



**GOVERNMENT OF SIKKIM
HUMAN RESOURCE DEVELOPMENT DEPARTMENT
GANGTOK**

No:556/HRDD/SE

Dated: 28/02/2014

NOTIFICATION

Rules for open competitive examination to be conducted by the Sikkim Public Service Commission for selection of candidates for appointment to the post of **Graduate Teacher** in various subjects is hereby published for general information:

1. The number of vacancies to be filled on the result of the examination will be specified in the Notice issued by the Sikkim Public Service Commission.
2. The examination will be conducted by the Sikkim Public Service Commission according to the syllabus and plans as indicated in the Appendix I to these rules.
3. The Date and the place of the examination will be fixed by the Sikkim Public Service Commission.
4. Candidates must write answers whether objectives or descriptive type in their own handwriting. Only visually challenged candidates will be allowed to use scribe.
5. The Commission shall have discretion to fix qualifying marks in any or all subjects to the written examination.

A candidate who obtains minimum qualifying marks in the written examination as may be fixed by the Commission shall be called for Class room demonstration test/personality test where the candidate's ability and knack to express and teach the given subject shall be tested. There will be a maximum of 50 marks to be assigned by the Commission at their discretion.

6. The decision of the Commission as to the eligibility or otherwise of a candidate for admission to the written examination shall be final.
7. No candidate will be admitted to the examination unless he holds a certificate of admission issued by the Commission.
8. A candidate must pay fees as may be prescribed by the Commission.

9. A candidate who is or has been declared by the Commission to be guilty of any attempt on his part to obtain support for his/her candidature by any means shall render himself/herself liable to be disqualified for admission to the competitive examination.
10. A candidate who is or has been declared by the Commission guilty of impersonation or of submitting false and fabricated documents which have been tampered with or making statement which are incorrect or false or suppressing material information, or otherwise resorting to any other irregular or improper means for obtaining admission to the examination hall or of using or of attempting to use unfair means in the examination hall may, in addition to rendering himself/herself liable to a criminal prosecution, be debarred
 - a) By the Commission permanently or for specified period for admission to any examination or appearing at any interview held by the Commission for selection of candidates.
 - b) By the State Government from any employment under them.
11. After the examination and interview, the names of the successful candidates will be arranged by the Commission in order of merit as disclosed by the aggregate marks finally awarded to each candidate. Candidates shall be considered for appointment to the available vacancies in the order in which their names appear in the list.
12. The terms and the manner or announcement of results of the examination shall be decided by the Commission at its discretion. The Commission will not enter in to any correspondence with any candidate regarding results.
13. Conditions of eligibility for appearing at the competitive examination have been indicated in the Appendix-II to these rules.
14. Candidates already in Government service or in Government owned undertaking or similar organizations, whether in temporary capacity or as work charged employees shall be, required to submit their application along with the 'No Objection Certificate' from their employers.
15. Success in the examination confers no right to appointment unless Government is satisfied after such enquiry as may be considered necessary that a candidate having regard to his character and antecedent is suitable in all respect for appointment.
16. A candidate must be in good mental and bodily health and free from any physical defect likely to interfere with the discharge of his duties as a

Teacher of Government School. A candidate who (after such medical examination as may be prescribed by the competent authority) is found not to satisfy these requirements will not be appointed.

17. If a candidate's handwriting is not easily legible, a deduction may be made in this account from the total marks otherwise accruing to him/her.
18. Credit will be given for good English including orderly, effective and exact expression combined with economy of words in all subjects of the examination and not only in subjects, which are especially devoted to English.
19. No travelling and daily allowances will be paid for the journey performed in connection with the examination, interview and medical examination.
20. All other matters not specified or for which no provision has been made in these rules shall be regulated by rules and orders applicable to the Service to which recruitment is being made.

BY ORDER AND IN THE NAME OF THE GOVERNOR

**(Dr. Thomas Chandy) IFS,
SECRETARY TO THE GOVERNMENT OF SIKKIM**

Appendix-I

Rules relating to the subjects and standards of the competitive examination of candidates for the post of Graduate Teacher under Human Resource Development Department, Government of Sikkim.

1. (A) The examination shall include compulsory and optional subjects and every candidate shall take all the compulsory subjects and two of the optional subjects.

