Paper-II

01. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF TEACHING ASSOCIATE IN COMPUTER SCIENCE

Unit-1 Computer Organization and Architecture: Number representation and computer arithmetic (fixed and floating point). Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Machine instructions and addressing modes, ALU and data-path, CPU and control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.

Unit-2 Computer Programming: Programming in C: Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps, File handling. Object-oriented programming: Class, Object, inheritance, polymorphism and overriding, constructors & destructors, overloading, exception handling.

Unit-3 Software Engineering: Software development Life Cycle and different models, Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.

Unit-4 Operating System: Main functions and different types of OS. Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, File systems. The Unix system: file systems, process Management, Bourne shell, shell variable, command line programming, filters and Unix commands, system calls.

Unit-5 Computer Networks: LAN, MAN, WAN, Transmission Media: Guided and unguided, Multiplexing (TDM, FDM, SDM & WDM) and switching techniques, Routing algorithms, Network reference models: OSI Model, TCP/IP Model, TCP/UDP and Sockets, IPv4 / IPv6, DNS , Network Security: Symmetric & Asymmetric Cryptography, Message Digest, Block and Stream Ciphers, One time pad, IP Security, E-Mail Security: PGP, IDS, Firewall.

Unit-6 Discrete Mathematical Structures: Counting principles, linear recurrence, mathematical induction, relations and functions, predicate and propositional logic. Graph: Definition and properties, connected graph, cycles & circuits, Tree: rooted tree, spanning trees. Models of Computability: Regular Expressions and Finite Automata. Context free grammars and Push down Automata. Regular and Context free languages, pumping lemma. Turing Machines and undecidability.

Unit-7 Data Structures and Algorithms: Analysis, Asymptotic notation, Notions of space and time complexity, Best, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and conquer; Tree and graph traversals, Spanning tree algorithms, Shortest paths; Hashing, Sorting, Searching. Basic concepts of complexity classes P, NP, NP-hard, NP-complete.

Unit-8 Database Management System: ER-model, Relational model (relational algebra, tuple calculus), Database design (integrity constraints, normalization-1NF, 2NF, 3NF, BCNF and

4NF), Structured Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.

Unit-9 System Software: Assemblers: one pass & two pass assemblers design, Macros & Macro processors, loaders & linkers, Text editors & debuggers, Program generators, Compiler & Interpreter, Different phases of compilation process.

Unit -10 Emerging Trends and Technologies: Concept of Parallel Computing (Parallel Virtual Machine and Message passing Interface) Mobile Computing: Cellular system, Handoff, Location Management, Pervasive Computing, WLAN, E-Technologies: E-commerce framework and applications, Business models, electronic payment System: Digital Token, Smart Cards, Credit Cards, risks in e-payment systems. Data Warehousing and Data Mining.

02. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN DRAWING & PAINTING**

Unit-I

Meaning, Origin & Development and Classification of Arts.Various form of Visual Art and their inter-relationship with other mode of creative expression, e.g. Performing Art and Literature. Material and Method: Application of materials, Support in Painting (Canvas, Paper, Wall Surface, Panels, Mix Media), Oil Painting and its techniques- Traditional and Non- Traditional Techniques of Wall Painting- Traditional (Fresco, Secco and Buono) and Modern. Water Color Painting, Wash technique, Pastal and Crayon, Acrylic color, color preparation and technical aspect of pigment, color theory and color harmony.Nature and Function of Art in the Society.Folk Art Tradition: Rajasthan (Mandna, Pichhwai, Phad and Kavad Painting); Odisa and Bengal (Patachitra), Bihar (Madhubani painting), Gujrat (Pithora painting) and Maharashtra (Warli painting).

Unit – II

History of Indian Art –Pre-historic Painting in India, Indus Valley Civilization, Wall Painting of Jogimara, Ajanta, Bagh, Badami and Sittanavasal. Manuscript painting tradition of pala and western India. Tradition of Miniature Painting: Mughal, Rajasthani, Pahari (Basoli and Guler-Kangra) and Deccan painting (Ahmednagar, Bijapur and Golconda). A comprehensive study of early Indian sculptors from Indus Valley to Gupta period- Maurya, Shung, Satavahana, Kushan and Gupta Dynasty.

Unit – III

Artist of Rajasthan - RamgopalVijayvargia, Kripal Singh Shekhawat, Goverdhan Lal Joshi, Bhoor Singh Shekhawat, Devki Nandan Sharma, Parmanand Choyal, Bhawani CharanGue, Dwarka Prasad Sharma, Ram Jaiswal, Suresh Sharma, Mohan Sharma, Jyoti Swaroop, R.V. Sakhalkar, C.S. Mehta, Bhawani Shankar Sharma, Sumahendra Sharma, ShailChoyal, Nathulal Verma, Vidhyasagar Upadhyay, Samander Singh Khangarot.

Unit – IV

Major Phases in Western Painting- Prehistoric Painting (France and Spain), Egyptian, Aegean Art, Greek Art and Roman Art, Byzantine, Gothic, Renaissance, Baroque and Rococo style of Painting.

Unit – V

Eastern Concept of Beauty- Concept of Beauty in Veda and Upnishads, Pandit Yashodhara's Theory of Shadanga, Vishnu Dharmottar Purana, Concept of Ras-Sutra in Natya Shastra and its commentaries. Theory of Rasa, Sadharanikarana of Bharat Muni, Bhatt Lolatt, Shankuk, Bhattnayak, Abhinav Gupt, Contribution of Rabindra Nath Tagore and A.K. Coomarswami towards Indian Aesthetics.

Unit – VI

Fundamental Elements of Visual Art (Line, Form, Colour, Tone, Texture, Space, Shape, Perspective, Design etc). Principles of Composition – Unity, Harmony, Balance, Emphasis or Dominance, Rhythm, Proportion, Contrast and foreshortening, etc. Creative Process: (Observation Perception. Imagination, Expression). Six Canons of Painting- In Indian and Chinese Painting.

Unit –VII

Major Trends in Indian Art- Company school of Painting, Advent of Modernism with Raja Ravi Verma.

Bengal School: Abanindranath Tagore and his Disciples, Nandlal Bos and his Disciples. Breakthrough in Indian Painting: Contribution of Amrita Shergil, Progressive Artist Group Bombay and Calcutta Group-Calcutta, Shilpi Chakra-Delhi, Chola Mandal-Madras and Baroda

School- Baroda.Famous Artists and Sculptors of India Painters- Abanindranath Tagore, Rabindra Nath Tagore, Nandlal Bose, Jamini Roy, E.B. Havell, Asit Kumar Haldar, Amrita Shergil, K.K. Hebbar, N.S. Bendre, M.F. Hussain, F.N. Suza, S.H Raza, K.H. Ara, K.G. Subramanyam, SatishGujral, J. Swaminathan, TyebMehta.Sculptors - Pradosh Das Gupta, Debi Prasad Roy Chaudhury, RamkinkarBaij, Dhanraj Bhagat, ShankhoChoudhari, Himmat Shah, Nagji Patel, Usha Rani Hooja, Annish Kapoor.

Unit –VIII

Indian Temples Architecture and Sculptures- Ellora, Elephanta, Mahabalipuram, Konark Temple, Khajuraho Temples and Meenakshi Temple.
Temple Sculptures of Rajasthan- Kiradu Temples-Barmer, Harsh Temple-Sikar, Ambika Temple-Jagat (Udaipur), Arthuna-Banswara, Delwara-Sirohi, Ranakpur-Pali, Abhaneri- Dausa.

Unit – IX

History of Western Modern Art- Neo-Classicism, Romanticism, Realism.
Impressionism, Neo-Impressionism, Post-Impressionism.
Fauvism, Cubism, Expressionism.
Futurism, Constructivism, Metaphysical Painting.
Dadaism, Surrealism, Abstract Art.
Op- Art, Pop- Art, Action Painting Minimal art and Post- Modern Trends, etc.

Unit – X

Western Concept of Beauty - Relevance of study of Aesthetics in Drawing and Painting. Theory of Imitation and Representation, Catharsis (Plato, Aristotle), Aesthetical view of Augustine, Baumgarten, Hegel, Schelling, Emanuel Kant, Sigmund Freud, Leo Tolstoy, Benedetto Croce, George Santayana, Susanne Langer, I.A. Richards, Roger Fry and Clive Bell.

03. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN ECONOMICS**

UNIT-1 Microeconomics

Consumer Behaviour- Cardinal utility analysis, Nature of utility functions, Demand theory: Market Demand Curve, Elasticity of demand, ordinary and compensated demand curves, Network externalities- Bandwagon, Snob and Veblen effect. Indifference curve analysis, Goods, bads and neutrals. Normal, inferior and Giffen goods, Consumer's Price effect, income and substitution effects, Slutsky theorem. Analysis of consumer behavior under risk and uncertainty, Asymmetric information. Behavioral Economics.

Law of Variable Proportions, Isoquant, Ridge lines. Optimum factor combination, Expansion path, Short run and long run production functions, Cost functions and Curves. Cost concepts and cost curves. Short run and long run cost curves. Modern theory of cost. Elasticity of substitution. Euler's theorem. Production function- Cobb Douglas and CES, Technical progress, Economies of scale and Learning curve analysis.

Determination of price and output under different market structures. Factor pricing analysis. Peak load pricing. Game theory: Cooperative and non-operative games, Sequential games, Dominant strategy and Nash Equilibrium. Welfare economics - Pareto optimality, Market failure and externalities, New welfare economics, Social Welfare Function, First and Second Theorem of Welfare economics, Theory of second best. Arrow's Impossibility Theorem.

