED 2020

PART - I (MATHEMATICS) भाग - I (गणित)

Straight Objective Type (Maximum Marks : 120)
This section contains FOURTY single choice questions. Each question has four choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

1. The greatest coefficient in the expansion of \((5 + 2x)^{10}\) is
   (A) \(10C^3 \times 5^7 \times 2^3\)  (B) \(10C^3 \times 5^3 \times 2^7\)
   (C) \(10C^5 \times 5^5 \times 2^5\)  (D) none of these

2. The value of \(2^nC^n + 2^nC^{n-1}\) equals to
   (A) \(2^n + 1\)  (B) \(2^n - 1\)
   (C) \(2^n + 1\)  (D) \(2^n - 1\)

3. Distance of \(\frac{2\pi}{3}\) chord of \(x^2 + y^2 + 2x + 4y + 1 = 0\) from the centre, is
   \(x^2 + y^2 + 2x + 4y + 1 = 0\) such that the chord is \(2\pi\) long. Which of the following is true?
   (A) \(1\)  (B) \(2\)
   (C) \(\sqrt{2}\)  (D) \(\frac{1}{\sqrt{2}}\)

4. The equation of the locus of the point of intersection of any two perpendicular tangents to the circle \(x^2 + y^2 = 4\) is given by
   \(x^2 + y^2 = 2\)  (B) \(x^2 + y^2 = 8\)
   (C) \(x^2 + y^2 = 16\)  (D) none of these

5. An ellipse with foci \((3, 1)\) and \((1, 1)\) passes through the point \((1, 1)\) so that its eccentricity is
   (A) \(\frac{\sqrt{3}}{2}\)  (B) \(\frac{\sqrt{3}}{2}\)
   (C) \(\sqrt{3} - \frac{1}{2}\)  (D) \(\frac{1}{2} - \sqrt{3}\)

6. If the distance between the focii of an ellipse is equal to the length of its latus rectum then, the eccentricity of the ellipse is
   (A) \(\frac{\sqrt{3} + 1}{2}\)  (B) \(\frac{\sqrt{3} - 1}{2}\)
   (C) \(\frac{2}{\sqrt{3} + 1}\)  (D) \(\frac{2}{\sqrt{3} - 1}\)

7. The number of solutions of the equation, \(2x + 9 |x| - 5 = 0\) is:
   (A) 4  (B) 2
   (C) 1  (D) 0

8. \(\log_a(\log_b a)\) is equal to
   \(\log_a(\log_b a)\)
   (A) \(\log_b a\)  (B) \(\log_b a\)
   (C) \(-1\)  (D) none of these

9. The number \(N = \log_3 79 \cdot \log_3 8\) lies between two successive integers 'a' and 'b' where
   \(\log_3 79 \cdot \log_3 8\) lies between two successive integers 'a' and 'b' where
   \(\log_3 79 \cdot \log_3 8\) lies between two successive integers 'a' and 'b' where
   (A) \(a = 1, b = 2\)  (B) \(a = 2, b = 3\)
   (C) \(a = 3, b = 4\)  (D) \(a = 0, b = 1\)

10. The set of values of \(x\) for which \(x^2(x - 1)^2(x + 1)^2 = 0\) is a polynomial
    (A) \(-\infty, -4\)  (B) \(-\infty, 0\)
    (C) \(-4, -1, 0, 1, 3\)  (D) \(-4, -1, 0, 1, 3\)

Nature of Questions

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11. If the eccentricity of the hyperbola \( x^2 - y^2 \sec^2 \alpha = 5 \) is \( \sqrt{3} \) times the eccentricity of the ellipse \( x^2 \sec^2 \alpha + y^2 = 25 \), then the value of \( \alpha \) is:

- (A) \( \pi/6 \)
- (B) \( \pi/4 \)
- (C) \( \pi/3 \)
- (D) \( \pi/2 \)

12. Equation of the hyperbola with foci \((0, \pm \sqrt{10})\) and passing through \((2, 3)\) is:

- (A) \( x^2 - y^2 = 1 \)
- (B) \( x^2 - y^2 = 1 \)
- (C) \( \frac{x^2}{2} - \frac{y^2}{5} = 1 \)
- (D) \( \frac{x^2}{5} - \frac{y^2}{3} = 1 \)

13. If \((2, 0)\) is the vertex & \( y \) – axis the directrix of a parabola, then its focus is:

- (A) \((2, 0)\)
- (B) \((-2, 0)\)
- (C) \((4, 0)\)
- (D) \((-4, 0)\)

14. The length of the latus rectum of the parabola, \( y^2 - 6y + 5x = 0 \) is:

- (A) 1
- (B) 3
- (C) 5
- (D) 7

15. If the line \( x - 1 = 0 \) is the directrix of the parabola \( y^2 - kx + 8 = 0 \), then one of the values of \( k \) is:

- (A) 1
- (B) 3
- (C) 5
- (D) 7

16. How many integers greater than 5000 can be formed with the digits 7, 6, 5, 4 and 3, using each digit at most once?

- (A) 72
- (B) 144
- (C) 84
- (D) 192

17. If 5 parallel straight lines are intersected by 4 parallel straight lines, then the maximum number of parallelograms thus formed, is

- (A) 20
- (B) 60
- (C) 101
- (D) 126

18. In a railway compartment, 6 seats are vacant on a bench. In how many ways can 3 passenger sit on them?

- (A) 100
- (B) 109
- (C) 107
- (D) 120

19. If \( p \) and \( q \) are the roots of the equation, \( x^2 + px + q = 0 \) then:

- (A) p = 1
- (B) p = 1 or 0
- (C) p = -2
- (D) p = 2 or 0

20. The solution set of \( |x^2 - 4| + (x + 2)^2 + \sqrt{x^2 + 3x + 2} = 0 \) is

- (A) \( x \in (-\infty, -2] \cup [-1, \infty) \)
- (B) \( x \in [-2, 2] \)
- (C) \( x \in [-2, 2] \)
- (D) \( x \in (-\infty, -2] \cup [-1, \infty) \)

21. The equation, \( x^n = -2x^2 + 6x - 9 \) has:

- (A) no solution
- (B) one solution
- (C) two solutions
- (D) infinite solutions