(B) A candidate shall specify in the application form the optional subject he/she desires to take but may intimate any change of intention to the Secretary, Sikkim Public Service Commission not later than the date prescribed for the payment of the examination fee.
2. A candidate shall answer the papers in English and Elective Subjects and Major Language papers in respective languages.
3. No candidate shall be considered to have qualified the written examination unless he/she obtains at least 45% marks in the aggregate of all subjects. Provided that the number of candidates to be called for the Viva-voce Test after a particular written examination shall be determined by the Sikkim Public Service Commission at its discretion, and that this number shall, as far as possible be restricted to five times the number of vacancies notified for recruitment through that examination.
4. The compulsory and optional subjects and maximum marks fixed for each subject shall be as shown in the statement below.

COMPULSORY SUBJECTS

SL.NO	SUBJECTS	Maximum marks
1.	General English	100 marks
2.	General Knowledge	100 marks
Total:		200 marks

GRADUATE TEACHER (Humanities)

Optional Subjects

(Any three) 100X3

300 Marks

1. History
2. Political Science
3. geography
4. Economics
5. Elective English
6. Elective Nepali
7. Elective Hindi

GRADUATE TEACHER (MATHEMATICS)

COMPUSORY SUBJECTS: 3X100 300 marks

1. Physics,
2. Chemistry
3. Mathematics

GRADUATE TEACHER (BIO-SCIENCE)

Compulsory Subjects: 3x100 300 Marks

1. Chemistry
2. Botany
3. Zoology

5) GRADUATE TEACHER (MAJOR LANGUAGE GROUP) HINDI, NEPALI AND ENGLISH.

A. Optional Subjects – Any two 100X2= 200

1. History,
2. Political Science
3. Geography
4. Economics

B. Compulsory Language Paper. (Any One) 100X1= 100

1. English Language Paper - 100
2. Nepali Language paper - 100
3. Hindi Language paper - 100

6) Viva- Voce/ Personality Test -60

The standard and contents of papers in general, shall be similar to those of Degree level, i.e. B.A. or B. Science etc. Examination of a recognized Indian University.

- I. General English and General knowledge papers shall be of two hours duration and the optional papers three hours duration.
- II. Knowledge of customs, manners and one of the languages Viz. Bhutia, Lepcha, Limbu and Nepali and suitability for appointment in peculiar conditions prevailing in Sikkim shall be considered as desirable qualification.

- 7) If a candidate's handwriting is not easily legible, a deduction may be made in this account from the total marks otherwise accruing to him/her.
- 8) Credit shall be given for good English including orderly, effective and exact expression combined with economy of words in all subjects of the examination and not only in subjects, which are especially devoted to English.

Note: *In the event of a tie, order of merit shall be determined in accordance with the highest marks accrued in the written examination and should the marks in the written examination of the candidates who tie be equal, then the order of merit shall be in accordance with the marks obtained by such candidates in the aggregate.*

DETAILED SYLLABUS FOR THE GRADUATE TEACHER COMPETITIVE EXAMINATION

General English:

Section A: Reading Comprehension:

- (i) a). Passage: Questions on the basis of the reading of the passage.
- (ii) Question Types: a). Sentence Completion
 - b). Table completion
 - c). Multiple Choice

II. Vocabulary:

- a). Matching Words with Correct Meaning
- b). Synonyms
- c). Antonyms
- d). Inferring Meaning of words in the passage

Section B: III Writing:

- a). Letter (formal/informal)
- b). Paragraphs on given topics
- c). Notice/Telegraphic Messages
- d). Visual Interpretation

Section C: IV Grammar Use of

- 1). Preparation
- 2). Articles
- 3). Models
- 4). Verbs
- 5). Voice
- 6). Phrasal Verbs

Types

- Editing
- Gap filling
- Identifying errors and correcting
- Writing correct form of verbs

Section D: V Making sentences using idioms to bring out their meaning

GENERAL KNOWLEDGE:-

Knowledge of current event of National and International importance. The paper will also include question on Indian culture, Indian policy and Indian economy.

Right to Education Act, 2009.

General Awareness about Sikkim.

VIVA-VOCE:-

The candidates will be interviewed by the Commission who will have before them a record of his/her career. He/she will be asked questions on matters of general interest. The object of the interview is to assess the personal suitability of the candidate for the service, or service for which he/she has applied to the commission.

