

**SYLLABUS FOR PRELIMINARY EXAMINATION FOR RECRUITMENT TO THE POSTS OF
ASSISTANT MASTER/MISTRESS IN ENGLISH**

Full Marks : 100

Time : 1 Hour 30 Minutes

1. A knowledge of the history of English Literature from 1340 to 2000.
2. A close acquaintance with the following works which are prescribed for detailed study :-

a)	William Shakespeare	:	Macbeth, As you Like It
b)	Jane Austen	:	Pride and Prejudice
c)	John Milton	:	Paradise Lost (Book I)
d)	Alexander Pope	:	The Rape of the Lock
e)	R. K. Narayan	:	The Guide
f)	Amitav Ghosh	:	The Shadow Lines
g)	P. B. Shelley	:	Ode to the West Wind
h)	John Keats	:	Ode to a Nightingale
i)	Alfred Tennyson	:	Ulysses
j)	Robert Browning	:	My Last Duchess
k)	T. S. Eliot	:	Preludes

3. Grammar
4. Vocabulary
Antonym, Synonym, Idiomatic usage of
Language, Figures of Speech etc.
5. Test of Comprehension

(Candidates will be given a passage of 250 to 300 words. They should read it carefully and answer the questions. The answers may be contained in the passage or may be inferred from the reading of the passage).

**SYLLABUS FOR SCREENING TEST FOR RECRUITMENT TO THE POSTS OF ASSISTANT
MASTER/MISTRESS IN BENGALI**

Full Marks: 100

Time: 1 Hour 30 Minutes

১) পাঠ্যবই:

- ক) উপন্যাস: কৃষ্ণকান্তের উইল - বঙ্কিমচন্দ্র চট্টোপাধ্যায়,
আরণ্যক - বিভূতিভূষণ বন্দ্যোপাধ্যায়,
বলয়গ্রাস - আশাপূর্ণা দেবী।
- খ) কাব্য: মেঘনাদ বধ কাব্য (চতুর্থ, ষষ্ঠ, নবম সর্গ) - মাইকেল মধুসূদন দত্ত,
বনলতা সেন কাব্যগ্রন্থ (প্রথম পাঁচটি কবিতা) - জীবনানন্দ দাস,
পদাতিক কাব্যগ্রন্থ (প্রথম পাঁচটি কবিতা) - সুভাষ মুখোপাধ্যায়,
বিদ্রোহী, আমার কৈফিয়ৎ - কাজী নজরুল ইসলাম।
- গ) নাটক: বিসর্জন - রবীন্দ্রনাথ ঠাকুর,
নরক গুলজার - মনোজ মিত্র।
- ঘ) প্রবন্ধ: নির্বাচিত প্রবন্ধ (প্রথম পাঁচটি প্রবন্ধ) - কাজী আব্দুল ওদুদ,
শ্রেষ্ঠ প্রবন্ধ (প্রথম পাঁচটি প্রবন্ধ) - অনন্যদাশঙ্কর রায়।
- ঙ) ছোটগল্প: মেঘ ও রৌদ্র - রবীন্দ্রনাথ ঠাকুর,
মহেশ - শরৎচন্দ্র চট্টোপাধ্যায়,
টিচার - মানিক বন্দ্যোপাধ্যায়,
গাছটা বলেছিল - সৈয়দ মুস্তাফা সিরাজ,
গিরগিটি - জ্যোতিরিন্দ্র নন্দী।

২) বাংলা সাহিত্যের ইতিহাস:

- ক) মঙ্গলকাব্য (মনসামঙ্গল, চণ্ডীমঙ্গল, ধর্মমঙ্গল)
খ) বৈষ্ণব কাব্য (বিদ্যাপতি, চণ্ডীদাস, জ্ঞানদাস, গোবিন্দদাস)
গ) ফোর্ট উইলিয়াম কলেজ, বিদ্যাসাগর, দীনবন্ধু, গিরিশ ঘোষ, দ্বিজেন্দ্রলাল রায়,
প্রমথ চৌধুরী, সত্যেন্দ্রনাথ দত্ত।

৩) বাংলা ব্যাকরণ:

- ক) সন্ধি,
খ) সমাস,
গ) প্রত্যয়,
ঘ) কারক ও বিভক্তি,
ঙ) পদ পরিবর্তন,
চ) লিঙ্গ পরিবর্তন,
ছ) অশুদ্ধি সংশোধন,
জ) এক কথায় প্রকাশ।