22. Consider an A.P. \( a_1, a_2, ..., a_n, ..., b_1, b_2, ..., b_m, ..., \) and the G.P. \( b_1, b_2, ..., b_m, ... \), such that \( a_1 = b_1 = 1, a_m = b_2 \) and \( \sum_{r=1}^{m} a_r = 369 \), then

- (A) \( a_2 = 37 \)
- (B) \( b_2 = 27 \)
- (C) \( b_1 = 81 \)
- (D) \( b_2 = 82 \)

23. Given figure shows a circle with centre at \( O, \angle AOB = 30^\circ \), and OA = 6 cm, then area of the shaded region is

- (A) \( 3\pi \text{ cm}^2 \)
- (B) \( 3\pi \text{ cm}^2 \)
- (C) \( 9 - 3\pi \text{ cm}^2 \)
- (D) \( 3\pi + 9 \text{ cm}^2 \)

24. If \( a = b - b^2 + b^3 - b^4 + ... \), then 'b' is equal to

- (A) \( \frac{a}{1-a} \)
- (B) \( \frac{a}{1+a} \)
- (C) \( \frac{1}{1-a} \)
- (D) None of these

25. The sum to infinity of the series \( \frac{1}{1} + \frac{1}{1+2} + \frac{1}{1+2+3} + ... \) is equal to:

- (A) \( \frac{2}{3} \)
- (B) \( \frac{5}{2} \)
- (C) \( \frac{3}{2} \)
- (D) None of these

26. Let \( W \) denote the words in the English dictionary. Define the relation \( R \) by \( R = \{(x, y) : x \in W \times W | 7 \text{ words x and y have at least one letter in common} \} \). Then \( R \) is:

- (A) reflexive, symmetric and not transitive
- (B) reflexive, symmetric and transitive
- (C) reflexive, not symmetric and transitive
- (D) not reflexive, symmetric and transitive
27. Let \( U = \{1,2,3,4,5,6,7,8,9\} \) and \( A = \{1,2,3,4\}, B = \{3,4,5,6\}, \)
\( C = \{5,6,7,8\} \) then \((A \cup B) \cap C'\) is
\( (A) \{1,2,3,9\} \) \( (B) \{1,2,3,4\} \)
\( (C) \{1,2,3,9\} \) \( (D) \) none of these

28. The sides of a triangle are as 3 : 7 : 8. Then \( R : r \) is:
\( (A) \frac{0}{2} \) \( (B) \frac{1}{2} \) \( (C) \frac{2}{2} \) \( (D) \) infinite

29. For an isosceles triangle \( ABC \), with \( \angle A = \frac{\pi}{2} \), \( n : m = \)
\( \frac{1}{2} \) \( \frac{1}{2} \) \( \frac{1}{2} \) \( \frac{1}{2} \)

30. The number of lines that can be drawn through the point
\((4, -5)\) and at distance 12 from the point \((-2, 3)\) is
\( (A) 0 \) \( (B) 1 \) \( (C) 2 \) \( (D) \) infinite

31. Let \( ABCD \) is a rhombus. Its diagonals \( AC \) and \( BD \) intersect
at the point \( O \) and satisfy \( BD = 2AC \). If the coordinates of \( D \) and \( M \) are 
\( (1, 1) \) and \( (2, \frac{1}{2}) \) respectively, the coordinates of \( A \) are
\( \frac{A}{4} = \{1,2,3,9\} \) \( \frac{A}{4} = \{1,2,3,9\} \)
\( \frac{A}{4} = \{1,2,3,9\} \) \( \frac{A}{4} = \{1,2,3,9\} \)

32. Let \( AL \) be the median of the triangle with vertices \( A(2, 2), B(6, -1) \) and \( C(7, 3) \). The equation of the line passing through
\((2, -4)\) and perpendicular to \( AL \) is
\( (A) 3x + y - 2 = 0 \) \( (B) 2x + y = 0 \)
\( (C) 9y - 2y - 26 = 0 \) \( (D) \) none of these

33. If \( \alpha \in \left[ \frac{3\pi}{2}, 2\pi \right] \) then the value of
\( \sqrt{1 + \sin^{2}\alpha} - \sqrt{1 - \sin^{2}\alpha} \) is equal to:
\( \text{if } \alpha \in \left[ \frac{3\pi}{2}, 2\pi \right] \)

34. The number of solutions of \( \sin 2x + \cos 4x = 2 \) in the
interval \((0, 2\pi)\) is
\( (A) 0 \) \( (B) 2 \) \( (C) 3 \) \( (D) 4 \)

35. The number of solutions of the equation, \( \sin x = \frac{x}{10} \) is
\( \text{satisfiable } \sin x = \frac{x}{10} \) \( \text{in the interval } (0, 2\pi) \)
\( (A) 3 \) \( (B) 6 \) \( (C) 7 \) \( (D) 10 \)

36. Value of \( \frac{4\sin^{9}\theta \sin^{2}1^{9} \sin^{3}9^{9} \sin^{5}1^{9} \sin^{6}9^{9} \sin^{8}1^{9}}{\sin^{5}4^{9}} \)
\( \text{is equal to } \frac{4\sin^{9}\theta \sin^{2}1^{9} \sin^{3}9^{9} \sin^{5}1^{9} \sin^{6}9^{9} \sin^{8}1^{9}}{\sin^{5}4^{9}} \)
\( (A) 1/16 \) \( (B) 1/32 \) \( (C) 1/8 \) \( (D) 1/4 \)

37. If \( \cot \theta = \frac{1}{\sqrt{3}} \), then the value of \( 1 - \cos^{2}\theta \) is
\( \frac{1}{2} \) \( \frac{1}{4} \) \( \frac{1}{8} \) \( \frac{1}{16} \)

38. If \( \sin \alpha \sin \beta - \cos \alpha \cos \beta + 1 = 0 \), then the value of \( 1 + \cot \alpha \tan \beta \) is
\( \text{if } \sin \alpha \sin \beta - \cos \alpha \cos \beta + 1 = 0 \) \( \text{and } \cot \alpha \tan \beta \)
\( \text{in the interval } (0, 2\pi) \)
\( (A) 0 \) \( (B) 1/2 \) \( (C) 2 \) \( (D) -1 \)