The test is intended to judge the mental caliber of candidates. In board terms this is really an assessment of not only his/her intellectual qualities but also his/her knowledge on the subjects he/she is required to teach to the students and his/her ability to express. His/her social traits and his/her interest in current affairs. Some of the qualities to be judged are mental alertness, critical powers of assimilation, care and logical exposition, balance of judgment, variety and depth of interest, ability for social cohesion and leadership intellectual and moral integrity.

OPTIONAL SUBJECTS

HISTORY:-

1. Source of Ancient Indian History.
2. Prehistoric India- Chalcolithic phase- The Indus valley Civilization- social and Economic life- Crafts, Script, Religion- end of the Civilization.
3. The Aryans in India- Origin and home of the Aryans- Aryans settlement- Rig Vedic period- political, Social and Economic Conditions- Literature and Religion, later Vedic period- Political, Social, economic conditions – Religion and philosophy.
4. New Religions movements- origin of Jainism and Buddhism.
5. Political conditions of North India in the 6th Century B.C.
 - (a) Sola Mahajanpadas
 - (b) Persian Invasion
 - (c) Macedonian invasion
 - (d) Huns invasion
 - (e) The decline of the Gupta Empire
6. The rise and fall of Maurya Empire: Ashoka's Dhamma, Socio- economic conditions of Maurya Empire, Maurya art and culture.

7. The Gupta Empire:
 - (a) Administration
 - (b) Socio Economic conditions
 - (c) Religion
 - (d) Huns invasion
 - (e) The decline of the Gupta Empire.
8. Post Gupta Period: Maukharis- Later Guptas- Bengal under Sasanka- Imperial Praliharas
9. Harshavardhan of Thanesar and Kannauj – his exploits and administration
10. Bengal under Palas Senas.
11. Dynasties of Southern India: Chalukyas and Rashtrakutas, Pallavas and Cholas.
12. Socio- Economic conditions of India on the eve of Arab invasions, Impact of Arab invasion.
13. The establishment of the Delhi Sultanate- The slave dynasty, the Khalji imperialism- Tughluq rules- the Khalji Revolution- the administrative structure under the Sultanate- the Problem of theocracy- The Vijayanagar empire.
14. Disintegration of the Delhi Sultanate- Babur's invasion and its impact- Mughal-Afghan contest for supremacy- Sher Shah's administrative measures- consolidation of the Mughal empire under Akbar- Mansabdari system- Religion policy.
15. An overview of the reigns of Jahangir and Shahjahan- Aurangzeb's expansionist policies- Conflict with the Marathas- Shivaji- Character of Maratha Pad- Shai Kingdom- Aurangzeb and the fall of the Mughals.
16. The growth of regional powers: Bengal, Avadh, Hyderabad and the crisis of the empire in the early 18th century.
17. Causes of the conflict between Siraj-ud-daulah and the East India Company - Mir Qasim, private trade and the English East India Company - Brief review of the British expansion - The colonial economy - Land revenue settlements - Drain of Wealth- Reindustrialization - Limited development of modern industries.
18. The revolt of 1857 context and nature.
19. Western Education and Social Reforms- Raja Ram Mohan Roy, Young Bengal and Vidyasagar - Brahma Samaj and Bathava Samaj – Aligarh movement – early state of Indian Nationalism – Pre-congress associations – foundation of the Indian National Congress – the moderates – foundation of the Indian National Congress – the moderates and the extremists.

20. The rise of extremism in Indian policies – Anti-partition and Swadeshi Movement – Separate electorate and British divide and rule policy – Gandhi and India Nationalism – non - Cooperation, Civil disobedience, Quit India movement Muslim League and the demand for Pakistan – Partition and independence.
21. The French Revolution of 1789 – social context of the revolution and popular movement – the reign of terror – the rise of Napoleon Bonaparte – Napoleon’s internal reconstruction – Napoleon and Europe – Expansion and collapse of the Napoleonic Empire.
22. The Vienna Congress (1815) – The Metternich systems – The revolutions of 1830 and 1848 – the new political ideologies – Nationalism, Liberalism and Socialism – the unification of Germany and Italy – Industrialization in England and Europe.
23. Europe imperialism: Economic forces behind European imperialism of the 19th Century – Colonialism and the Scramble for Africa – German’s Welt-Politic – Triple alliance and Triple Entente – The origin of the First World War – Peace settlement of 1919 – the Russian Revolution of 1917 – Weimer republic and the rise of Nazism in Germany – Fascism in Italy – Origins of the second World War Bipolar Politics in the post colonial era.
24. The role of Lamaism for establishment of Namgyal dynasty in Sikkim.
25. Socio-Economic conditions of Sikkim under Namgyal rulers.
26. The era of British domination in Sikkim (1889 – 1947)
27. Impact of the British administration on the life of Sikkim People.
28. Western Education and Social change in Sikkim.
29. Economic reforms and the rise of new feudalism under British administration in Sikkim.