UNIT-2 Macroeconomics

National income - concepts and measurement, flaws in conventional system of National Income Accounts, Latest changes in national income accounts in India. Green Accounting, Consumption hypotheses - absolute, relative, life-cycle and permanent income hypotheses. Classical, Keynesian and Post- Keynesian theories of determination of income and output. Phillips curve Controversy, Post Keynesian Theories of demand for Money: Baumol, Tobin, Friedman, Patinkin and Real balance effect. Investment function: Neoclassical theory, Accelerator theory, Tobin’s Q theory.

Money supply and high powered money. Money Multiplier The IS-LM model, the relative effectiveness of monetary and fiscal policies. Ricardian Equivalence. Natural Rate of Unemployment- Adaptive Expectation. Trade Cycle Theories: Multiplier- Accelerator Interaction model, Kaldor model. Mundell -Fleming model. Monetarism: Monetarist-Fiscalist debate on Policy Activism. New classical approach to macro economics. Real Business Cycles, New Keynesian Macroeconomics- Sticky Price (Menu Cost) Model, Efficiency Wage Hypothesis.

UNIT-3 Economic Growth and Development

Economic development and growth. Climate change. Measurement and indicators of development: PQLI, HDI, HPI and GDI. Entitlement and capability approach. Growth-Distribution Trade-offs. Measurement of inequality- Lorenz curve and Gini Coefficient.

Development and Growth models: Lewis, Fei-Ranis, Harrod-Domar, Solow, Kaldor. Endogeneous Growth, Uzawa-Lucas Model. Golden Rule of Capital Accumulation. Technological progress- Embodied and disembodied, Technical progress- Hicks and Harrod, Learning by doing. Cambridge criticism of Neo-classical Analysis of Growth. Economic function of market and state: Market failure and government failure. Project evaluation and Cost-benefit analysis. Theory of Environment Regulation: Political Economy Model of Regulation, Pigovian taxes; Subsidies for Abatement of pollution, Property Rights and the Coasian Approach: bargain Solution. Quantitative regulation: Command and Control- Standard setting; Tradable pollution permits. Methods of environment valuation: Hedonic pricing, Contingent valuation and Travel cost method.

Substainable Development goals and their governance. Role of Multilateral Development Bodies, Causes and impact of Global financial crisis of 2008 and Euro Zone crisis.

UNIT - 4 Indian Economy-

Economic Growth in India: Pattern and structure. Problems of Indian economy - poverty, unemployment, Inflation, regional disparities. Characteristics of Indian Population and Population Policy. Food security in India. Inclusive growth. Agriculture development and policies. Agriculture Credit in India: Kisan Credit Card, Micro Finance Programme- SHG and Bank Linkage Programme. National Agricultural Insurance Scheme. Industrial development and policies. Service Sector Growth. Economic Reforms in India, Financial sector reforms. RBI and monetary policy. Demonetization, Impact of covid-19 on Indian Economy. Global Economic recession and its impact on Indian economy. Foreign trade: Trends, Composition and Direction, India's Balance of Payment position in recent years, WTO: issues and its impacts on Indian economy. Evolution of Niti Aayog. Major flagship programmes of Indian Government.

Migration- policy issues, Globalization and trade policy. Rural development programmes, Bilateral Trade agreement and their implications on India.

UNIT - 5 Quantitative Techniques

Diagrammatical, Graphical & tabular representation of data, Measures of Central tendency, Dispersion, Skewness and Kurtosis, Simple Correlation, Partial and Multiple co-relation, Time Series. Components of Time Series, Regression Analysis, Probability- definition, theorems of addition and multiplication, conditional probability, Bayes Theorem. Binomial, Poisson and Normal distributions. Sampling techniques. Estimation: properties of good estimator, Point and Interval estimation, Types of errors, Level of significance and power of test. Hypothesis testing- Z, t, chi-square and F tests. Association of attributes, Analysis of Variance. Matrices, Determinants, Differentiation, Simple and partial differentiation Integration- their applications in Economics. Indefinite and definite integration, Unconstrained and constrained optimization. Linear Programming, Game Theory, Input-Output analysis.

UNIT - 6 Public Economics and International Economics

Social, merit, mixed, club goods. Public expenditure- Wiseman-Peacock hypothesis, Leviathan Hypothesis, Niskanen Model, Public- Choice Theory, Public revenue - principle, effects. Taxation: incidence, impact and effects of taxation. Problem of double taxation. Elasticity and buoyancy of taxes. Problem of Tax Evasion and Parallel Economy in India. Tax reforms, GST and its implication for India. Issues of subsidies in India. Public debt -sources, burden, effects and its management. Centre-State financial relations, Fiscal policy: Neutral, Compensatory, and Functional Finance. Public Enterprises and Public Utilities. Concept of budget deficits.

Theories of international trade- comparative cost, opportunity costs. Heckscher-Ohlin theory, Factor Price Equalization Theorem. Terms of trade. Balance of payments.

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04. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN ENGLISH**

Part 'A'-
(i) Critical Appreciation of a given poem or piece of prose.
(ii) English Language Usage and Grammar.

Spotting Errors

- Determiners & Articles
- Modal Auxiliaries
- Prepositions & Phrasal verbs
- Tenses and Sequence of Tenses
- Idiomatic Expressions

Basic sentence Patterns and Transformations

- Basic sentence patterns
- Complex Compound sentences
- Active/Passive
- Direct/Indirect
- Negative/Interrogative

Part 'B'- Literary Criticism
a) Classical (Western and Indian)
b) Renaissance
c) Elizabethan and Jacobean
d) Neo Classical
e) Pre Romantic and Romantic
f) Victorian and Pre Raphaelite
g) Early Moderns till T.S. Eliot

Part 'C'- Critical Theory
a) New Criticism
b) Structuralism and Post Structuralism
c) Modernism and Post Modernism
d) Post Colonialism
e) Feminist Criticism
f) Psychoanalytical Criticism
g) New Historicism

Part 'D'- British Literature through the Ages-

(i) Renaissance
(ii) Elizabethan
(iii) Jacobean
(iv) Neo Classical
(v) Romantic
(vi) Victorian
(vii) Modern

Part 'E'- American and Non-British English Literature-

(i) American Literature from Sixteenth Century to the Present Day
(ii) Afro-American Literature
(iii) African Literature
(iv) New Literature (Caribbean, Canadian & Australian)

Part 'F'- Indian Writing in English-

(i) Colonial
(ii) Post-Colonial
(iii) Dalit
(iv) Diaspora

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05. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN GEOGRAPHY**

Unit – 1.

History of Geographic Thought: Development of geographical knowledge during ancient and medieval period; Contributions of Greek, Roman and Arab geographers. Foundations of modern geography; Contributions of German, French, British and American schools. Development of geographical knowledge in India. Conceptual and methodological developments during the 20th century with changing paradigms; determinism and possibilism, quantitative revolution and impact of positivism, behaviouralism, humanism, radicalism and welfare approach in geography. Concepts of chorological science, areal differentiation, system analysis and spatial organization.

Unit – 2.

Research Methodology: Meaning, types and significance of Research, Research approaches; deductive and inductive, Concept of qualitative and quantitative research, Identification of research problem, Research design, Types of data, Data collection; questionnaire and schedule, Research methodology and research methods, Bi-variate and multivariate analysis, Sampling fundamentals and sampling design, Data analysis, Interpretation and report-writing, Plagiarism, Research ethics, Citing of references.

Unit – 3.

Geomorphology: Fundamental Concepts of Geomorphology, Geological time scale, Processes of development of land forms; Endogenetic and exogenetic forces, Orogenesis and important phases of mountain building, Mountain building theories, Continental drift and plate tectonics, Denudation processes; weathering and erosion, Concept of geomorphic cycles; Davis and Penk, Landforms associated with fluvial, glacial, arid, coastal and karst cycles, Slope forms and concepts of slope evolution, Environmental and Applied geomorphology and Geomorphic hazards.

Unit – 4.

Climatology: Composition and structure of atmosphere, Insolation, Heat budget, Distribution of temperature, atmospheric pressure and general circulation of winds; Monsoons and jet streams, Stability and instability of atmosphere, Air-masses and fronts, Temperate and tropical cyclones, Types and distribution of precipitation, Classification of world climates; Koppen's and Thornthwatte's schemes and Hydrological cycle.

Unit – 5.

Oceanography: Relief of Oceans; hypsometric curve, Bottom relief of Indian, Atlantic and Pacific oceans, Ocean deposits, Coral reefs, Temperature, density and salinity of oceans, Ocean circulations; tides and ocean currents, Sea-level changes, Marine resources and their utilization.

Unit – 6.

Environment Geography: Components of environment and ecology, Physical factors influencing world distribution of plants and animals, Types, forms and functions of ecosystem; forest, grassland, marine, desert and mountain ecosystems, Bio-diversity; depletion and conservation, Environmental pollution; types, causes, effects and solutions, Climate change; global warming and ozone depletion, Environmental hazards and disasters; types, effects and management and Environmental Impact Assessment (EIA).

Unit – 7.

Cartography: Types of maps and their interpretation, single purpose and composite maps; choropleth, isopleth and chorochromatic maps, Statistical diagrams; one, two and three dimensional diagrams, Climatic graphs; climograph, hyther graph and climatograph, Map projections; classification and their specific uses and Toposheets; Traditional and Open Series Maps (OSM).

Unit – 08

Geospatial Techniques: Remote sensing and computer application in mapping; digital mapping, electro-magnetic radiations, Remote sensing systems; platforms, sensors, resolution and radiometric characteristics, Digital Elevation Model, Application of remote sensing in the study of land use, land cover and resource planning, Introduction to Geographic Information System (GIS), Fundamentals of GIS; geo-spatial databases, data capture, Raster and vector data, Implications of integration of remote sensing and GIS and Global Positioning System (GPS).