39. If \( A, B, C \in \mathbb{Q} \) then \( (A) \alpha \text{ rational} \) \( (B) \alpha \text{ rational} \)
\( \text{when } B \neq 0 \) \( \text{when } C \neq 0 \) \( \text{when } C \neq 0 \) \( \text{when } B \neq 0 \)

40. Number of values of \( x \) satisfying \( \frac{|x - 5|}{2} > 2 \) is
\( \text{if } \frac{|x - 5|}{2} > 2 \) \( \text{and } \frac{|x - 5|}{2} > 2 \)
\( (A) 0 \) \( (B) 1 \) \( (C) 2 \) \( (D) \) infinite

41. \( \alpha \in \left[ \frac{3\pi}{2}, 2\pi \right] \) \( \text{if } \alpha \in \left[ \frac{3\pi}{2}, 2\pi \right] \)

42. \( \sqrt{1 + \sin^{2}\alpha} - \sqrt{1 - \sin^{2}\alpha} \) \( \text{if } \alpha \in \left[ \frac{3\pi}{2}, 2\pi \right] \)

43. \( 1 - \cos^{2}\theta \) \( \text{if } \alpha \in \left[ \frac{3\pi}{2}, 2\pi \right] \)

44. \( \sin x = \frac{x}{10} \) \( \text{in the interval } (0, 2\pi) \)

45. \( \frac{4\sin^{9}\theta \sin^{2}1^{9} \sin^{3}9^{9} \sin^{5}1^{9} \sin^{6}9^{9} \sin^{8}1^{9}}{\sin^{5}4^{9}} \) \( \text{is equal to } \frac{4\sin^{9}\theta \sin^{2}1^{9} \sin^{3}9^{9} \sin^{5}1^{9} \sin^{6}9^{9} \sin^{8}1^{9}}{\sin^{5}4^{9}} \)

46. \( \frac{1}{\sqrt{3}} \) \( \frac{1}{2} \) \( \frac{1}{4} \) \( \frac{1}{8} \)

47. \( \frac{1}{2} \) \( \frac{1}{4} \) \( \frac{1}{8} \) \( \frac{1}{16} \)

48. \( \frac{1}{2} \) \( \frac{1}{4} \) \( \frac{1}{8} \) \( \frac{1}{16} \)

49. \( \frac{1}{2} \) \( \frac{1}{4} \) \( \frac{1}{8} \) \( \frac{1}{16} \)

50. \( \frac{1}{2} \) \( \frac{1}{4} \) \( \frac{1}{8} \) \( \frac{1}{16} \)
41. If E, M, J and G respectively denote energy, mass, angular momentum and gravitational constant, then \( EJ^2 \) has the dimensions of:

- (A) \( M^3 G^2 \) 
- (B) \( M^4 G^2 \) 
- (C) \( M^2 G \) 
- (D) \( M^2 G^2 \)

42. A jet of water with a cross-sectional area \( A \) is striking a wall at an angle \( \theta \) to the normal and rebounds elastically. If the velocity of water in the jet is \( v \), the normal force acting on the wall is:

- (A) \( \frac{EJ^2}{\rho^2} \) 
- (B) \( \frac{EJ^2}{\rho} \) 
- (C) \( \frac{EJ^2}{\rho^2} \) 
- (D) \( \frac{EJ^2}{\rho^4} \)

43. The distance \( x \) moved by a body of mass 0.5 kg by a force varies with time \( t \) as: \( x = 3t^2 + 4t \), where \( x \) is expressed in metre and \( t \) in second. What is the work done by the force in the first 2 seconds:

- (A) 2 \( v^2 \rho \cos \theta \) 
- (B) \( v^2 \rho \cos \theta \) 
- (C) 2 \( v^2 \rho \cos \theta \) 
- (D) \( a \rho \cos \theta \)

44. In the circuit shown in figure, the current through the 10 \( \Omega \) resistor is:

- (A) \( \frac{1}{9} \) 
- (B) \( \frac{4}{9} \) 
- (C) \( \frac{2}{3} \) 
- (D) \( \frac{5}{6} \)

45. When a charged particle moves perpendicular to a uniform magnetic field, its:

- (A) Kinetic energy and momentum both change 
- (B) Kinetic energy changes but momentum remains unchanged 
- (C) Momentum changes but kinetic energy remains unchanged 
- (D) Kinetic energy and momentum both do not change

46. A thin lens of focal length \( f \) has an aperture of diameter \( d \). It forms an image of intensity \( I \). Now, the central part of the aperture upto diameter \( d/2 \) is blocked by opaque paper. The focal length and the image intensity will change to:

- (A) \( \frac{1}{2} \) 
- (B) \( \frac{1}{4} \) 
- (C) \( \frac{3}{4} \) 
- (D) \( \frac{3}{2} \)

47. The magnitude of the angular momentum of an electron revolving in a circular orbit of radius \( r \) in a hydrogen atom is proportional to:

- (A) \( r^2 \) 
- (B) \( r \) 
- (C) \( r^3 \) 
- (D) \( r^4 \)

48. A cube of ice is floating in water contained in a vessel. When the ice melts, the level of water in the vessel:

- (A) rises 
- (B) falls 
- (C) remains unchanged 
- (D) falls at first and then rises to the same height as before

49. Two masses \( m_1 \) and \( m_2 \) are attached to a massless string which pass over a frictionless fixed pulley. Given that \( m_1 = 10 \) kg and \( m_2 = 6 \) kg and \( g = 10 \) ms\(^{-2} \). What is the acceleration of the masses?