POLITICAL SCIENCE

I. Contemporary World Politics

1. The cold war era
The origin of Cold war- causes of Cold war- the emergence of two power blocks Challenge to Bipolarity- new International Economic order- India and the Cold war.
2. The end of Bipolarity

- Soviet System-Disintegration of Soviet Union- Consequences of Disintegration.
3. Alternative Centers of Powers
European Union-Association of South East Asia- Nation (ASEAN)- The Rise of the Chinese Economy.
 4. International Organization in a unipolar world.
Evolution of United Nations- Principal Organs of UN and their functions- Reforms of the UN after the Cold War- India and the UN Reform.
 5. Globalization
Concept and Causes- Political- Economic and Cultural consequences of Globalization.

II. Politics in India Since Independence

1. Era of one party dominance
The establishment of a system of free and fair elections- The domination of the Congress Party in the years immediately after independence – the emergence of opposition Parties and their Policies.
2. India's external relation
The international concept that shaped India's external relations- Policy of Non-alignment. The history of India's relation with China and Pakistan- the evolution of India's Nuclear Policy.
3. Challenges to and restoration of the Congress System
Challenge of political Succession- Fourth General Election, 1967- Split in the Congress- Restoration of Congress.
4. Crises of Democratic order
Background of Emergency, Declaration of Emergency and its Consequences- politics after Emergency.
5. Regional Aspirations
Jammu and Kashmir, Punjab, The North East- Sikkim's merger with India
6. Recent development in Indian Politics.
Era of Coalition- Political rise of other backward classes and Mandal Commission.

III. INDIAN CONSTITUTION

1. Background- Government of India Act, 1919, 1935
2. Making of the constitution- Constituent Assembly
3. The Preamble
4. Fundamental Rights and Fundamental duties

A. Union Executive:-

- (a) President and vice President- qualifications- powers and functions- Procedure for impeachment.
- (b) Prime Minister- Appointment Power and position- Prime Minister as the Keystone of Cabinet.
- (c) Council of Ministers- Appointment- Composition- Collective and Individual responsibility.

B. The Union Legislature:-

Parliament- Lok Sabha and Rajya Sabha- Composition- Officers of the parliament- Relationships between two houses of Parliament- Legislative procedures- Money Bills and Ordinary Bills. Conduct of Business.

C. The Union Judiciary-

Supreme Court – Constitution – Appointment of Judges- Qualification for appointment- Tenure impeachment of the judge- Jurisdiction of Supreme Court.

7.

A) The State Legislature-

The Bi-cameral and Unicameral legislature- Legislative Council and Legislative Assembly- Composition, Duration, Qualification, Legislative Procedure in a State having bi-cameral legislature as compared with that in Parliament.

B) The State Executive-

The Government and Chief Minister- Appointment- Powers- Tenure- Discretionary functions of the Governor.

C) The State Judicial-

The High Court- Composition, appointment of Judges, terms of Office, jurisdiction and powers of the High Court.

8. Local Self-government – Rural local Institution:-

Evolution of Panchayati Raj System, three tiers of Panchayati Raj: Village Panchayat, block samiti and Zilla Parishad (Composition and functions of all three tiers).

9. Local Self-government- Urban Local Institution-

Municipal Corporation- Composition, functions.

Municipalities (Nagarpalikas)- composition, functions.

GEOGRAPHY

Physical Geography

Material of the Earth's Crust : Different types of rocks, their origin and characteristics, rock group and influence of rocks on topography.

The Constitution of Earth's interior

The theory, Isostasy: Continental drift theory: Plate tectonic: Mountain building (Ideas of Kober, Wegner, Holmes).

Earth movements and structure and related topography including fault and folding.