Unit – 09

Statistical Method: Data tabulation, Study of frequency distribution, Measures of central tendency, Selection of class intervals for mapping, Measures of dispersion and concentration; standard deviation, Lorenz curve and Gini's coefficient; Methods of measuring association, simple and multiple correlation and regression. Measurement of spatial patterns of distribution; nearest-neighbour analysis, Scaling techniques; rank score and weighted score; Sampling techniques for geographical analysis and Models in geography; Simulation model, Gravity model.

Unit – 10

Economic Geography: Spatial organisation and classification of economies, Factors affecting spatial organization of economic activities; primary, secondary, tertiary and quaternary, Classification of resources, Forest, power and mineral resources, Conservation of resources, World energy crisis, Globalisation and its impact on world economy and Major regional trade blocks and their economic integration.

Unit – 11

Agricultural Geography: Nature, scope and development of agriculture geography, Agriculture typology; agricultural systems of the world, Selected agricultural concepts and their measurements; agricultural productivity and efficiency, cropping pattern, crop concentration, crop diversification, cropping intensity and degree of commercialization, Concept and techniques of delimitation of agricultural regions, Von Thunen's model of land use planning and Green Revolution.

Unit – 12.

Industrial and Transport Geography: Nature, scope and development in industrial geography, Factors of localization of manufacturing industries, Classification of industries; Resource based and footloose industries, Theories of industrial location: A. Weber, August Losch, D. M. Smith, TordPalander and E. M. Hoover, Industrial regions of the world and Major industrial hazards. Models of transport development, Structural analysis of transport network, Measure of accessibility and connectivity, Transport cost and spatial patterns of flow.

Unit- 13.

Regional Planning: Typology of Regions, Regional concept in geography and its application to planning, Concept of planning region, Conceptual and theoretical framework of regional planning, Regional hierarchy, Methods of regional delineation, Theories of Regional Development, Concept of development, Indicators of development and Regional imbalances.

Unit – 14.

Population Geography: Nature, scope and development of population geography, Population components and characteristics, Patterns of world population distribution, growth and density, Policy issues, Migration; types, causes and consequences, Patterns and processes of migration, Population theories; Malthus, Marx, Sadler and Ricardo, Demographic transition model, Population-resource regions, Gender discrimination and empowerment of women.

Unit – 15.

Settlement Geography: Site, situation, types, size, spacing and internal morphology of rural and urban settlements, Ecological processes of urban growth, Spatial pattern and distribution of urban centres, Rural-urban fringe, City-region, Settlement systems, Primate city, Rank-size rule, Settlement hierarchy; Christaller's central place theory; August Losch's theory of market centres and Concepts of smart city.

Unit – 16.

Socio-Cultural Geography: Nature and scope of social geography, Social structure and social processes, Elements of social geography: ethnicity, tribe, dialect, language, caste and religion and Concept of social well-being. Nature and scope of cultural geography, Concept of culture-areas and cultural regions, Cultural regions of the world, Theories of tribal groups, Environment impact

on dwelling places as cultural expressions and Problems arising due to cultural diffusion, racism and terrorism.

Unit – 17.

Political Geography: Definition and scope of political geography, Geopolitics, Global strategic views, Concept of nation, state and nation-state, Boundaries and frontiers, Capital cities and core areas, Politics of world resources, Geography of federalism, Geo-political significance of Indian Ocean and Development of Electoral geography.

Unit – 18.

Geography of India: Physiographic divisions, Climate, Vegetation, Drainage, Major soil types, Water resources, Irrigation, Agriculture; major food and commercial crops, Green revolution and food security, Agro-climatic regions, Mineral and power resources, Major industries and industrial regions, Population distribution and growth, Population problems and policies, Tribes, Tribal areas and their problems, Regional disparities in social and economic development, Regional planning in India and planning regions, Development of road, rail and inland water ways and Natural disasters in India; earthquakes, floods, droughts, cyclones and tsunami.

Unit – 19.

Geography of Rajasthan: Physiographic divisions, Climate, Rivers and lakes, Soils and vegetation, Minerals and power resources, Agriculture and irrigation, Agro-climatic regions, Livestock, Major industries and industrial regions, Sites of geo-tourism, Population; distribution, density, growth, sex-ratio, literacy, SC and ST population, Environmental problems; desertification, deforestation and soil erosion, Bio-diversity and its conservation and Development programmes.

06. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN HINDI**

इकाई–1 – हिन्दी भाषा तथा व्याकरण

- हिन्दी भाषा का उद्‌भव एवं विकास, हिन्दी भाषा की प्रमुख बोलियाँ– राजस्थानी, ब्रज, खड़ी बोली, अवधी, भोजपुरी। राजस्थानी भाषा का प्राचीन स्वरूप– डिंगल राजस्थानी भाषा की प्रमुख बोलियाँ, मारवाड़ी, मेवाती, ढूँढाड़ी, हाड़ौती, मेवाड़ी, वागड़ी।
- राजभाषा के रूप में हिन्दी की संवैधानिक स्थिति तथा मानक हिन्दी। देवनागरी लिपि की विशेषताएँ तथा मानकीकरण।
- हिन्दी व्याकरण– मानक वर्णमाला, शब्द तथा शब्द निर्माण– उपसर्ग, प्रत्यय, संधि (स्वर, व्यंजन), समास, वाक्य एवं वाक्य भेद, शब्द शुद्धि एवं वाक्य शुद्धि।
- शब्द के व्याकरणिक प्रकार– संज्ञा, सर्वनाम, विशेषण, क्रिया, क्रियाविशेषण, सम्बंध सूचक अव्यय, समुच्चय बोधक अव्यय।

इकाई–2 – भारतीय काव्यशास्त्र

- काव्य– परिभाषा, काव्य लक्षण, काव्य हेतु और काव्य प्रयोजन, साहित्य का स्वरूप।
- भारतीय काव्यशास्त्र– रस सिद्धांत तथा साधारणीकरण, रस निष्पत्ति, ध्वनि सिद्धांत, वक्रोक्ति सिद्धांत, अलंकार सिद्धांत।
- अलंकार– अनुप्रास, यमक, श्लेष, वक्रोक्ति, उपमा, उत्प्रेक्षा, रूपक, संदेह, भ्रान्तिमान, विभावना, वरणसगाई, अपह्नुति।
- छन्द– दोहा, चौपाई, सोरठा, उल्लाला, छप्पय, कुंडलियां, गीतिका, हरिगीतिका, मंदाक्रांता, द्रुतविलम्बित, कवित्त।

इकाई–3– पाश्चात्य काव्यशास्त्र

- प्लेटो का काव्य सिद्धान्त।
- अरस्तू का काव्य सिद्धान्त– अनुकरण, विरेचन और त्रासदीय लौंजाइनस– उदात्तसिद्धान्त; क्रोचे– अभिव्यंजना सिद्धान्त; कॉलरिज– कल्पना सिद्धान्त; टी.एस. एलियट– परंपरा एवं निर्वैयक्तिकता सिद्धान्त, मार्क्सवादी साहित्य चिन्तन, उत्तर आधुनिकतावाद तथा विखण्डनवाद।

इकाई–4– आदिकाल एवं मध्यकालः निर्धारित पाठ

- पृथ्वीराज रासो (पदमावती समय)– चंदबरदाई, नागरी प्रचारिणी सभा, वाराणसी
- कबीर ग्रन्थावली– (सं. श्यामसुन्दर दास) – आरंभिक 20 पद, साखियाँ – गुरु कौ अंग एवं विरह कौ अंग (प्रकाशक– नागरी प्रचारिणी सभा– वाराणसी)
- मीरां पदावली– सं0 डॉ0 शम्भुसिंह मनोहर (प्रका0 रिसर्च पब्लिकेशन्स, जयपुर)
- भ्रमरगीत सार–(सं. रामचन्द्र शुक्ल) – 21 से 50 पद (प्रकाशक– नागरी प्रचारिणी सभा– वाराणसी)

- जायसी ग्रन्थावली– नागमती वियोग खंड (सं. रामचन्द्रशुक्ल) (प्रकाशक– नागरी प्रचारिणी सभा– वाराणसी)
- कवितावली– तुलसीदास–पद संख्या 65 से 110 (नाम– विश्वास, कलि–वर्णन, राम–नाम–महिमा) (प्रकाशक–गीता प्रेस, गोरखपुर)
- बिहारी रत्नाकर– (सं. जगन्नाथ दास रत्नाकर) – आरंभिक 25 दोहे (प्रका0 गंगा पुस्तकालय कार्यालय, लखनऊ)
- घनानंद कवित्त – (सं. विश्वनाथ प्रसाद मिश्र) – 1 से 25 तक छंद (प्रका0 वाणी वितान प्रकाशन, वाराणसी)

इकाई–5 – आधुनिक कालः निर्धारित पाठ

- कामायनी–जयशंकर प्रसाद (चिंता तथा श्रद्धा सर्ग)
- राम की शक्ति पूजा– सूर्यकान्त त्रिपाठी 'निराला'
- अंधेरे में – गजानन माधव मुक्ति बोध
- गोदान– प्रेमचन्द
- महाभोज (उपन्यास) – मन्नू भण्डारी
- आधे–अधूरे– मोहन राकेश
- निबंध– श्रद्धा और भक्ति (रामचन्द्र शुक्ल), नाखून क्यों बढ़ते हैं (हजारी प्रसाद द्विवेदी), राघवः करुणो रसः (कुबेरनाथ राय)।
- कहानियाँ – उसने कहा था (चंद्रधर शर्मा गुलेरी), कफन (प्रेमचन्द), पुरस्कार (जयशंकर प्रसाद), रोज (अज्ञेय), गदल (रांगेय राघव), परायी प्यास का सफर (आलमशाह खान), सलाम (ओमप्रकाश वाल्मीकि), आपकी छोटी लड़की (ममता कालिया)।
- यात्रा वृत्तान्त : सौंदर्य की नदी नर्मदा– अमृतलाल वेगड़