- (A) \( 2.5 \) ms\(^{-2} \) 
- (B) \( 5 \) ms\(^{-2} \) 
- (C) \( 20 \) ms\(^{-2} \) 
- (D) \( 40 \) ms\(^{-2} \)

50. A charge \( q \) is placed at the centre of the cubical vessel (with one face open) as shown in figure. The flux of the electric field through the surface of the vessel is:

- (A) \( \frac{q}{\varepsilon_0} \) 
- (B) \( \frac{q}{2\varepsilon_0} \) 
- (C) \( \frac{q}{4\varepsilon_0} \) 
- (D) \( \frac{5q}{6\varepsilon_0} \)

51. A block of mass \( m \) is lying at a distance \( r \) from a spherical shell of mass \( M \) and radius \( R \) as shown in the figure. Then:

- (A) only gravitational field inside the shell is zero 
- (B) gravitational field and gravitational potential both are zero inside the shell 
- (C) gravitational potential as well as gravitational field inside the shell are not zero 
- (D) can't be ascertained.
52. The equivalent resistance between points A and B is:  

![Resistance Diagram]

\[ R_{eq} = \frac{65}{2} \Omega \]

53. The radii of two metallic spheres are 5 cm and 10 cm and both carry equal charge of 75µC. If the two spheres are shorted then charge will be transferred:

(A) 25 µC from smaller to bigger
(B) 25 µC from bigger to smaller
(C) 50 µC from smaller to bigger
(D) 50 µC from bigger to smaller

54. Two parallel, long wires carry currents \( i_1 \) and \( i_2 \) with \( i_1 > i_2 \). When the current are in the same direction, the magnetic field at a point midway between the wire is 20µT. If the direction of \( i_1 \) is reversed, the field becomes 30µT. The ratio \( i_1/i_2 \) is:

(A) 2

55. Huygen's principle of secondary wavelets can not be used to:

(A) deduce the laws of reflection of light
(B) deduce the laws of refraction of light
(C) explain the transverse nature of light waves
(D) predict the location of a wavefront as time passes

56. When a wave travels in a medium, the particle displacements are given by:

\[ y(x, t) = 0.03 \sin \left(2\pi \left( \frac{x}{200} \right) - 0.01t \right) \]

where \( y \) and \( x \) are in meters and \( t \) in seconds. Then select incorrect statement.

(A) The amplitude of the wave is 3 cm
(B) The wavelength of the wave is 200 m
(C) The speed of the wave is 200 m/s
(D) At a given instant of time, the phase difference between two particles 25 m apart is \( \pi/2 \)

57. Figure shows the velocity time graph of a particle moving along straight line (\( v \) is in m/s and \( t \) is in seconds). Its average velocity in 20 seconds will be:

(A) 10 m/s
(B) zero (null)
(C) 3.75 m/s
(D) 7.5 m/s

58. Two small spheres of equal mass, and heading towards each other with equal speeds, undergo a head-on collision (no external force acts on system of two spheres). Then which of the following statement is correct?

(A) Their final velocities must be zero.
(B) Their final velocities may be zero.
(C) Each must have a final velocity equal to the other’s initial velocity.
(D) Their velocities must be reduced in magnitude twice the initial velocity.

59. When a satellite is at a distance \( R \) from the center of Earth, the force due to gravity on the satellite is \( F \). What is the force due to gravity on the satellite when its distance from the center of Earth is 3\( R \)?

(A) \( F \)
(B) \( F/9 \)
(C) \( F/3 \)
(D) \( 9F \)
03. SAMPLE TEST PAPER

60. Pick up the correct statement
   (A) The device used for producing electric current is called galvanometer.
   (B) An electric motor converts mechanical energy into electrical energy
   (C) An electric generator works on the principle of electromagnetic induction
   (D) A wire with a green insulation is usually the live wire
   (E) An electric motor converts electrical energy into mechanical energy.

61. The r.m.s speed of molecules in still air at room temperature is closest to:
   (A) Walking speed (1 m/s)
   (B) The speed of a horse running fast (15 m/s)
   (C) The speed of supersonic plane (500 m/s)
   (D) Escape speed from earth (11 km/s)
   (E) An electric motor converts mechanical energy into electrical energy.

62. A person throws a ball vertically up in air. The ball rises to a maximum height and then falls back down such that the person catches it. Neglect the friction due to air. While the ball was in air, three statements are given below. (g = 9.8 m/s²)
   Statement 1: Just after the ball leaves the persons hand, the direction of its acceleration is upwards.
   Statement 2: The acceleration of ball is g = 9.8 m/s². The direction of the acceleration is downwards.
   Statement 3: The acceleration of ball is zero when it was in air.
   (A) Statement 1 only
   (B) Statement 2 only
   (C) Statement 3 only
   (D) Both statement 2 and statement 3
   (E) All statements (A) to (D) are correct.

63. Moment of inertia of a disc about O O is:
   (A) \( \frac{3m r^2}{2} \)
   (B) \( \frac{5m r^2}{2} \)
   (C) \( \frac{5m r^2}{4} \)
   (D) \( \frac{5m r^2}{8} \)

64. Altitude above earth's surface at which acceleration due to gravity decreases by 0.1% is approximately:
   (A) 3.2 km
   (B) 6.4 km
   (C) 2.4 km
   (D) 1.6 km

65. The AC produced in India changes its direction every:
   (A) \( \frac{1}{100} \) sec.
   (B) 100 sec.
   (C) 50 sec.
   (D) None of these
   (E) Every 100 sec.

66. If a trolley starts from rest with a constant acceleration of 4 m/s², the velocity of the body after 4s would be:
   (A) 2 m/s
   (B) 8 m/s
   (C) 4 m/s
   (D) 6 m/s

67. When a block is placed on a wedge as shown in figure, the block starts sliding down and the wedge also starts sliding on ground. All surfaces are rough. The centre of mass of (wedge + block) system will move (A) leftward and downward.
   (B) rightward and downward.
   (C) leftward and upwards.
   (D) only downward.