Subaerial denudation (weathering, erosion and mass wasting) The processes of erosion and deposition and the resulting land form; running water, wind, glacier and underground water in limestone; Drainage development in folded and uniclinal structure: Cycle of erosion: Concept of Davis and Penck: Interruption of fluvial cycle.

Climatology

Composition and structure of the atmosphere, Insolation, horizontal and vertical distribution of temperature, atmospheric pressure; Type of precipitation and their causes, classification of world climate; Koppen and Thornthwait's classification.

Oceanography

Distribution of salinity and temperature; Erosional and depositional features of coast; origin and characteristics of continental shelf, sub-marine canyon, coral reef and island.

Economic Geography:

Geography of resource : nature, scope and significance

Resources; meaning and classification

Agriculture: cultivation and their association with different natural and human conditions of the following cereal crops – wheat, rice and non – cereal crops – cotton, tea and rubber.

Power resources: Coal, Petroleum, natural gas and water.

Factors effecting the localization of industries (theories of Weber and Losch), study of the iron and steel and cotton textile industries, Industrial development and associated environmental problems: water and air.

Soil formation, characteristics and distribution.

Regional Geography of India:

Land: Relief, major relief division, their nature; Rivers of India; Climate ,their control, character and division; Natural vegetation, nature and distribution; Soil, soil zones of India, their nature and distributions.

Economy: Agriculture: Main characteristic and problems of Indian Agriculture, measures adopted for development of agriculture economy, future prospects of Indian agriculture; agricultural region of India.

Industry: Post Independence developments of Indian Industrial Economy, factors of location and production of iron and steel, Cotton textile and petrochemical industries.

People: Population density, distribution and growth pattern, present population problem and suggestion solution.

Population and Social Geography

Definition and scope of population geography. Growth and distribution of population in the world.

Migration of population: causes and type of migration.

Scope and content of social geography. Language and religion of the world.

Definition, types of characteristics of rural and urban settlements.

Fundamentals of Physical Geography:-

- Geography as an integrating discipline, as a science of spatial attributes.
- Rocks and Minerals – major types of rocks and their characteristics
- Landforms and their evolution
- Geomorphic processes – weathering, mass wasting, erosion and deposition; Soils formation.
- Biosphere – importance of plants and other organisms; biodiversity and conservation; ecosystems, bio-gas chemical cycle and ecological balance.

ECONOMICS

1. **Economic Reforms Since 1991:**

A). Liberalization B). Privatization C). Globalization

2. **Current Challenges facing the Indian Economy:**

A). Poverty B). Human Capital Formation in India C). Rural Development
D). Employment E). Infrastructure F). Environment and Sustainable Development

3. **Index Numbers:**
 - a). Consumer Price Index
 - b). Wholesale Price Index
 - c). Index number of Industrial Production

1. **Forms of Market and Price Determination:**

- A). Perfect Competition- Meaning and Features
- B). Market Equilibrium under perfect competition – Determination of equilibrium Price, Effects of Shifts in demand and supply
- C). Monopoly, Monopolistic Competition, Oligopoly – their meaning and features

2. **Money and Banking:**

- a). Money- its meaning and functions
- b). Supply of money
- c). Money creation by the Commercial Banking System
- d). Central Banking and its functions

3. **Government Budget and the Economy:**

- a) Govt. Budget meaning and its components
- b) Classification of receipts- revenue receipt and capital receipt.
- c) Classification of expenditure – revenue expenditure and capital expenditure.
- d) Various measures of Govt. deficit: revenue deficit, fiscal deficit, primary deficit: their meaning & implications
- e) Measures to correct Fiscal deficit

1. **Consumers' Surplus**

Measurement of Consumers' Surplus, Measurement of Consumers' surplus with Indifference curves, Measurement of Consumer's Surplus with declining marginal Utility of money- Applications of Consumer's Surplus: Water-Diamond paradox: Loss of benefit from Tax-Critical Evaluation of the concept of consumers Surplus- Importance of the concept of Consumer's Surplus – Use of Consumer's Surplus in cost – Benefit Analysis.

2. **Some Applications of Demand and Supply Analysis**

Price Control and Rationing – Minimum Price Fixation – Incidence of Taxation-

Application of demand & supply analysis to Agriculture. Effect of Unplanned Fluctuation and in Agricultural supply on prices: Effect of unplanned fluctuations in production of incomes of Farmers; stabilization of Agricultural prices and incomes; Buffer Stock Operations by the Government.