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**SYLLABUS FOR PRELIMINARY EXAMINATION FOR RECRUITMENT TO THE POSTS OF
ASSISTANT MASTER/MISTRESS IN CHEMISTRY**

Full Marks : 100

Time : 1 Hour 30 Minutes

**Group - A
Organic Chemistry**

1. Bonding in organic molecules :

σ and π bonds, bond distance, bond angle, and bond energy. Dipole moment of organic molecules. Inductive, resonance and hyperconjugative effect. Hydrogen bond. Tautomerism, Aromaticity, Huckel's rule, aromatic, non aromatic and anti aromatic compounds. Effects of structure, substituents and solvent on acid and base strength.

2. Stereo Chemistry of carbon compounds :

Elements of symmetry. Chirality, Eanantiomerism and diastereo isomerism. Optical purity, racemization, resolution. Projection structure of stereoisomers – Fischer, Sawhorse, Newman, Flying – wedge DL, RS and EZ notations. Examples of enantiotopic and diastereotopic ligands and faces. Conformations of alkanes (upto 4 carbon), Cyclohexane, dimethylcyclohexanes and 1, 2 – glycols. Stereoisomerism in allenes and biphenyls (excluding RS notation).

3. Reaction mechanism :

General methods of study of mechanism of organic reactions illustrated by examples – use of isotopes, cross-over experiment, intermediate trapping, kinetic studies, stereochemistry. Energy profile diagrams of simple organic reactions, thermodynamic and kinetic control of reactions.

4. Reactive intermediates :

Generation, geometry, stability and reactions of carbocations, carbanions, free radicals, carbenes and benzyne.

- 5.**
- a) **Substitution reaction** – S_N1 , S_N2 , S_Ni and NGP. Electrophilic and nucleophilic substitution of aromatic compounds.
 - b) **Elimination reaction** – E_1 , E_2 , E_1CB and Syn - elimination.
 - c) **Addition reaction** – electrophilic addition to $C=C$ and $C\equiv C$, nucleophilic addition to $C=O$, conjugated olefins and carbonyls.
 - d) **Rearrangement reaction** :
Pinacol-pinacolone, Hofmann, Beckmann, Claisen, Baeyer-Villiger, Favorskii.

6. Chemistry and mechanism of :

Aldol condensation, Claisen condensation, Perkin reaction, Knoevenagel reaction, Wittig reaction, Michael reaction Arndt Eistert reaction, Acyloin condensation, Friedel-Craft reaction and Von Richter reaction.

7. Synthetic uses of reagents :

OsO_4 , HIO_4 , $Pb(OAc)_4$, SeO_2 , $LiAlH_4$, $NaBH_4$, B_2H_6 , NBS, PCC, Na or Li in liq- NH_3 , Alkyl lithium, Lithium dialkylcuprate, Lithium diisopropylamide, Aluminium isopropoxide.

- 8.** IUPAC nomenclature. Synthesis and reactions of alkanes, alkenes, alkynes, alkyl halides, ethers, alkanols, alkanals, alkanones, alkanolic acids, esters, amides, nitriles and amines.

9. Pericyclic reaction :

Definition and classification. FMO approach of electrocyclic, cycloaddition reactions and sigmatropic H-shifts.

- 10.** Basic principles and applications of UV, IR, and NMR spectroscopy of simple organic molecules. Road-map problems related to spectroscopy and organic reactions.

Group - B

Inorganic Chemistry

1. **Chemical bonding** :
 - a) **Ionic bonding** ;
polarizing power and polarizability, ionic potential, Fajan's rules.
 - b) **Covalent bonding** :
Lewis structures, VSEPR theory, Valence Bond theory (Heitler-London approach), Directional character of covalent bonds, hybridization, Bent's rule, concept of resonance. Molecular orbital theory (MO) elementary approach – sigma and pi bonds, multiple bonding, MO diagrams of simple homonuclear and heteronuclear diatomic molecule, simple triatomic molecules like BeH₂, CO₂, BF₃, bond order, bond energy.
Shapes of the molecules and ions containing lone pairs and bond pair.
 - c) **Weak Chemical forces** :
Vander Waals forces; Hydrogen bonding, Effects of chemical forces on physical properties.
 - d) **Metallic bonding** :
Qualitative ideas of band theory, Conducting, Semiconducting and insulating properties.