68. A 60 kg body is pushed horizontally with just enough force to start it moving across a floor and the same force continues to act afterwards. The coefficient of static friction and sliding friction are 0.5 and 0.4 respectively. The acceleration of the body is:
   (A) 0.5 m/s²
   (B) 0.6 m/s²
   (C) 0.3 m/s²
   (D) 0.4 m/s²
69. A rigid body moves a distance of 10 m along a straight line under the action of a force of 5 N. If the work done by this force on the body is 25 J, the angle which the force makes with the direction of motion of the body is 
(A) 0° (B) 30° (C) 60° (D) 90°

70. The frictional force is—
(A) Self adjustable (B) Not self adjustable (C) scalar quantity (D) Equal to the limiting force

PART - III (CHEMISTRY) भाग - III (रसायन विज्ञान)

Atomic masses (परमाणु भार) : [H = 1, D = 2, Li = 7, C = 12, N = 14, O = 16, F = 18, Na = 23, Mg = 24, Al = 27, Si = 28, P = 31, S = 32, Cl = 35.5, K = 39, Ca = 40, Cr = 52, Mn = 55, Fe = 56, Cu = 63.5, Zn = 65, As = 75, Br = 80, Ag = 108, I = 127, Ba = 137, Hg = 200, Pb = 207]

Straight Objective Type (Maximum Marks : 90)

This section contains THIRTY single choice questions. Each question has four choices (A), (B), (C) and (D), out of which ONLY ONE is correct.

71. 10⁻² mole of NaOH was added to 10 litre of water at 25⁰C. The pH will change by
(A) 4 (B) 3 (C) 11 (D) 7

72. The volume occupied by atoms in a simple cubic unit cell is : (edge length = a)
(A) a³ (B) 4πa³/3 (C) πa³/6 (D) 8√3π/8

73. In P₄ and O₃, the number of σ bond are : (P₄ तथा O₃ में σ बंती की संख्या है)
(A) 4 and 2 (4 तथा 2) (B) 6 and 2 (6 तथा 2) (C) 6 and 3 (6 तथा 3) (D) 4 and 3 (4 तथा 3)

74. Three faradays of electricity was passed through an aqueous solution of iron (II) bromide. The mass of iron metal (at. mass = 56 u) deposited at the cathode is: (Fe का परमाणु भार = 56 u)
(A) 56 g (B) 84 g (C) 112 g (D) 168 g

75. Consider the reaction N₂(g) + 3H₂(g) → 2NH₃(g). Then:

(A) —d[N₂]/dt = k[N₂][H₂]³ (B) —d[1/3]/3 dt [H₂] = k[N₂][H₂]³

76. A gas cylinder containing cooking gas can withstand a pressure of 14.9 atmosphere. The pressure gauge of cylinder indicates 12 atmosphere at 27 °C. Due to sudden fire in the building temperature starts rising. The temperature at which cylinder will explode is:
(A) 14.9 atm (B) 15.9 atm (C) 16.9 atm (D) 17.9 atm

77. Given E⁺ / Ag⁺ is 0.88 V. E⁻ / Ni²⁺ / Ni is 0.25 V. Which of the following statements is true?
(A) Ag⁺ is an oxidizing agent but Ni²⁺ is a reducing agent
(B) Ni²⁺ can be reduced by silver metal
(C) Ag⁺ is a better oxidizing agent than Ni²⁺ and Ni is a better reducing agent than Ag.
(D) Ni²⁺ is a better oxidizing agent than Ag⁺ and Ag is a better reducing agent than Ni.

78. How many electrons in ²³⁵⁵Br have n = 4 and l = 4
(A) 2 (B) 4 (C) 6 (D) 8

79. The energy of a photon of wavelength λ is given by the formula : hc/λ. (hc = 12400 eV Å, When λ is in Å). Find energy of 2 photons of λ = 620 nm
(A) 2eV (B) 3eV
(C) 4eV (D) can’t be predicted
80. 64 gm of an organic compound has 24 g carbon and 8 g hydrogen and the rest is oxygen. The empirical formula of the compound is:
(A) CH₂O   (B) CH₃O   (C) C₂H₄O   (D) None of these

81. Which of the following molecule will not have zero dipole moment?
( A) PF₃Cl₂   (B) SO₃   (C) XeF₄   (D) CH₂Cl₂

82. How many 3º alcohol is possible with molecular formula C₆H₁₄O ?
(A) 2   (B) 3   (C) 4   (D) 5

83. The molecule exhibiting maximum number of non-bonding electron pairs around the central atom is:
( A) BeCl₂   (B) MgCl₂   (C) CaCl₂   (D) BaCl₂

84. Arrange the alkaline earth metals in decreasing order of size of their hydrated ion:
( A) Be²⁺, (B) Mg²⁺, (C) Ca²⁺, (D) Sr²⁺, (E) Ba²⁺

85. Extraction of silver from Ag₂S by the use of sodium cyanide is an example of:
(A) Roasting   (B) Hydrometallurgy   (C) Electrolysis   (D) Smelting

86. The hybridization of atomic orbitals of nitrogen in NO₂⁻, NO₃⁻ and NH₄⁺ are:
(A) sp, sp³ and sp² respectively   (B) sp³ and sp²   (C) sp², sp³ and sp²   (D) None of these

87. The correct order of the increasing ionic character is:
(A) BeCl₂ < MgCl₂ < CaCl₂ < BaCl₂   (B) BeCl₂ < CaCl₂ < MgCl₂ < BaCl₂   (C) BeCl₂ < BaCl₂ < MgCl₂ < CaCl₂   (D) None of these

88. The species which has four unpaired electrons is:
(A) [Co(CN)₆]³⁻   (B) [Cr(H₂O)₆]³⁺   (C) [FeCl₄]⁻²   (D) [Fe(H₂O)₆]³⁺
96. Which of the following elements show only positive or zero oxidation state?

(A) N  (B) O  (C) Na  (D) H

97. The beta and alpha glucose have different specific rotations. When either is dissolved in water, their rotation changes until the same fixed value results. This is called:

(A) epimerisation  (B) racemisation  (C) anomerisation  (D) mutarotation

98. Base catalysed aldol condensation occurs with:

(A) benzaldehyde  (B) 2-methyl propanal  (C) 2,2-dimethylpropanal  (D) formaldehyde

99. Compound ‘A’ (C<sub>16</sub>H<sub>18</sub>) on ozonolysis gives only one product ‘B’, (C<sub>8</sub>H<sub>8</sub>O). ‘B’ gives positive Iodoform test and forms sodium benzoate as one of the product. Identify the structure of ‘A’.