3. **Economic of Development; Economic Growth and its Determinants:**

Economic growth as an objective of a Developing Economy – Factors determining Economic growth: supply of natural resources, Capital Formation: Technological Progress: Foreign Technological progress Growth of Population- Harrod – Domar Growth equation Capital output ratio – Poverty Alleviation and Economic growth- Sources of economic growth-knowledge or Education:

Harrod – Domar Model of growth – Relevance of Harrod – Domar Growth Model for Developing Countries.

4. Role of Education and Natural Resources in Economic Development:

Education as investment- consumption benefits of education- External benefits of Education – Education, inequality and poverty – Education and Rural Development.

ELECTIVE ENGLISH:

Poetry

John Donne	: The Good Morrow
Henry Vaughan	: The Retreat
Dryden	: Mac Flecknoe
Alexander Pope	: The Rape of the lock (Canto I + II)
Blake	: The Tiger; The lamb
Wordsworth	: Tintern Abby, Lucy poems
P.B.Shelley	: Ode to the West Wind Ode to a Sky Lark.
John Keats	: Ode to Nightingale Ode to Autumn
Tennyson	: Ulysses
R.Brauning	: The Last Ride Together
W.B. Yeats	: The wild Swan at Coole Easter 1916
Wilfred Owen	: Stranger Meeting
T.S.Eliot	: Preludes

Drama

Shakespeare	: Macbeth
G.B.Shaw	: Arm and the Man
Goldsmith	: She stops to Conquer
T.S.Eliot	: Murder in the Cathedral

Novel

Charles Dickens	: A Tales of Two Cities
Thomas Hardy	: Far from the Madding Crowd
E.M.Forster	: A Passage to India

Essay:

Charles Lamb	: Dream Children : A Reverie
Francis Bacon	: Of Studies
R.K. Narayan	: An Astrologer's Day

Grammar and Usages

- (a) Common Errors
- (b) Subject Verb Agreement Tenses: Articles, Prepositions, Active and Passive Voice; Adverbs; Adjectives.
- (c) Sentence Forms
- (d) Composition
- (e) Rhetoric and Prosody

Reading Comprehension: Unseen

Writing	Notice
	Advertisement
	Abstracts
Study Skills	Note making
	Summarizing
Composition	Articles (Magazines & Newspaper)
	Reports
	Letters to Editors
	Business letters
	Letters of complaint.

PHYSICS

1. Force and Laws of motion

Force, Inertia, Newton's Laws of Motion, Impulse, Law of conservation of linear Momentum and its application, Dynamics of uniform circular motion, Centripetal force, example of circular motion.

2. Gravitation, Work and Energy

Universal Law of Gravitation, acceleration due to gravity and its variation due to altitude and depth, buoyancy, Archimedes' Principle, different forms of energy, Law of conservation of energy, concept of work, Power, Commercial unit of energy

3. Oscillations and Waves

Periodic motion, simple harmonic motion and its equation, oscillation of spring- restoring force and force constant, simple pendulum, resonance.

Longitudinal and transverse waves, speed of waves, Principle of superposition of waves, standing waves in strings and organ pipes, beats, Doppler effect.

4. **Light (Ray optics)**

Reflection of light, spherical mirror, mirror formula, refraction of light, total internal reflection and its applications, lenses, lens formula, lens-makers formula, power of lens, microscopes and astronomical telescope (reflecting and refracting types) and their magnifying powers.

5. **Electricity and Magnetic Effects of electric current**

Flow of electric charges in metallic conductor, drift velocity, Ohm's Law, electrical resistance (linear and non-linear), electrical energy and power series and parallel combination of resistances, emf and internal resistance of a cell, potential difference.

Oersted's Experiment, Biot-Savart law and its application to current carrying circular loop, Ampere's law and its applications, force on a current-carrying conductor in a uniform magnetic field, Force between two parallel current-carrying conductors-definition of ampere, construction and working principle of moving coil galvanometer, conversion to ammeter and voltmeter.

Nuclear physics-

Composition of nucleus, atomic masses, Radioactivity, radio-active decay law, Mass energy relation, mass defect, binding energy and its variation with mass number, nuclear fission and fusion, nuclear reactor.