2. **Chemical periodicity** :
 - a) **Periodic Table** :
Classification of elements on the basis of electronic configuration, Modern periodic Table (current IUPAC version).
 - b) **Atomic and ionic properties** :
Effective nuclear charge, screening effect, Slater rules, atomic radii, ionic radii, covalent radii, ionization energies, electron affinity, electro-negativity, inert pair effect.

3. **Acid-Base Concepts** :
Bronsted and Lowry's concept, Lewis concept, HSAB principle.

4. **Non-aqueous solvents** :
Liquid ammonia and liquid sulphur dioxide.

5. **Coordination Compounds** :
Double and complex salts, Werner's theory, Chelate complexes, nomenclature of complex compound, stereo chemistry and coordination number, isomerism of coordination compounds – geometrical and optical isomers in respect of coordination numbers 4 and 6.

Bonding in coordination compounds : valence bond descriptions and its limitations, crystal field theory (elementary). Crystal field stabilization energies in weak and strong field cases mainly of octahedral and tetrahedral complexes.

6. **Magnetism and Colour** :
Origin of magnetic moments, paramagnetism, diamagnetism, ferro and antiferromagnetism, orbital and spin contributions, spin only moments of 3dⁿ ions.

Theoretical aspects of d-d spectra (elementary idea) selection rules for spectral transitions.

7. **Organo metallic compounds** :
Definition and classification, Metal-Carbon bonded complexes of transition metals – their preparation, properties and stability. Application of 18 electron rule to carbonyl, nitrosyl and cyanides of transition metals.

8. **The Chemical elements and its compounds** :
 - (a) (i) Group trends and periodic trends of effective nuclear charge, atomic and ionic radii, ionisation energies, electron affinity and electronegativity with respect to s-, p-, d- block elements.
 - (ii) General trends of variation of electronic structures, elemental forms, oxidation states, catenation and properties of important class of compounds such as oxides, oxyacids, halides and formation of complex compounds with respect to the following groups of (i) Li, Na, K (ii) Be, Mg, Ca, Sr and Ba (iii) B, Al, Ga, In, Tl (iv) C, Si, Ge, Sn, Pb (v) N, P, As, Sb, Bi (vi) O, S, Se, Te (vii) F, Cl, Br, I. and (viii) Chemistry of noble gases.

9. **Extraction/Preparation/Isolation of the following elements** :
 - (i) Extraction and purification of Li, Mg, Sn, Pb.
 - (ii) Extraction and purification of Ti, V, Cr, Mn, Pt, Ag, Au, U.
 - (iii) Manufacture of Steel, Alloy Steels.

10. **Radioactivity and Atomic structure** :
 - (a) **Radioactivity** : Radioactive decay, half-life, Average life of radio elements, radioactive equilibrium Group displacement law, isotopes (uses of isotopes), isobars and isotones.
 - (b) **Atomic nucleus** : Fundamental particles of atomic nucleus, nuclear stability, neutron-proton ratio, nuclear binding energy. Nuclear forces.

Transmutation of elements, fission, fusion reactions.
 - (c) **Extra nuclear structure** : Bohr's theory and its limitations, Sommerfield's modification, spectrum of H-atom.

Group - C

Physical Chemistry

1. Quantum Theory :

Black-body radiation and Planck's Law, photo-electric effect and photon concept of light, wave particle duality, de Broglie hypothesis, Heisenberg uncertainty principle, Schrodinger's wave equation (time independent), Interpretation of wave function particle in one-dimensional box, quantum numbers, hydrogen atom wave functions separation of radial and angular part, shapes of s, p and d orbitals.

2. The Gaseous State :

Kinetic theory of gases, equation of state of real gases, intermolecular interactions, liquefaction of gases and critical phenomena, Maxwell's distribution of speeds, features of kinetic energy distribution, mean speed, root mean square speed, most probable speed, principle of equipartition of energy, specific heats of gases, intermolecular collisions, collision number and mean free-path, viscosity of gases and mean free-path.

3. The Liquid State :

Nature of liquid state, surface tension, capillary rise, spreading of liquid over other surface, temperature dependence of surface tension. Measurement of surface tension, viscosity of liquids, origin of viscosity of gases and liquids, determination of viscosity coefficient, Poiseuille's equation, temperature dependence of viscosity coefficients of gases and liquids.