(A) Ph – CH<sub>2</sub> – CH = CH – CH<sub>2</sub> – Ph

(B) CH<sub>3</sub> – CH – C = Ph

(C) Ph – C = – C – Ph

(D) Ph – CH – CH<sub>2</sub> – Ph

100. The correct order of ease of deprotonation of labelled H-atoms is

<table>
<thead>
<tr>
<th>Label</th>
<th>Order</th>
</tr>
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<tbody>
<tr>
<td>(A)</td>
<td>1 &gt; 3 &gt; 2</td>
</tr>
<tr>
<td>(C)</td>
<td>3 &gt; 2 &gt; 1</td>
</tr>
</tbody>
</table>

**HINTS & SOLUTIONS TO SAMPLE TEST PAPER-3**

1. **Term of greatest coefficient means numerically greatest term when x = 1**

\[ r = \left[ \frac{10 + 1}{5} \right] \]

\[ t_0 = \frac{10}{2} \]

\[ t_4 = \frac{1}{2} \]

\[ n \text{ largest coefficient} = \frac{11}{2} \text{ Ans. (A)} \]

2. **Two solutions**

3. **Radius (रेखाप्रमाण) = \sqrt{1 + 4 - 1} = 2**

4. **Centre (सेंट्र) = (-1, -2)**

5. **S’P + S’P = 2a**

6. **2ae = \frac{2b^2}{a}**

7. **2x^2 + 9 |x| = 5 = 0 \Rightarrow 2|x|^2 + 9|x| = 0 \Rightarrow 2x^2 + 10|x| - |x| - 5 = 0 \Rightarrow 2|x|(|x| + 5) - 1(|x| + 5) = 0**

\[ |x| = 5 \text{ is impossible} \]

\[ |x| = \pm \frac{5}{2} \text{ two solutions} \]

---

**ANSWER KEY TO SAMPLE TEST PAPER-3**

1. (A)  2. (C)  3. (A)  4. (B)  5. (A)
2. (C)  3. (A)  4. (B)  5. (A)
6. (D)  7. (B)  8. (A)  9. (B)  10. (A)
11. (B)  12. (D)  13. (C)  14. (C)  15. (C)
16. (D)  17. (B)  18. (D)  19. (B)  20. (C)
21. (A)  22. (B)  23. (A)  24. (A)  25. (A)
26. (A)  27. (B)  28. (B)  29. (B)  30. (A)
31. (B)  32. (C)  33. (D)  34. (A)  35. (C)
36. (C)  37. (C)  38. (A)  39. (D)  40. (A)
41. (B)  42. (A)  43. (D)  44. (B)  45. (C)
46. (D)  47. (A)  48. (C)  49. (A)  50. (D)
51. (C)  52. (B)  53. (A)  54. (C)  55. (C)
56. (D)  57. (D)  58. (B)  59. (B)  60. (C)
61. (B)  62. (C)  63. (D)  64. (A)  65. (A)
66. (B)  67. (B)  68. (D)  69. (C)  70. (A)
71. (A)  72. (C)  73. (B)  74. (B)  75. (D)
76. (A)  77. (C)  78. (D)  79. (C)  80. (A)
81. (D)  82. (B)  83. (C)  84. (A)  85. (B)
86. (B)  87. (A)  88. (C)  89. (C)  90. (B)
91. (A)  92. (B)  93. (D)  94. (A)  95. (B)
96. (C)  97. (D)  98. (B)  99. (C)  100. (A)
8. \[ \log_a(\log_b a) = \log_a(\log_b a). \log_b(\log_b b). \]
\[ \log_b(\log_b b) = \log_b b = 0. \]
9. \[ N = \log_3 79. \log_{18} 3. \log_2 18 = \log_3 79. \log_2 2. \log_2 3. = 2. \]
\[ \log_2 3(–3) \log_5 2 = \log_5 79 \]
10. \[ x^4(x – 1)^2(x + 4) \geq 0 \Rightarrow \frac{x(x + 4)}{(x + 1)(x – 3)} \geq 0 \]
\[ \text{and } x = 1 \]
\[ x = -4 \cup -1 \cup 0 \cup 3 \]
\[ \Rightarrow x \in (-\infty, -4) \cup (-1, 0) \cup (3, \infty) \cup \{1\} \]
11. \[ \text{Let eccentricity of hyperbola } \frac{x^2}{5} – \frac{y^2}{5 \cos^2 a} = 1 \text{ is } e. \]
\[ \text{Then } 5 \cos^2 a = 5(e^2 – 1) \]
\[ \cos^2 a = e^2 – 1 \]
\[ \cos^2 a = 1 + \frac{1}{\cos^2 a} \]
\[ \Rightarrow \cos^2 a = \frac{1}{2} \Rightarrow \cos a = \frac{\sqrt{2}}{4} \]
13. \[ \text{Let focus is } (a, 0) \]
\[ x = 0 \]
\[ \Rightarrow y = \frac{1}{x} \]
\[ \Rightarrow y = \frac{1}{x} \]
\[ \text{so } 0 + a = 2 \Rightarrow a = 4 \]
\[ \Rightarrow 0 + a = 2 \Rightarrow a = 4 \]
16. \[ \text{4 digit number } 3432 = 72 \text{ : 5 digit number } 120 \]
\[ \text{Total way } 192 \]
18. \[ \text{Total ways कुल संलग्न } = 4\times3\times3\times3 = 36 \]
\[ = 6, 5.4.6 = 120 \]
19. \[ p + q = p \Rightarrow 2p + q = 0 \] \[ \text{............(1)} \]
\[ p + q = q \Rightarrow q (p – 1) = 0 \]
\[ \Rightarrow q = 0 \text{ or (या) } p = 1 \]
\[ \text{When } q = 0, \text{then } p = 0 \]
\[ \text{बज } q = 0 \text{ है, तो } p = 0 \]
\[ \text{When } p = 1, \text{then } q = -2 \]
\[ \text{जब } p = 1 \text{ है, तो } q = 0 \]
20. \[ \text{Here each term is non-negative, thus each must be equal } \]
\[ \text{to zero simultaneously,} \]
\[ \Rightarrow |x^2 – 4| = 0 \text{ & } (x + 2)^2 = 0 \text{ & } \sqrt{x^2 + 3x + 2} = 0 \]
\[ \Rightarrow x = -2 \text{ & } x = -2 \text{ & } x = -1, -2 \]
\[ \Rightarrow \text{ common solution is } x = -2 \]
34. \( \sin 2x + \cos 4x = \frac{2}{3} \) when \( x = 2 \) and (A) \( \cos 4x = 1 \)
\( \Rightarrow 2x = \frac{\pi}{2}, \frac{5\pi}{2} \) and (A)
\( 4x = 0, 2\pi, 4\pi, 6\pi \)
\( x = \frac{\pi}{4}, \frac{5\pi}{4}, \frac{3\pi}{2} \)
No. common solution (कोई उपयोगी कोण नहीं)
so number of solution is 0 (अंत: हलों की संख्या शून्य)