इकाई–6 – हिन्दी साहित्येतिहास लेखन की परंपरा और आदिकाल

- हिन्दी साहित्य के इतिहास लेखन की परंपरा। काल विभाजन और नामकरण। प्रमुख साहित्येतिहास ग्रंथों का परिचय।
- आदिकाल– सामाजिक–सांस्कृतिक पृष्ठभूमि, आदिकाल की साहित्यिक प्रवृत्तियाँ–सिद्ध, नाथ एवं जैन साहित्य, रासो काव्य परंपरा एवं तत्सम्बन्धी प्रामाणिकता का प्रश्न, प्रमुख कवि एवं उनकी रचनाएँ (सरहपाद, गोरखनाथ, चंदबरदाई, नरपति नाल्ह, अमीर खुसरो, विद्यापति)।

इकाई–7–भक्तिकाल

- भक्तिकाल–ऐतिहासिक और सामाजिक –सांस्कृतिक आधार। भक्ति आंदोलन का अखिल भारतीय स्वरूप। भक्ति आंदोलन की दार्शनिक पृष्ठभूमि, भक्ति आंदोलन के प्रमुख संप्रदाय एवं आचार्य। भक्ति आंदोलन का क्षेत्रीय वैशिष्ट्य और राजस्थान में भक्ति आंदोलन। भक्ति आंदोलन एवं सामाजिक समरसता। भक्ति कालीन प्रवृत्तियाँ – निर्गुण भक्ति साहित्य (कबीर, रैदास, दादू), सूफी काव्य (जायसी, कुतुबन, और मंझन), कृष्ण भक्ति साहित्य (सूरदास, नन्ददास और मीरां), राम भक्ति साहित्य (तुलसीदास)।

इकाई–7–रीतिकाल

- रीतिकाल– सामाजिक –सांस्कृतिक पृष्ठभूमि। रीतिकालीन काव्यशास्त्र। रीतिकालीन साहित्य की स्रोत सामग्री। वर्गीकरण– रीतिबद्ध, रीतिसिद्ध और रीतिमुक्त। प्रमुख कवि और उनकी रचनाएं (केशवदास, मतिराम, भूषण, देव, भिखारीदास, बिहारी, पद्माकर, सेनापति, आलम और घनानंद)।

इकाई–8–आधुनिककालः काव्य

- आधुनिककाल– ऐतिहासिक और सामाजिक–सांस्कृतिक पृष्ठभूमि– 1857 का स्वाधीनता संग्राम, हिन्दी नवजागरण, भारतेन्दु और उनका मंडल। राष्ट्रीय – सांस्कृतिक काव्यधारा (मैथिलीशरण गुप्त, माखनलाल चतुर्वेदी, रामधारीसिंह दिनकर, श्याम नारायण पांडेय, सुभद्रा कुमारी चौहान)। छायावाद–पृष्ठभूमि, प्रवृत्तियां, प्रमुख कवि और रचनाएं (जयशंकरप्रसाद, सूर्यकांत त्रिपाठी 'निराला', सुमित्रानंदन पंत और महादेवी वर्मा)। प्रगतिवादी काव्य – केदारनाथ अग्रवाल, नागार्जुन, शमशेर, मुक्तिबोध। प्रयोगवाद और नई कविता– अज्ञेय, धर्मवीर भारती, नरेश मेहता, रघुवीर सहाय, विजयदेव नारायण साही और जगदीशगुप्त।
- समकालीन कविता– अशोक वाजपेयी, अरुण कमल, आलोक धन्वा, लीलाधर जगूड़ी, वेणुगोपाल, अनामिका, अनुज लुगुन, नन्द चतुर्वेदी और हरीश भादानी।

इकाई–9–आधुनिककालः गद्य

- हिन्दी गद्य का विकास और भारतेन्दु। भारतेन्दुयुगीन हिन्दी पत्रकारिता, हिन्दी गद्य– सरस्वती और महावीर प्रसाद द्विवेदी की भूमिका। हिन्दी उपन्यास का विकास और प्रमुख उपन्यासकार। हिन्दी कहानी का विकास और प्रमुख कहानीकार। हिन्दी नाटक और रंगमंच का विकास, प्रमुख नाटककार। हिन्दी निबंध और आलोचना का विकास, प्रमुख निबंधकार एवं आलोचक। हिन्दी की कथेतर विधाओं का विकास– जीवनी, आत्मकथा, संस्मरण, रेखा चित्र और यात्रावृत्तांत। हिन्दी की साहित्यिक पत्रकारिताः परम्परा और वैशिष्ट्य।

07. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN HISTORY**

UNIT-A: Ancient India:

1. Reconstructing Ancient India: Literary and Archaeological Sources.

2. Pre and Proto History of India

   (a) Paleolithic to Neolithic- Chalcolithic Transition – Major Sites, Tools and Culture. (b) Saraswati-Sindhu River - Valley Civilization (Harappan Civilization) – Origin and Extent, Major sites and settlement pattern, trade and craft, religious practices, decline and significance of Later Harappan phase.

3. Vedic Age- Vedic Vangmaya, Transformation from Rig Vedic period to the Later Vedic period; Political, Social and Economic life; Religion, ritual and philosophy. Significance of the Vedic Age.

4. State formation and the rise of Mahajanpadas: Republics and Monarchies; Rise of urban centres; Economic growth- craft, guild, money and trade; Emergence of Jainism, Buddhism and Ajivak sects; Rise of Magadha. Invasion of Alexander and its impact on India.

5. Mauryan Empire- Foundation of the Mauryan Empire, political achievements of Chandragupta, Bindusara and Ashoka; Ashoka and his Dhamma, Ashokan Edicts; Polity, Administration and Economy; Art and Architecture.

6. Post Mauryan Period: Shung and Kanvya; Contact with outside world-Indo-Greek, Sakas, Kushanas, Western Kshatrapas; growth of urban centres, trade and economy, Development of religious sects: Vaishnav, Shaiva, Mahayana; Art, Architecture, and Literature.

7. Early State and Society in Deccan and South India: Megalithic period, The Satavahanas, Tamil States of the Sangam Age; Administration, Economy, Sangam literature and culture; Art and Architecture.

8. Imperial Guptas- Political history, polity, society, economy, trade and commerce, literature and art.

9. Economy during Post-Gupta period- trade and commerce, banking & currency.

10. Harshvardhan- conquest, polity, religion, art and literature.

11. Rise of regional states- Chalukyas, Pallavas, Cholas, Rashtrakutas, Pratiharas and Palas.

12. India’s contact with outside World- West Asia, Central Asia and East-Asia.

13. Pre-Medieval India (700A.D. to 1200A.D.)- Society and Economy, Feudalism and its impact on socio-political life, Development of regional cultural identities and regional political powers. Development of philosophy and religion during the period.

14. Development of diverse art, literature and culture in ancient India - Architecture, sculpture, music, literature of classical languages, Development of education, philosophy, science and technique.

UNIT-B: Medieval Indian History

1. Source of Medieval Indian History: Archaeological and Literary.
2. Foundation and Consolidation of Delhi Sultanate 1206 to 1290 A.D.
3. Territorial expansion of Sultanate during Khalji and Tughlaq period.
4. Rise of Provincial dynasties Vigayanagar, Bahamani and Jaunpur- Polity and Cultural contribution.
5. The Sayyid and the Lodis; the disintegration of Sultanate. Polity of the Sultanate.
6. Society, Culture and Economy during Sultanate period (from 13th century to the close of 15th century)-
   (a) Composition of rural society, ruling classes, town dwellers, women, religious classes, caste and slavery under the Sultanate, Bhakti movement, Sufi movement.
   (b) Persian literature, Literature in the regional languages of North India, Sultanate architecture and provincial variants, Development of music and paintings, Evolution of a Composite Culture, Cultural Synthesis in Medieval India.
   (c) Economy: Agricultural Production, rise of urban economy and non-agricultural production, trade and commerce. Technology and craft during Sultanate period.
7. Mughal Empire, first phase: Babur, Humayun, the Sur Empire: Sher Shah's administration.
8. Portuguese colonial enterprise.
9. Territorial Expansion Akbar, Jahangir, Shahjahan and resistance of Indian powers.
10. Aurangzeb and Decline of Mughal Empire in 18th Century and emerging regional powers.
11. Period of cooperation and conflicts 1556-1707.
12. Policies of the Mughals-Deccan, religious, Rajputs and North-West Frontier policies.
13. Administrative System- Central, Provincial and Revenue administration, Mansabdari and Jagirdari system.
14. Art and Cultures- Architecture, Painting, Music and Literature
15. Economic Life- Agriculture, Industries, Trade and Commerce, Banking and Currency system.
16. Rise of the Marathas- Shivaji- conquests, civil and military administration, nature of Chauth and Sardeshmukhi, concept of Hindu Padpatshahi.
17. Expansion of Maratha power under Peshwas-Maratha Confederacy, civil and military administration under the Peshwas, Third battle of Panipat-1761.
18. Society and Culture in later Medieval India –

a) Composition of Society, Bhakti movement and Sufi movement.
b) Literary tradition of Persian, Sanskrit and regional languages. Mughal and Sur Architecture, Regional forms of Architecture. Music and Paintings during Mughal period
c) Economy: Agricultural production, rise of urban economy and non-agricultural production, trade and commerce, technology and craft, education, science & technique during the period.