CHEMISTRY

Organic Chemistry:

Some Basic Principles and Techniques

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

Electronic displacements in a covalent bond: inductive effect, electrometric effect, resonance and hyper conjugation.

Homolytic and heterolytic fission of a covalent bond: free radicals, carbonations, carbonions; electrophiles and nucleophiles, types of organic reactions.

Hydrocarbons

Classification of hydrocarbons

Alkanes- Nomenclature, isomerism, conformations (ethane only), physical properties, chemical reactions including free radical mechanism of halogenations, combustion and pyrolysis.

Alkenes- Nomenclature, structure of double bond (ethene) geometrical isomerism, physical properties, methods of preparation; chemical reaction: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov 's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes- Nomenclature, structure of triple bond (ethyne), physical properties. Methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of – hydrogen, halogens, hydrogen halides and water.

Atomic hydrocarbons: Introduction, IUPAC nomenclature; benzene: resonance aromaticity; chemical properties: mechanism of electrophilic substitution. – nitration sulphonation, halogenations, Friedel Craft's alkylation and acylation: directive influence of functional group in mono-substituted benzene; carcinogenicity and toxicity.

Alcohols, Phenols and Ethers

Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of Primary alcohols only); identification of primary, secondary and tertiary alcohols; mechanism of dehydration, uses of methanol and ethanol.

Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

Aldehydes, Ketones and Carboxylic Acids

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

Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

Organic compounds containing Nitrogen

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

Cyanides and Isocyanides- will be mentioned at relevant place in context.

Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

Chemistry in Everyday life:

1. **Chemical in medicines-** analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.
2. **Chemical in food-** preservatives, artificial sweetening agents.
3. **Cleansing agents-** soaps and detergents, cleansing action.

Inorganic Chemistry:

Some Basic Concepts of Chemistry

General Introduction: Importance and scope of chemistry.

Historical approach to 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, 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. Thomson's model and its limitations, Rutherford's model and its limitations. Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum number, shapes of s, p, and d orbitals, rules for filling electrons in orbitals- 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

Significances of classification, brief history of the development of periodic table, modern periodic law and the present form of periodic table, periodic trends in properties of elements – atomic radii, ionic radii. Ionization enthalpy, electron gain enthalpy, electro negativity, valence.

Chemical Bonding and Molecular Structure

Valance electrons, ionic bond, covalent bond: bond parameters. Lewis structure, polar character of covalent molecules, VSEPR theory, concept of hybridization, involving s, p and d orbitals and shapes of some simple molecules, molecular orbital: theory of homo nuclear diatomic molecules (qualitative idea only), hydrogen bond.

Redox Reactions

Concept of oxidation and reduction, redox reactions, oxidation number, balancing redox reactions, applications of redox reactions.

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, properties and structure; hydrogen as a fuel.

d and f Block Elements

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals- metallic character, ionization enthalpy, oxidation states, ionic radii, colour catalytic property, magnetic properties, interstitial compounds, alloy formation preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$.

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

Actinoids- electronic configuration, oxidation states.

Coordination Compounds

Coordination compounds- Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding isomerism, importance of coordination compounds (in qualitative analysis, extraction of metals and biological system)

Environmental Chemistry

Environmental pollution – air, water and soil pollution, chemical reaction in atmosphere, smog, major atmospheric pollutants; acid rain, ozone and its reactions, effect of depletion of ozone layer, green house effect and global warming – pollution due to industrial wastes; green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution.

PHYSICAL CHEMISTRY

States of Matter: Gases and Liquids

Three states of matter. Intermolecular interactions, types 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. Derivation from ideal behavior, liquefaction of gases, critical temperature.

Liquid state – Vapour pressure, viscosity and surface tension (quality 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 transformation, ionization, and solution. Introduction of entropy as a state function, free energy change for spontaneous and non-spontaneous processes, criteria for 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 salt (elementary idea). Buffer solutions, solubility product, common ion effect (with illustrative examples).

Solid State

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

Solutions

Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties- relative lowering of vapour pressure, elevation of Boiling Point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass.

Electrochemistry

Redox reactions, conductance in electrolytic solutions, specific and molar conductivity variations of conductivity with concentration, Kohlraush's Law, electrolysis and laws of electrolysis (elementary idea), dry cell – electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Nernst equation and its application to chemical cells, fuel cells; corrosion.