35. \( 4 \sin 9^\circ \sin 21^\circ \sin 39^\circ \sin 51^\circ \sin 69^\circ \sin 81^\circ \)
\[ = 4 \sin 9^\circ \cos 9^\circ \sin 21^\circ \cos 21^\circ \cos 29^\circ \cos 51^\circ \cos 69^\circ \cos 81^\circ \]
\[ = \frac{\sin 18^\circ \cdot \sin 78^\circ \cdot \sin 42^\circ}{\sin 54^\circ} \]
\[ = \frac{1}{8} \]

36. \( \cot \theta = \frac{1}{\sqrt{3}} \)
\( H = \sqrt{B^2 + B^2} \Rightarrow H = \sqrt{(\sqrt{3})^2 + (1)^2} = \sqrt{4} = 2. \)
So, \( \cot \theta = \frac{B}{H} = \frac{1}{2} \) and \( \sin \theta = \frac{P}{H} = \frac{\sqrt{3}}{2} \)
\( 1 - \cos^2 \theta = \frac{3}{4} \) and \( \sin^2 \theta = \frac{3}{5} \)

37. \( \cos \alpha \cos \beta = \sin \alpha \sin \beta \)
\( \therefore \) \( \alpha + \beta = 2\pi \)
\( 1 + \cot \alpha \tan (2\pi - \alpha) = 1 + \cot \alpha (-\tan \alpha) = 0 \)

40. \( x > 5 \) \( \Rightarrow x = 3 \) \( x < 5 \) \( \Rightarrow x = 1 \)
\( x = 5 \) \( \Rightarrow x = 2 \)
not possible संभव नहीं
not true सत्य नहीं
\( x = 2 \)

41. \( \frac{E^2}{M^2G^2} = \left(\frac{ML^2T^{-2}}{M^2L^{-2}T^{-2}}\right)^2 = M^2L^4T^0 \),
which is dimensionless.

42. The mass of water stream striking against the wall in 1 second = \( a \nu \). Hence, the change in its momentum per second is \( (a \nu) \nu - (-a \nu) \nu = 2a \nu \nu^2 \). The normal component of the rate of change of momentum and, therefore, force is \( 2a \nu^2 \cos \theta \). Hence the correct choice is (A).

43. Velocity \( (v) = \frac{dx}{dt} = \frac{dT^2 + 4T + 5}{dt} = 6T + 4 \) (3\( T^2 + 4T \)) Acceleration is
\( a = \frac{dv}{dt} = 6 \frac{d}{dt}(T^2 + 4T) = 6 \frac{dt}{dt} \) Therefore, applied force is
\( F = ma = 0.5 \times 6 = 3 \) N.

44. Refer to figure. Let \( V \) be the potential at point A. Points B, C and D are earthed. So the potential at A, B and C = 0. Potential at D = 12 V. Potential difference between D and E is \( V_D = 12 - V \), between E and B is \( V_E = V \) and between E and C = V. Therefore
\( I_1 = \frac{12 - V}{3} ; I_2 = \frac{V}{3} ; I_3 = \frac{V}{12} \)

From Kirchhoff's junction rule, \( I_1 = I_2 + I_3 \), i.e.,
\( \frac{12 - V}{3} = \frac{V}{3} + \frac{V}{12} \Rightarrow V = 16 \) V

Hence \( I_1 = 16/3 - 4/9 \) So the correct choice is (B).

45. Since the force exerted by the magnetic field is perpendicular to the direction of motion of the particle, the speed of the particle cannot change but its velocity changes. Hence the correct choice is (C).

46. The focal length of a lens does not change if a part of it is blocked. If the central part of the aperture up to \( d/2 \) is blocked, the exposed area of the aperture reduces by one-fourth the earlier area because
\( \frac{\pi \left(\frac{d}{2}\right)^2}{\pi d^2} = \frac{1}{4} \)
Hence the intensity of the image reduces by a factor of 4. Thus the intensity becomes \( I - I/4 = 3I/4 \). Hence the correct choice is (D).

47. \( r = \frac{\varepsilon_0 \pi h^2}{\pi m \nu^3} \)
\( L = \frac{nh}{2\pi} \Rightarrow nh = 2\pi L \)
\( \therefore r = \frac{\varepsilon_0 \left(2\pi L\right)^2}{\pi m \nu^3} \Rightarrow L = \left(\frac{me^2}{4\pi\varepsilon_0}\right)^{1/2} \times r^{1/2} \)
Thus \( L \propto r^{1/2} \), which is choice (A).

48. The weight of the floating ice is equal to the weight of water displaced by it. So, when the ice melts, the volume of water produced by the melting ice is equal to the volume of water displaced by the ice cube.

49. \( a = \frac{\left(m_1 - m_2 \right)g}{\left(m_1 + m_2\right)} = \frac{4 \times 10}{16} = 2.5 \) m/sec\(^2\)

50. Total flux through closed cubical vessel = \( \frac{q}{\varepsilon_0} \) & Flux
through one face = \( \frac{1}{6} \left(\frac{q}{\varepsilon_0}\right) \)
So, total flux passing through given cubical vessel is =
\[
5 \left( \frac{q}{6c_0} \right) \quad \text{as vessel has 5 faces}
\]
51. Inside the shell gravitation field due to the shell will be zero but there will be some gravitational field due to the block.

52. Comparing this with the given equation we have
\[\bar{V}_{av} = \frac{25}{2} \text{m/s}.\]

53. (A) \(Q_1 = Q_2 + Q_3 = 150 \mu C\)
\[
\frac{Q_1}{C_1} + \frac{Q_2}{C_2} = \frac{Q_1'}{C_1} \quad \Rightarrow \quad Q_1' = 50 \mu C
\]
\[Q_2' = 100 \mu C\]
The 25\(\mu C\) charge would flow from smaller to bigger sphere.