UNIT-C: Philosophy of History and Historiography

(A) Philosophy of History

Analytical and Speculative Philosophy of History.
Analytical Philosophy of History:
Nature of historical evidence, inference and fact; Proof and sources of history: Literary- primary, secondary and tertiary and archaeological sources.
Historical Explanation.
General-laws model; historical objectivity; causation.
The idealist tradition: Dilthey-Croce-Collingwood
Postmodern 'End of History' - the postmodern challenge.
Speculative Philosophy of History.
Brief survey of various Speculative philosophers of history- Vico, Herder, Hegel, Marx, Spengler, Toynbee and Fukuyama.
Indian Historians: Barni, Abul Fazal, R.C Majumdar, J.N. Sarkar, D.D. Kosambi and K.M. Ashraf.

(B) Historiography

A brief survey of various traditions of historiography: Indian (Ancient, Medieval and Modern); Chinese (Confucius), Graeco-Roman (Heredotous), Judeo-Christian, Islamic Historian (Ibn Khardum), Ranke and scientific history, Marxist, Colonial, Nationalist, Cambridge, Subaltern and Postmodern.

UNIT-D: Modern India

1. 18th century transition: (a) Decline of Mughal Empire (b) Emergence of regional powers (c) Advent of European powers

2. Establishment and Expansion of British Rule-Bengal, Avadh, Mysore, Maratha and Sikhs.

3. Capitalism, Imperialism and Transition to colonial economy:
(a) Land revenue settlements in British India; Economic impact of the revenue arrangements; Commercialization of agriculture; decline of cottage industry; Rise of landless agrarian labourers; Impoverishment of the rural society.
(b) Dislocation of traditional trade and commerce; De-industrialisation; Drain of wealth; British capital investment, European business enterprise and its impact.

4. Early Structure of the British Raj: The Early administrative structure; From diarchy to direct control; The Regulating Act (1773); The Pitt's India Act (1784); The Charter Act (1833); The Voice of free trade and the changing character of British colonial rule; The English utilitarian and India.

5. Indian Response to British Rule I: Socio-culture changes:

   (a) The introduction of western education in India; The rise of press, literature and public opinion; The evolution of modern Indian languages and literature; Progress of Science; Christian missionary activities in India.

   (b) Social and Religious Reform Movements: The Brahmo Movement; Devendra Nath Tagore; Iswarchandra Vidyasagar; The Young Bengal Movement; DayanadaSaraswati; Social reform movements of Maharashtra and other parts of India; The contribution of Indian renaissance to the growth of modern India; Sir Saiyad Ahmed Khan and Aligarh Movement. Islamic revivalism- the Feraizi and Wahabi Movements.

   (c) Movements for the upliftment of Dalits and women.

6. Indian Response to British Rule II: Revolts and uprisings

   (a) Peasant movement and tribal uprisings in the 18th and 19th centuries including the Rangpur Dhing (1783), the Kol Rebellion (1832), the Mopla Rebellion in Malabar (1841-1920), the Santal Hul (1855), Indigo Rebellion (1859-60), Deccan Uprising (1875) and the Munda Ulgulan (1899-1900); The Great Revolt of 1857 —Origin, character, causes of failure, the consequences; The shift in the character of peasant uprisings in the post-1857 period; the peasant movements of the 1920s and 1930s.

7. Emergence of Indian Nationalism:

   (a) Factors leading to the birth of Indian Nationalism; Politics of Association; The Foundation of the Indian National Congress; objectives of Early Congress; the Moderates and Extremists; The Partition of Bengal (1905); The Swadeshi Movement in Bengal; the economic and political aspects of Swadeshi Movement; The beginning of revolutionary extremism in India.

   (b) Age of Gandhian Politics : Character of Gandhian nationalism; Gandhi's popular appeal; Rowlatt Satyagraha; the Khilafat Movement; the Non-cooperation Movement; National politics from the end of the Non-cooperation movement to the beginning of the Civil Disobedience Movement; the two phases of the Civil Disobedience Movement; Simon Commission; The Nehru Report; the Round Table Conferences; the election of 1937 and the formation of ministries; Cripps Mission; the Quit India Movement; the Wavell Plan; The Cabinet Mission.

   (C) Other strands in the National Movement: Nationalism and the Peasant Movements; Nationalism and Working-class movements; The Revolutionaries: Bengal, the Punjab,

Maharashtra, U.P. the Madras Presidency and outside India; Indian National Army (Azad Hind Fauz). The Left; The Left within the Congress: Jawaharlal Nehru, Subhas Chandra Bose, the Congress Socialist Party; the Communist Party of India, other left parties.

8. Constitutional Developments in the Colonial India between 1858 and 1935.
9. Growth of Muslim League and communalism in Indian Politics; Circumstances leading to partition of India.
10. Post-Independence Nation-building- the Linguistic reorganization of the states, Five-year planning, Institutional building during Nehruvian Era, development of science and technology.

UNIT-E: History of Modern World

1. Renaissance- Causes and Impact; Reformation- Causes, growth and significance; Counter Reformation and its impact; geographical discoveries of 15th-16th centuries.
2. Enlightenment and Modern outlook: Major Ideas of Enlightenment and development of scientific attitude, Industrial Revolution- Causes and Impact on Society.
3. Idea of Nation–States– Formation of French and British Nation state, American Revolution- Causes and effects.
4. French Revolution and Napoleonic Era- Causes, important events and impact, contribution of Napoleon Bonaparte.
5. Rise of Nationalism in 19th century and disintegration of empires. Nation building in Germany and Italy.
6. Growth of imperialism and colonialism in the 19th century-Asia and Africa. World War I: Causes and Consequences, The First World War and Paris Peace Conference.
7. Russian Revolution of 1917- Causes and significance.
8. The great depression and its impact, Rise of Fascism and Nazism.
9. Second World Wars- Causes, important events and impact.
10. World organization- League of Nations and U.N.O.
11. Liberation from Colonial Rule: Latin America, Arab World, South Asia and South- East Asia, Chinese Revolution of 1949.
12. Cold War- Emergence of two blocks.
13. Emergence of Third World and Non-alignment.
14. Dismantling Soviet Union and the End of Cold War.

UNIT-F: Political and Cultural History of Rajasthan

1. Sources- Archaeological and Literary sources.
2. Pre and Proto History of Rajasthan- Paleolithic to Chalcolithic Transition – Major Sites- Kalibanga, Ahar, Bagore, Ganeshwar, Balathal, tools and culture.
3. Rajasthan in Early Historical Period – major sites, Republics in Post Mauryan period.
4. Gupta and Post Gupta period: Origin of the Rajput – Guhils, Gurjar-Pratihar, Parmar, Rathore, Bhati, Tomar and Chauhan
5. Society, culture and polity in ancient Rajasthan.
6. Medieval Rajasthan- Political powers of Sultanate Age- Chauhan, Guhils, Rathore and Parmar
7. Rajput resistance- Prithviraj-III, Hamir of Ranthambhor, Rawal Ratan Singh and Kanhaddeo.
8. Mughals and Rajput States-Rajput Resistance - Sanga, Maldeo, Chadrasen and Pratap.
9. Rajput Cooperation with the Central Power- Man Singh, Rai Singh, Mirja Raja Jai Singh, Jaswant Singh.
10. Feudal System in Rajasthan.
11. Political and Cultural achievements of rulers in medieval Rajasthan.
12. Rajasthan in 18th century- Instability and origin of new political powers- Jat, Maratha and British.
13. Company Paramountcy and structural changes in the polity of Rajasthan.
14. Role of Rajasthan in the revolt of 1857.
15. Awakening in Rajasthan- Social changes and political awakening.
16. Tribal and Peasants movements in Rajasthan.
17. Freedom Struggle in Rajasthan.
18. Economic life of Rajasthan (1818 to 1948 A.D.)- Agriculture, Industry, Trade and Commerce. Economic impact of British Rule- (Land Revenue, Agriculture, Industry, Mines, Salt, Opium, Trade and Commerce, Migration of Marwari Traders, Transport and Communication).
19. Integration of Rajasthan- its various stages.
20. Development of art- Architecture, Sculpture, Paintings, Music, Dance and Drama from pre - history to modern times.
21. Development of literature throughout the historical period in Rajasthan.

08. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN HOME SCIENCE**

Unit-01 Food and Nutrition-

1. Definition - Food, Nutrition, Nutrients, Functions of foods & Principal component of food, Food groups.
2. Properties of food, Balanced diet, Food pyramid, cooking methods, Effect of heat on nutrients, Food preservation techniques.
3. Colloidal system & Emulsions in foods.
4. Food pigments & additives, Qualitative evaluation of foods.
5. Classification, Composition & Effect of heat on cereals, pulses, vegetables & fruits, fats & oils sugar, milk, meat & egg.
6. Food Standards, HACCP & Food packaging, Microbiology for safety of food.
7. Menu- Types, points to consider, Budget & Cost analysis, Dietary guidelines for proper nutrition.
8. Food service management of Institutional level- hospital, educational institute, social & special institute, Role of dietician.
9. Macro & micro nutrients - functions, requirement, deficiencies and effect of heat.