4. Solid State :

Forms of solids, laws of crystallography, crystal lattices, crystal systems and crystal classes, Bragg's Law, X-ray diffraction by crystals, crystal structure of NaCl, KCl, structure of diamond and graphite, Lattice energy, Born-Haber Cycle, Einstein's equation for heat capacity of solids, Debye equation (elementary concept).

5. Thermodynamics :

- a) Thermodynamic systems, states, processes, work, heat and internal energy, first law of thermodynamics, work done and heat absorbed in different types of processes. Reversible and irreversible process, energy and enthalpy changes in various processes and their temperature dependence.
- b) Second law of thermodynamics, Carnot's cycle and Carnot's theorem, absolute scale of temperature, entropy as a state function, entropy change in various processes, entropy – reversibility and irreversibility, Free-energy functions, criteria for spontaneity and equilibrium, physical concept of entropy, entropy and probability.
- c) Application thermochemistry, laws and their applications, Kirchoff's relation, Maxwell relation, $C_p - C_v$ relation Joule-Thomson expansion, thermodynamic equation of state, Gibbs-Helmholtz equation, Clausius-Clapeyron relation and phase transition, colligative properties of dilute solutions.

6. Reaction equilibrium :

- a) Homogeneous equilibrium, relationship K_p, K_c, K_x . Van't Hoff's reaction isotherm (deduction using chemical potential). Temperature dependence of equilibrium constant, Le-Chatelier's principle, response of equilibria to different conditions.
- b) Ionic equilibrium, solubility product, dissociation constant of weak acids, ionic product of water, pH, buffer, indicators, hydrolysis of salt solutions.

7. Electrochemistry :

- a) Electrical conductance, weak and strong electrolytes, variation of equivalent conductance with dilution, Kohlrausch's law, transport number, determination of transport number by moving boundary method, theory of strong electrolytes, applications of conductance measurements.
- b) Galvanic cells, thermodynamic derivation of E.M.F. of chemical cells with examples, Transference cell, liquid junction potential and salt bridge, measurement of e.m.f. of cells and its applications, fuel cells and batteries.

8. Chemical Kinetics :

Concentration dependence of rate of reaction, differential and integral rate equations for zeroth, first, second order reactions, rate equations involving reverse, parallel, consecutive and chain reactions, effect of temperature and pressure on rate constant, collision and transition state theories of reaction rates.

9. Photo Chemistry :

Absorption of light, Lambert-Beer's law, laws of photochemistry, quantum yield, some typical photochemical reactions, HI-decomposition, CH_3CHO -decomposition, $\text{H}_2 - \text{Br}_2$ reaction, photosensitized reaction, Fluorescence and phosphorescence.

10. Surface phenomenon and Catalysis :

Adsorption from gases and solutions on solid adsorbents, adsorption isotherms – Langmuir and B.E.T. isotherms, determination of surface area. Gibbs adsorption isotherms, surfactants, micelle formation. Characteristics and mechanism of homogeneous and heterogeneous catalytic reactions Enzyme catalysis.

**SYLLABUS FOR PRELIMINARY EXAMINATION FOR RECRUITMENT TO THE
POST OF ASSISTANT MASTER / MISTRESS IN GEOGRAPHY**

Full Marks : 100

Time : 1 Hour 30 Minutes

S E C T I O N - I

A. PHYSICAL GEOGRAPHY

1. Origin of Continents and Ocean Basins; Continental Drifts and Plate Tectonics; Epirogenic and Orogenic movements; Different kinds of Landforms and their origin; Volcanoes and Volcanic features; Earthquakes.
2. Earth's Crust - general properties; Modes and origin of igneous, sedimentary and metamorphic rocks.
3. Weathering and Mass wasting.
4. Evolution of Landforms under different Cycles of Erosion - fluvial, glacial, Aeolian, marine and karst; Evolution of drainage system and its adjustment to structure.
5. Elements and factors of climate; Distribution of temperature and pressure belts over the Earth.
6. Airmass, Planetary Winds and Local Winds.
7. Precipitation - origin and types; Cyclones and Anti-Cyclones.
8. Classification of World Climates.

B. ENVIRONMENTAL GEOGRAPHY

9. Concepts of Environment, Ecology and Ecosystem; Natural and Man-made Ecosystems; Concepts of Bio-Diversity; Environmental Pollution, Degradation and Conservation; greenhouse effects and global Warming; Man-Environment relationships.