54. 
\[
\frac{\mu_0}{2\pi} (\delta_1 - \delta_2) = 20 \Rightarrow \frac{\mu_0}{2\pi} (\delta_1 + \delta_2) = 30 \Rightarrow \frac{\delta_1 + \delta_2}{\delta_1 - \delta_2} = \frac{3}{2}
\]
\[
\Rightarrow \frac{\delta_1}{\delta_2} = \frac{5}{1} \quad \text{Ans. (C)}
\]

55. The correct choices are (A), (B) and (D).

56. The particle displacements are given
\[y = (x, t) = A \sin \left( \frac{2\pi}{\lambda} (vt - x) \right)\]
Comparing this with the given equation we have
\[A = 0.03 \text{ m} \quad \lambda = 0.01 \pi \text{ m} \]
\[\Rightarrow \lambda = 200 \text{ m} \Rightarrow \frac{2\pi v}{\lambda} = 2\pi \Rightarrow v = \frac{\lambda}{2} = 200 \text{ ms}^{-1}\]
Phase difference \(\Delta \phi = \frac{2\pi}{10} \times 25 = \frac{\pi}{4}\)
So all the four choices are correct.

57. \[V_{av} = \frac{\text{Displacement}}{\text{time}} \]
Displacement = area of curve
\[v_{av} = \frac{2(10 + 20)10}{20} = \frac{30}{4} \text{ m/s.}\]

58. Nothing is mentioned about coefficient of restitution. Hence the only true statement is ‘their final velocities may be zero.’

61. \[V_{rms} = \sqrt{\frac{3RT}{M_0}}\]

62. The acceleration of ball during its flight is \(g = 9.8 \text{ m/s}^2\) downwards.
\[u_{max} = 100 \times 10^{-3} \Rightarrow \frac{2h}{R_E} = -10^{-3} \Rightarrow h = 3200 \text{ m}\]

67. Friction force between wedge and block is internal i.e. will not change motion of COM. Friction force on the wedge by ground is external and causes COM to move towards right. Gravitational force (mg) on block brings it downward hence COM comes down.

74. Mole of Fe deposited = \(\frac{1}{2} \times 1 = 1.5 \text{ mole}\)
\[W_{Fe} = 1.5 \times 56 = 84 \text{ gm.}\]

76. Suppose the cylinder will burst at \(T_2 K\)
\[T_2 = \frac{P_2 T_1}{P_1} (V_1 = V_2) = \frac{14.9 \times 300}{12} = 372.5 K\]
\[\text{mana kikisinh} T_2 K \text{taap par foot jata hai}\]
\[T_2 = \frac{P_2 T_1}{P_1} (V_1 = V_2) = \frac{14.9 \times 300}{12} = 372.5 K\]

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77. The S.R.P. of Ag+ is higher than that of Ni^{2+} hence it is a better oxidizing agent. Like wise the S.O.P. of Ni is higher than that of Ag hence it is a better reducing agent. Ag^+ of AgCN (s) + NaCN (aq)

Ag^+ of AgCN (s) + NaCN (aq)

Hence empirical formula is CH_4O.

81. CH_3Cl_2 will have resultant dipole moment. Rest all have symmetrical structure and so, zero dipole moment.

82. CH_3Cl_2 with a chirality at 10°.

84. Greater the charge density on atom, greater will be the hydration, greater will be the hydrated radii.

85. Ag_2S (concentrated ore) + 2NaCN (aq) \rightarrow Air \rightarrow 2AgCN (s) + Na_2S (aq).

\[ \text{Air} \]

4Na_2S (aq) + 5O_2 (g) + 2H_2O (l) \rightarrow 2Na_2SO_4 (aq) + 4NaOH (aq) + 2S (s)

AgCN (s) + NaCN (aq) \rightarrow Na[Ag(CN)_2] (soluble complex)

2Na[Ag(CN)_2] (aq) \rightarrow Zn (dust) 2Ag (s) + Na_2Zn(CN)_4 (aq). Hence these reactions suggest that extraction of silver from Ag_2S by the use of sodium cyanide is an example of hydrometallurgy.

87. As size of cations increase, their polarising power decrease and thus ionic character increase.

88. K^+ has more number of shells than Mg^{2+} and Al^{3+}. Al^{3+} and Mg^{2+} are isoelectronic but Al^{3+} has higher nuclear charge so Al^{3+} > Mg^{2+}.

89. K^+ in Mg^{2+} and Al^{3+} is different. Mg^{2+} is a better oxidizing agent. Likewise the S.O.P. of Ni is higher than that of Ag hence it is a better reducing agent.

91. (A) Sandmeyer reaction. 

93. The \( \beta \) and \( \alpha \) glucose have different rotations. When either is dissolved in water, their rotation change until the same fixed values results. This is called mutarotation.

94. 2-Methyl propanal as it contains \( \alpha - H. \n\r

95. Ph - C = C - Ph \rightarrow ozonolysis \rightarrow Ph - C = O \rightarrow Ph - COO^- \rightarrow Ph - C = O \rightarrow CH_3 CH_3 iodoform test \rightarrow Ph - COO^-
## SAMPLE TEST PAPER

### ResoNET-2019

**COURSE NAME**

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<tr>
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<th>Application Form No.</th>
<th></th>
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<tr>
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<td>(Capital Letters Only)</td>
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<tr>
<td>VISHWAAS (JJ)</td>
<td>Room No.</td>
<td>Test Date</td>
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<tr>
<td>VIRESH (JD)</td>
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<tr>
<td>VIJAY (JR)</td>
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**Note:** Students are advised do not disturb the five guide view marks (Dark Circles -- printed on corners of ORS). Otherwise ORS will not be processed for results.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 |
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**Medium**

- English
- Hindi

**Category**

- General
- OBC
- SC
- ST
- DS
- PH

**Board Studied (Class-X)**

- CBSE
- ICSE
- STATE
- OTHER

In case of other - Name of Board

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Please turn overleaf & fillup the required information

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