Unit-02 Textiles -

1. Textiles Fibres and Yarns:
   I. Textile terminologies- fibre, yarn, weave, fabric etc.
   II. Classification of fibers, Identification of fibres and weaves.
   III. Manufacturing process of major natural and manmade fibres, properties and their end use.
   IV. Blended fibres and yarns.
2. Different methods of yarns and fabric constructions:
   I. Classification of yarns, yarn count, ply and twist.
   II. Spinning – mechanical and chemical.
   III. Types of yarns.
   IV. Basic loom, part and operation, type of looms.
   V. Different methods of fabric construction: weaving- type of weaves, knitted, braiding, non-woven fabrics, bonding and knotting.
3. Fabric Finishes: Textiles finishes- meaning, objectives, classification, processing and purposes of finishes. Dyeing and printing-classification, method of block printing, tie and dye, batik, roller printing, screen printing, discharge, heat transfer printing and digitized printing. Chemistry of

Dyes and Pigments- composition, properties. Affinity towards fibres method of application fixing, after treatment and fastness properties.

4. Traditional Textiles of India: embroidered textiles, printed textiles, woven textiles, dyed textiles of various regions in India. Identification on the basis of fibre content, technique, motif, colour and designed.

5. Textile Testing and Quality Control:

   I. Textile Testing- need of testing, sampling method, techniques of testing fibres, yarn, fabrics and garments.

   II. Quality Analysis- weaves, ends, picks, count, weight, thickness, porosity, air permeability, thermal conductivity and dimensional stability.

   III. Fabric Properties and Analysis- abrasion and colour fastness, crease, recovery, stiffness, drapability, shrinkage, pilling and GSM of fabrics. Labeling- types of labels and purpose. IV. Textile and Environment- banned dyes, eco-friendly textiles, contamination and effluent treatment, Eco-label and eco marks. Recent developments in textiles and apparels- nano textiles, technical textiles, occupational clothing, zero waste designing, up cycling and recycling.

Unit-03 Resource Management and Consumer Issues -

1. Management- concept, approaches, management of time, energy, money, space, motivating factors, motivation theories, systems approach of management.

2. Functions of management- planning, supervision, controlling, organizing, evaluation, family life cycle-stages, availability and use of resources.

3. Resources- classification, characteristics, factors affecting use, resource conservation, trends in Resource management.

4. Time management and Energy Management: work simplification techniques, classes of change, fatigue and its management.

5. Decision Making: importance, definition, decision making process, types of decision making.

6. Money management- family income, types, supplementation, budgeting, household accounts, family savings and investment, tax implications.

7. Consumer- definition, role, rights and responsibilities, consumer behavior, consumer problems, education and empowerment.

8. Consumer protection- consumer organization, cooperatives, alternative redressal, standardization, standard marks, quality control, buying aids, consumer legislation.

9. Entrepreneurship- concept, process, barriers, entrepreneurial motivation, challenges, enterprise setting, project planning and appraisal, enterprise management.

Unit 04 Human Development

1. Meaning, definition & importance of Human Development
2. Principles of Development, growth and development, maturation and learning, heredity and environment.
3. Factors affecting Development
4. Prenatal Development- the period of the Zygote, Embryo and Fetus, the "APGAR" scale, Postnatal developments- infancy and babyhood- Newborn Reflexes, changes in body size & proportions- Stages of Childhood- Characteristics and Developmental tasks of Childhood, Handedness.
5. ECCE- Need, Importance and Objectives of ECCE. ECCE centre - Kindergarten, Montessori, open type, play school, nursery and Balwadi etc.
6. Adolescence - Definition, stages, characteristics, physical changes, emotional life, socialization, problems and morality.
7. Adulthood, characteristics, changing role and responsibilities in early and middle adulthood.
8. Aging- physical and psychological changes, care and needs.
9. Theories of Human Development and behaviour - Jean Piaget, Kohlberg, Erickson, Freud, Skinner, Watson, Pavlov's theory.

Unit 05 Extension Management and Community Development

1. Historical perspectives of extension–genesis of extension education and extension systems in India and other countries, objectives of extension education and extension service, philosophy and principles of extension programme development.
2. Programme management- need assessment, situation analysis, planning, organization, implementation, monitoring and evaluation.
3. Extension methods and materials- interpersonal, small and large group methods, audio-visual aids- need, importance, planning, classification, preparation and field testing, use and evaluation of audio-visual materials.
4. Curriculum development and planning for extension education and development activities, Bloom's taxonomy of educational objectives and learning.
5. Non-Formal, adult and lifelong education-historical perspectives, concept, theories, approaches, scope, methods and materials used, challenges of implementation and evaluation, issues to be addressed.

6. Training, skill development and capacity building for human resource development- methods of training, entrepreneurship development.

7. Community development- concept, approaches, principles, historical perspective of community development in India. Leadership, Support structures for community development- Panchyati Raj Institutions, NGOs and Community based organisations.

8. People's participation: - concept, meaning, importance and types of peoples' participation, Historical Prospectives of Community development in India. Participatory Learning and Action (PLA) - methods, techniques and stakeholders' perspectives.

9. Development programmes in India for urban, rural and tribal population groups- programmes for nutrition, health, education, wage and self-employment, women's development, skill development, sanitation and infrastructure.

Unit 06 Food & Nutrition-

1. Nutrition through lifespan-physiological changes, growth & development from conception till old age.

2. Therapeutic nutrition and diet counselling for weight management, diabetes, fever, disorders of gastro intestinal tract, gall bladder, surgery and burns.

3. Public health nutrition.

4. Physiology of circulatory system, respiratory system, reproductive system and excretory system.

5. Enzymes and metabolism of carbohydrate, protein and fats.

6. Microbial food spoilage and food borne diseases.

7. Community nutrition, sports nutrition, nutrition in emergencies and disasters.

8. Nutritional assessment methods and techniques.

9. Nutrition intervention, national nutrition policies and programs, food and nutrition security.

Unit-07 Apparel Designing

1. Clothing construction Process-
   I. Equipments and tools used for manufacturing garments- advancements and attachments used for sewing machine. Types of machines used and their parts.
   II. Fabric Selection, preparation, layout, calculation of material for different garments.
   III. Body measurements- procedure, need, figure types and anthropometry.

2. Apparel manufacturing
   I. terminology used
   II. seams and seam finishes, disposal of fulness, plackets, fasteners, yokes, necklines, collars, sleeves, trimming and pockets.

III. Elements and principles of design and its application to apparel. Illustrations and parts of garments.
IV. Pattern making- drafting, draping and flat pattern making techniques, pattern alteration and dart manipulation techniques.

3. Fashion-Terminologies, fashion cycle, fashion theories, fashion adoption, fashion forecasting and factors affecting fashion.

4. Physiological, psychological and sociological aspects of clothing-
I. Origin and theories of clothing
II. Role of clothing in personality development and self-concept.
III. Factors affecting clothing selection
IV. Social impact of clothing in relation to occupation, occasion, nationality and income.
V. Selection of clothing for different age groups. Selection of fabrics for different uses.

5. Apparel Quality testing- Quality standards and specification, Quality parameters and defects of fabrics and garments. Common fitting problems and their remedies. Care and maintenance of clothing- principles of washing, laundry agents, storage techniques case labels and symbols.

Unit-08 Housing and Interior Design

1. Design fundamentals – design, importance and functions, elements of art, principles of design.

2. Colour - dimensions of colour, psychological effects of colour, colour schemes, factors affecting use of colour, colour theories, advancing and receedingcolours. Use of colour in interiors of residential and non residential buildings.

3. Lighting- Types of lights and lighting, illusion, unit of measurement, lighting for different spaces, lighting fixtures.

4. Space planning and design- housing need and importance, principles of planning spaces, types of house plans, economy in construction, planning for different income groups.

5. Building regulations-norms and standards, zoning, housing for special groups and areas, housing finance.

6. Furniture and furnishing - architectural styles, contemporary trends, wall finishes, wall and window treatments, floor & floor coverings.

7. Housing and environment- building materials, impact on environment, green rating systems, energy efficiency in buildings, energy auditing, indices of indoor comfort, carbon foot prints.

8. Energy as a resource- conventional and non- conventional sources, renewable /non-renewable energy, advance energy management, National efforts on energy conservation.

9. Product design - design thinking process, diffusion and innovation, design communication, ergonomic considerations.

10. Ergonomics - significance, scope, anthropometry, man, machine, environment relationship, factors affecting physiological cost of work, body mechanics, functional design of work place. Occupation health and safety. Ergonomics and kitchen management.

Unit 09 Family Studies and Exceptional Children -

1. Dynamics of marriage and family relationships --Meaning, definition, functions and types of marriage, Readiness of marriage, Mate selection, Alternatives to marriage, single hood, consensual unions and their socio emotional implications, Marital Harmony -Pre and post marital counseling and its importance.

2. Family- meaning, definition and types of family. Concept of family life cycle, changing needs of family at different stages of family life cycle beginning expanding & contracting.

3. Domestic violence, marital disharmony, conflict, resolution of conflict.

4. Parent education, positive parenting, community education.

5. Human rights, rights of children, rights of women, status of women, gender roles.

6. Guidance and counseling- across life span and for care givers.

7. Children with special needs -definition, classification, characteristics, identification, education and special considerations.

8. Organizations working for children with special needs.

9. Laws related to women and children.

Unit 10 Communication for Development -

1. Basics of communication- nature, characteristics, functions, process, models, elements, principles, barriers, perception, persuasion and empathy, types of communication, levels (settings) of communication transactions, process of listening.

2. Communication Theories- human interaction theories, mass communication theories, message design theories.

3. Concept of development- theories, models, measurement and indicators of development.

4. Diffusion and adoption of innovation, adoption process, adopter categories.

5. Role of communication in development- concept, need and importance, development journalism, use of print, radio, television and internet in development.

6. Concerns of development communication- gender, health, environment, sustainability, human rights, population, literacy, rural and tribal development.