Chemical Kinetics

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

Surface Chemistry

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

Polymers

Classification - natural and synthetic, methods of polymerization (addition and condensation), copolymerization. Some important polymers: natural and synthetic like polythene, nylon, polyesters, bakelite, rubber.

BIOLOGY

(A) **ZOOLOGY**

I. Animal diversity:

Characteristic features of the following with examples:

1. Phyla for protozoa.
2. Protochordates-
3. Hemichordates-
4. Chordates from class-Fishes to class mammalian

II. Genetics:

Mendelism – Principles, Significance back cross, test cross – gene interaction, Human Genetics – mutation chromosomal and gene disorders.

III. Cell Biology:

Structure of prokaryotic and eukaryotic cell, Structure and function of plant and animal cell organelles, Cell division – Mitosis and Meiosis, Cell cycle, sex linked inheritance.

IV. Human Physiology-

Blood composition & function of blood component, blood groups, structure and function of hemoglobin- blood circulation, digestion, absorption, metabolism, structure and function of kidney, origin and propagation of nerve impulse along a Neuron, synaptic junction.

V. Animal Diseases:

Symptoms, vector and control measures of the following: Amoebiasis, malaria, sleeping sickness, filariasis

VI. Reproduction –

Animal reproduction, types sexual and asexual fertilization, gametogenesis, spermatogenesis and oogenesis in brief

VII. Evolution:

Theories on the origin of life on earth, origin of life, Lamarckism, Darwinism-natural selection and various concept of evolution.

(B) BOTANY

VIII. Plant Diversity:

Algae, Fungi, Bryophyte, Pteridophyte, Gymnosperms and Angiosperms – Characteristic features in brief.

Taxonomic study and Economic importance of the following family-

1. Poaceae
2. Liliaceae
3. Musaccae
4. Gingeraceae
5. Orchidaceae
6. Brassicaceae
7. Solanaceae
8. Malvaceae
9. Cucurbitaceae
10. Astereceae

IX. Plant Physiology -

Photosynthesis, Transpiration, Respiration, Mineral nutrition, Nitrogen fixation various Plant Growth Regulators, their role and Application.

a. Ecology & Environment

Ecosystem – component, types energy flow i.e Tropic levels, food chain, food web organism & population, environment & ecological adaptation, conservation of biodiversity, biosphere reserves, national parks & sanctuaries and environmental issues. Conservation of Natural Resources.

b. Plant Diseases:

Symptom, casual organism, control measures of some common diseases in plants.

X. Biotechnology-

Concept of genetic engineering, Recombinant DNA technology, Genetically modified organism.

XI. Reproduction:

Sexual reproduction in flowering plants structure of flower, pollination, fertilization and development of seeds and fruits.

MATHEMATICS:

Differential and Integral Calculus:

Function, limit, continuity, derivation, Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor series, Expansion of some special series, Successive differentiation, Leibniz theorem, Maxima and Minima, Indeterminate forms, L' Hospital's rule, Partial differentiation, Euler's theorem, Tangent and normal, Asymptotes, Envelopes.

Indefinite integral, definite integral, Fundamental/ Theorem of integral calculus, reduction formula, Beta and Gamma function, Calculation of area and volume of surfaces, Double Integration.

Differential Equations:

Formation of differential equation, first order differential equations second order differential equations.

Analytical Geometry:

Two dimensional geometry, three dimensional geometry

Classical Algebra:

Complex number system's sequences and series, power series, convergence and Divergence. Determinants and Matrices

Abstract Algebra:

Group, Rings, Subgroups, Sub rings, integral domains

Statistics and Dynamics

Speed, velocities and accelerations of a particle, work, power, energy, equilibrium, fictitious motions.

Linear programming:

Fundamental, Mathematical formulation, Simplex method, Graphical solution, Fundamental theorem of LPP, Big M Method, two phase technique, Duality, Transportation problem and assignment problem.

Statistics:

Fundamentals, Measures of central tendency, probability moments skewness, kurtosis, probability distribution.

Numerical Analysis:

Numerical methods, interpolation, Newton's forward and backward Difference table, Solution of Equations, Numerical Integration.

Vector Analysis:

Vectors, Scalars, Scalar and vector products, simple applications in geometry and mechanics.