S E C T I O N - II

C. ECONOMIC GEOGRAPHY

10. Geographical factors favourable for the localization of the following major economic activities :
 - a) Lumbering,
 - b) Agriculture (Intensive Subsistence farming, Extensive Commercial farming and Plantation agriculture),
 - c) Fishing,
 - d) Mining (Coal, Petroleum and Iron ore - their distribution and utilization),
 - e) Power resources (conventional and Non-conventional),
 - f) Manufacturing (Iron & Steel, Aluminium, Cotton Textile and Jute industries).

D. HUMAN GEOGRAPHY

11. Concepts of Geographical Environment, Natural Regions of the Earth; - their characteristics; Role of Climate, Drainage and Relief in localizing human activities with particular reference to food gathering, pastoralism and subsistence agriculture.
12. Settlement Patters - Rural and Urban; Hierarchy of Urban Settlements; Growth and distribution of World Population.

E. GEOGRAPHY OF INDIA

13. Structure, Relief, Drainage, Climate, Soils and Natural Vegetation.
 14. Irrigation and River Valley Projects; Agriculture and Green Revolution.
 15. Mineral Resources and industrial Regions.
 16. Population - growth and distribution, age-sex composition, migration, urbanization and regional disparities.
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SYLLABUS FOR PRELIMINARY EXAMINATION FOR RECRUITMENT TO THE POSTS OF ASSISTANT MASTER/MISTRESS IN MATHEMATICS

Full Marks : 100

Time : 1 Hour 30 Minutes

Algebra :

Complex Number : De Moivre's theorem, its applications.
Exponential, Sine, Cosine, Logarithm of a Complex Number.

Theory of Equations : Relation between roots and co-efficients, symmetric function of roots, transformation of equation, multiple root.

Determinant and matrix : Properties and applications.

Inequality : $AM \geq GM \geq HM$ and its applications.

Set Theory :

Basic concepts, mapping, group, ring, field.

Boolean Algebra :

Basic concepts. Boolean variables and functions and their truth tables. NOT, OR and AND gates. Binary systems.

Vector :

Vector addition, Scalar and vector product. Application of vector algebra in geometrical and trigonometrical problems.

Calculus :

Differential Calculus - Sequence, series, Limit, continuity, differentiability, Successive derivatives. Rolle's theorem, Mean value theorem.

Integral Calculus - Indefinite integral, definite integral and its properties, definite integral as limit of sum. Beta and Gamma functions.

Application of Calculus :

Tangent & normal, curvature, pedal equation, curve-tracing, area, rectification.

Differential Equation :

Linear equation, Clairaut's equation, Complementary function, particular integral of higher order. Linear equations with constant Co-efficient.

Geometry :

Translation and rotation of axes. Reduction into Canonical form. Pair of straight lines. Circle, Parabola, ellipse, hyperbola – simple properties.

Equation of straight lines in space, equation of plane.

Numerical Analysis :

Errors in numerical computation – gross error, round off, truncation error, significant figure, absolute, relative, percentage error. Operators - $\Delta \nabla E$

Difference table, Newton's forward and backward interpolation formula.

Probability :

Basic concepts, addition and multiplication rule of probabilities. Conditional probability, Bay's theorem.

Dynamics :

Motion in a straight line under variable acceleration, motion under inverse square law, motion in resisting medium. Impact of elastic bodies, loss of KE in direct and oblique impact.

SYLLABUS FOR PRELIMINARY EXAMINATION FOR RECRUITMENT TO THE POST OF ASSISTANT MASTER/MISTRESS IN PHYSICS

Full Marks : 100

Time : 1 hour 30 minutes

1. Classical Mechanics :

Newton's laws of motion; Mechanics of a single particle; Rotational Motion; Gravitation.

2. General Properties of matter :

Elasticity; Surface Tension; Viscosity.

3. Vibrations and Waves :

Simple Harmonic Motion; General Wave Equations; Vibrations of Strings.

4. Heat :

Kinetic theory of gases; Equations of state; Brownian Motion.

5. Thermodynamics :

First and second Laws Entropy, Thermodynamic Functions.

6. Optics :

Geometrical Optics; eye pieces; physical optics; Interference; Diffraction, resolving power, polarisation.

7. Electricity and Magnetism :

Magnetic effects of currents
Varying currents
Alternating currents.

8. Electronics :

P – n Junctions, transistors and uses.

9. Modern Physics :

Bohr's theory
Millikan's experiment
X-rays, Moseleys Laws, Bragg reflection
Radio-activity, alpha, beta, gamma rays.