7. Behavior change communication- concept, importance, principles, models and process of behaviour change.

8. Traditional, modern and new media for development - folk forms of songs, art, dance, theatre, puppetry, advertisement, cinema, ICTs for development-community radio, participatory video, social media and mobile phones.

9. Organisation/agencies/institutes working for development communication-international/national/state and local.

Unit 11 Research Methodology

1. Meaning of research, its significant and objective, Criteria of good research in Home science.

2. Role of statistics in research, type and methods of research.

3. Review of literature, Planning for research

4. Sampling method and tools of data collection.

5. Processing of data, Reliability and validity of data, Tabulation and presentation using graphs charts/diagrams.

6. Types of reports.

7. Principles of writing, Technical writing.

8. Bibliography, executive summary and footnotes writing, Reference citation.

9. Report presentation.

09. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN POLITICAL SCIENCE**

1. Indian Political Thought

- Manu &Kautilya. Traditions of Non-Violence in Buddhism & Jainism.
- Nature of State in Medieval India: Ziauddin Barani, Abul Fazal.
- Raja Ram Mohan Roy, Dayanand Saraswati, Sir Syed Ahmed Khan, E.V. Ramaswamy Naicker.
- DadabhaiNaoroji, Aurobindo Ghosh, M. K. Gandhi, Jawaharlal Nehru.
- Jai Prakash Narain, Ram Manohar Lohiya, B.R. Ambedkar, Kamala Devi Chattopadhyay.

2. Political Concepts and Ideologies

- Perspective of the State: Ideal, Liberal, Marxist, Post-Colonial and Sub-altern.
- Sovereignty, Power, Authority, Legitimacy.
- Rights, Liberty, Equality, Justice, Citizenship.
- Concept of Democracy: Classical, Liberal & Marxist Theories; Models of Democracy: Representative, Participatory, Deliberative.
- Political Ideologies: Liberalism, Marxism, Conservatism.

3. Comparative Politics and Governments

(With Special Reference to Constitutional Frameworks of UK, USA, France, China & Canada)

- Constitution, Types of Constitutions, Constitutionalism in Theory and Practice.
- Classification of Government: Democracy and Dictatorship, Unitary and Federal, Parliamentary and Presidential.
- Organs of Government: Theory of Separation of Powers, Executive, Legislature and Judiciary—their interrelationship in comparative perspective.
- Theories of Political parties, Types and functions of Political parties, Pressure Groups and Interest Groups.

4. Indian Constitution and Institutions

- Making of Indian Constitution, Preamble, Fundamental Rights, Directive Principles of State Policy and Fundamental Duties.

- Constitutional Framework of Indian Federalism, Center-State Relations and institutions of Local Self Governments.
- Union Executive: President, Prime Minister and Council of Ministers. Parliament: Composition, Power and Role.
- Judiciary: Supreme Court, High Court, Judicial Review, Basic Structure Debate, Judicial Activism and Judicial Reforms.
- State Executive: Governor, Chief Minister and Council of Ministers. State Legislature: Composition, Power and Role.

5. Theories and Concepts of International Relations

- Theories: Idealist, Realist, Neo-Realism, Systems, Marxist, Functionalist, Constructivism and Dependency.
- Approaches: Decision making, Game, Communication and Bargaining.
- Concepts: National Power and its elements, National Interest and its instruments, Balance of Power, Collective Security.
- Arms Race and Arms Control, Disarmament, Nature, Causes and Types of Wars.
- Emerging Concepts: Multiculturalism and Identity Politics, Regionalism, Green Politics, End of History.

6. Western Political Thought

- Plato, Aristotle, Cicero, St. Thomas Aquinas.
- Machiavelli, Hobbes, Locke, Rousseau.
- Bentham, J.S. Mill, Hegel, T.H. Green.
- Karl Marx, Gramsci, Habermas, Frantz Fanon.
- Hannah Arendt, John Rawls, Robert Nozick, Michael Walzer.

7. Political Theory

- Nature and Need of Political Theory, its main concerns, decline and resurgence.
- Behaviouralism and Post-Behaviouralism. Fact-Value Dichotomy.
- System's Approach, Structural Functional Approach.
- Group Theory, Elite Theory, Rational Choice Theory.
- Nationalism: European and Non-European. Feminism and Post-Modernism.

8. Comparative Politics Analysis

- Approaches to the study of Comparative Politics: Institutionalism and New Institutionalism, Political Culture, Political Development, Political Socialization.
- State in comparative perspective: Characteristics and changing nature of state in Capitalist and Socialist economies and advanced industrial and developing societies.
- Governance: Bureaucracy, Public Policy, Good Governance and Democratic Governance, Civil Society.
- Colonialism and Decolonization: Development and Under Development, Liberalization, Privatization and Globalization.
- Revolution and Resistance, Democratization. New Social Movements and Patterns of changes in contemporary societies.

9. Political Processes and Dynamics in India

- Historical Background of Indian Politics: Making of India as a Nation State, Demands of Autonomy and Separatist movement, Emerging Trend in Centre-State relations, Practices of grass root democracy.
- Socio-Cultural Aspects of Indian Politics: Issue of Caste, Class, Religion, Ethnicity and Gender in Indian Politics, Civil Society, Social and Political Movements.
- National and Regional Political Parties, Ideological and Social bases of Parties, Trends in Electoral behavior, Electoral Reforms, Pressure Groups.
- Commentators of Indian Politics: Granville Austin, Morris Jones, Rudolph and Rudolph, Rajni Kothari, C.P. Bhambri and Amartya Sen.
- Polity of Rajasthan: Formation of Rajasthan; Different Phases of Political competition in Rajasthan, Determinants of Party Politics in Rajasthan, People's Movements in Rajasthan.

10. International Politics and Indian Foreign Policy

- Rise of Super Powers, Cold War and Bi-Polarity, Non-Alignment Movement, End of Cold War and Remaking of the World order.
- United Nations: Objectives, structure and functioning, revision of the Charter. India's Contribution to United Nations.
- Regional and Sub-regional Organizations: SAARC, EU, ALBA, ASEAN, African Union, OPEC, BRICS, BIMSTEC, G-20.
- American Hegemony in Contemporary Global Order. Nuclear Proliferation and Disarmament, International Terrorism. Issue of Human Rights in International Politics.

- Political Economy of International Relations: From Bretton Woods to WTO, New International Economic Order, North-South Dialogue, South-South Co-operation, and Environmental issues.
- India's relations with USA, Russia, China and European Union: India and its Neighbours, 'Look East' Policy, India and West Asia, Central Asia, Africa, Latin America. Indian Diaspora, Neo-Liberal Mould of Indian Foreign Policy.

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10. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN PUBLIC ADMINISTRATION**

1. **Basic Premises:** Meaning, Nature, Scope & Significance of Public Administration, Evolution and present status of Discipline, Public Administration as an independent discipline, Public & Private Administration, Paradigm shift from Government to Governance- New Public Administration, New Public Management, Public Choice Theory, Good Governance, Globalization and its impact on Public Administration, Post Modernism.

2. **Theories and Approaches:** Classical- Fayol, Gulick, Urwick, Mooney & Riley. Scientific Management- F.W. Taylor and Associates. Bureaucratic Theory- Max Weber, Criticism and Post-Bureaucratic Organizations. Human Relation: - Elton Mayo, M.P. Follet and Chester Barnard. Herbert Simon, Behavioural, Systems, Ecological Approaches, Structural Functional. Organizational Humanism: Chris Argyris, Rensis Likert.

3. **Principles of Organisation:** Hierarchy, Unity of Command, Span of Control, Coordination, Delegation, Supervision, Authority and Responsibility, Line and Staff and Auxiliary Agencies, Decentralization.

4. **Administrative Behaviour:** Leadership- Trait, Behavioural and Contingency Theories. Communication- Meaning and Types. Decision-Making- Herbert Simon. Motivation- Maslow, Herzberg, McGregor, Clayton Alderfer.

5. **Comparative and Development Administration:** Evolution, Meaning, Nature, Scope and Significance of Comparative Public Administration (CPA), Approaches to study of CPA- Ecological and structural Functional Contribution of F.W. Riggs, Problems of comparative Research Anti-Development Theories Bureaucracy and Development Features of Administrative systems of UK, USA and France. Concept and Features of Development Administration and Administrative Development, Development and Non-Development Dichotomy, Anti-Development Thesis, Bureaucracy and Development. Role of Non-state actors in Development administration.

6. **Human Resource Management:** Evolution of Civil Services, Bureaucracy and Civil Service, Classification, Recruitment, Training, Promotion, Career-Development, Conduct and Discipline, Political Rights of Civil Servants, Right to Strike.
7. **Financial Administration:** Meaning and Importance of Financial Administration, Concept, Principles, Significance, Role and Types of Budget, Audit and Accounts-concept and importance.

8. **Public Policy:** Meaning, Significance and Types, Formulation, Implementation and Evaluation, Models of Public Policy-Making.

9. **Administrative Law:** Meaning, sources, significance, Administrative Law and Rule of Law, Delegated Legislation, Administrative Tribunals: - Concepts Emergence and Significance, Administrative Adjudication.

10. **Research Methodology:** Meaning, Nature and Problems of Objectivity in Social Research, Scientific Method, Types of Social Research, Research Design, Hypothesis, Sources and Methods of Data Collection, Sampling and Questionnaire.

11. **Evolution and Development of Indian Public Administration:** Kautilya, British Legacy, Constitutional Framework, Parliamentary Democracy and Federalism, Salient Features of Indian Administration.

12. **Union Government and Administration:** The President, The Prime Minister and Council of Ministers, Central Secretariat, Cabinet Secretariat, Prime Minister's Office, Cabinet Committees, (IRDA) Insurance Regulatory and Development Authority, (TRAI) Telecom Regulatory Authority of India Union-State Relations- Legislative, Administrative and Financial.

13. **State Administration:** The Governor, the Chief Minister and Council of Minister, Chief Secretary, State Secretariat, Directorates and Field Organizations. Divisional Commissioner, Role of District Collector, Revenue Administration, Law & Order Administration, Development Administration.

14. **Local Self Government- Urban and Rural:** Meaning, Evolution and Development, Features of 73rd and 74th Constitutional Amendment Acts, Organization and Functions of Urban and Rural Local Bodies, Major Challenges and Role in Modern Times.

15. **Personnel Administration:** Features and Constitutional Framework of Civil Services, Classification Recruitment, Training, Promotion and Capacity Building, Conduct and Discipline, Neutrality and Anonymity. Commitment, Professional Associations and Unionism. Classification of Indian civil services, Recruitment, Recruitment Agencies- U.P.S.C.

16. **Financial Administration:** Preparation, Enactment and Execution of Budget, Parliamentary Committees, Parliamentary Control over Finance, Comptroller and Auditor General of India, Role of Ministry of Finance. Monetary & Fiscal Policies Public, Borrowings and Public Debts.

17. **Economic Policy and Planning:** Salient features, Economic Policy since Independence, Mixed Economy and Industrial Policies, New Economic Policy and Disinvestment Policy, Economic Planning in India, Decentralized Planning, NITI Aayog, National Development Council, Public Sector Enterprises in India, Types, Features and their relative problem areas, Impact of Liberalization, Privatization & Globalization (LPG).

18. **Accountability and Control:** Administrative Accountability and Responsiveness, Legislative, Executive and Judicial Control over Administration, Lokpal and Lokayukta, Jan Sunwai.

19. **Issues in Indian Administration:** Minister-Civil Servant Relationship, Generalists versus Specialists. Ethics, Law and Order Administration- Role of Central and State Agencies in tackling Insurgency, Terrorism and Corruption, Cyber Crimes, Administrative Reforms in India, Issues and Problems, Citizens Charter, Service Delivery, Right to Information, Role of Civil Society.

20. **Social Administration:** Social Welfare and Social Justice, Social Change, Welfare Boards- Centre and State, Major Sectors- Education and Health, Role of Non-Government Organizations and Self-Help Groups in socio-economic development, Reservation Policy.

11. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN SANSKRIT**

इकाई–1 – वैदिक साहित्य

- 1.1 देवता– अग्नि, सवितृ, इन्द्र, रुद्र, बृहस्पति, अश्विनी, वरुण, उषस, सोम।
- 1.2 निम्नलिखित सूक्तों का अध्ययनः –
    - ऋग्वेद – अग्नि (1.1), इन्द्र (2.12), पुरुष (10.90), हिरण्यगर्भ (10.121), नासदीय (10. 129), वाक् (10.125), उषस् (3.61)।
    - शुक्ल यजुर्वेद – शिवसंकल्प (अध्याय 34 मन्त्र 1–6), प्रजापति (अध्याय 23 मन्त्र 1–5)।
    - अथर्ववेद – राष्ट्राभिवर्द्धनम् (1.29), काल (10.53), पृथिवी (12.1)।
- 1.3 वैदिक काल के विषय में विभिन्न सिद्धांत– मैक्समूलर, ए.वेबर, जैकोबी, बालगांगाधर तिलक, एम.विन्टरनिट्ज, भारतीय परम्परागत विचार। ऋग्वेद का क्रम, वैदिक संहिताएं तथा उनकी विषय वस्तु, संहिताओं के पाठ–भेद।
- 1.4 ब्राह्मण एवं आरण्यक– सामान्य लक्षण, विशेषताएं प्रतिपाद्य विषय, अग्निहोत्र, अग्निष्टोम यज्ञ, दर्शपूर्णमास यज्ञ एवं पंचमहायज्ञ।
- 1.5 उपनिषदों की विषयवस्तु तथा प्रमुख अवधारणाओं का अध्ययन। विशेषतः निम्नलिखित उपनिषदों के सन्दर्भ मेंदृ ईश, कठ, तैत्तिरीय।
- 1.6 वेदाङ्गों का सामान्य परिचय एवं निरुक्त– शिक्षा, कल्प, व्याकरण, निरुक्त, छन्द, ज्योतिष, निरुक्त (अध्याय 1 और 2)। निरुक्त में चार पद– नाम, आख्यात, उपसर्ग, निपात, षड्भावविकार। निरुक्ताध्ययन के उद्देश्य, निम्नलिखित शब्दों की व्युत्पत्तियाँ – आचार्यः, वीरः, ह्रद, गो, समुद्र, अश्व, अग्नि, वृत्र, आदित्य, उषस, मेघ, वाक्, उदक, नदी, जातवेदस, वैश्वानर, निघण्टुः।

इकाई–2 – दर्शन

- 2.1 ईश्वरकृष्ण की सांख्यकारिका– सत्कार्यवाद, पुरुष–स्वरूप, प्रकृति–स्वरूप, सृष्टि विचार, प्रत्ययसर्ग, कैवल्य।
- 2.2 सदानन्द का वेदान्तसार– अनुबन्धचतुष्टय, अज्ञान, अध्यारोप–अपवाद, लिङ्गशरीरोत्पत्ति, पञ्चीकरण, विवर्त, जीवन्मुक्ति।
- 2.3 केशवमिश्र की तर्कभाषा– पदार्थ, कारण, प्रमाण– प्रत्यक्ष, अनुमान, उपमान, शब्द।
- 2.4 लौगाक्षिभास्कर का अर्थसंग्रह– धर्मलक्षण, शाब्दी भावना, आर्थी भावना, विधि एवं उसके प्रकार।
- 2.5 पातञ्जल योग सूत्र– चित्तभूमि, चित्तवृत्तियाँ, ईश्वर का स्वरूप, योगाङ्ग, समाधि, कैवल्य।
- 2.6 सर्वदर्शनसंग्रह– जैनमत, बौद्धमत, चार्वाक का सामान्य अध्ययन।

इकाई–3 – व्याकरण तथा भाषा–विज्ञान

- 3.1 महाभाष्य (पस्पशाह्निक)– शब्द की परिभाषा, शब्द एवं अर्थ का संबंध, व्याकरण के अध्ययन के उद्देश्य, व्याकरण की परिभाषा, साधु शब्द के प्रयोग का परिणाम, व्याकरण की पद्धति।
- 3.2 लघुसिद्धान्त कौमुदी – समास, तिङन्त (भू एवं एध् धातु मात्र), कृदन्त, तद्धित–अपत्यार्थक, मत्वर्थीय, स्त्री–प्रत्यय। परिभाषाएं– संहिता, गुण, वृद्धि, प्रातिपदिक, नदी, घि, उपधा, अपृक्त, गति, पद, विभाषा, सवर्ण, टि, प्रगृह्य, सर्वनाम–स्थान, निष्ठा, सार्वधातुक, आर्धधातुक, अङ्–ग, भ, सर्वनाम।

- 3.3 सिद्धान्त कौमुदी– कारक प्रकरण।
- 3.4 भाषाविज्ञान– भाषा की परिभाषा एवं प्रकार, भाषा तथा वाक् में अंतर, भाषा तथा बोली में अंतर, भाषा का वर्गीकरण (परिवारमूलक एवं आकृतिमूलक)। संस्कृत ध्वनियों के विशेष संदर्भ में मानवीय ध्वनि यंत्र, भाषा की प्रक्रिया एवं ध्वनियों का वर्गीकरण–स्पर्श, संघर्षी, अर्धस्वर एवं स्वर। ध्वनि संबंधी नियम (ग्रिम, ग्रासमान, वर्नर)। ध्वनि परिवर्तन की दिशाएँ तथा कारण। वाक्य का लक्षण तथा भेद। भारोपीय भाषा परिवार का सामान्य एवं संक्षिप्त–परिचय। वैदिक, लौकिक संस्कृत एवं प्राकृत भाषा में प्रमुख अंतर।

इकाई –4–काव्यशास्त्र

- 1.1 नाट्यशास्त्र (प्रथम द्वितीय तथा षष्ठ अध्याय)
- 1.2 दशरूपक (प्रथम तथा तृतीय प्रकाश)
- 1.3 काव्यप्रकाश, काव्यलक्षण, काव्यप्रयोजन, काव्यहेतु, काव्यभेद, शब्दशक्ति, अभिहितान्वयवाद, अन्विताभिधानवाद, रसस्वरूप एवं रससूत्रविमर्श, रसदोष, काव्यगुण। अलंकार – अनुप्रास, श्लेष, वक्रोक्ति, उपमा, रूपक, उत्प्रेक्षा, समासोक्ति, अपह्नुति, निदर्शना, अर्थान्तरन्यास, दृष्टान्त, विभावना, विशेषोक्ति, संकर, संसृष्टि।
- 1.4 साहित्यदर्पण :– काव्य की परिभाषा, काव्य की अन्य परिभाषाओं का खण्डन, शब्दशक्ति – संकेतग्रह, अभिधा, लक्षणा, व्यञ्जना, रस (रस –भेद स्थायीभावों सहित, रूपक के प्रकार, नाटक के लक्षण, महाकाव्य के लक्षण।)
- 1.5 ध्वन्यालोक (प्रथम उद्योत)

इकाई – 5–संस्कृत साहित्य पुराण एवं अभिलेख

- 2.1 रामायण – रामायण का क्रम, रामायण में आख्यान, रामायणकालीन समाज, परवर्ती ग्रन्थों के लिए रामायण एक प्रेरणा–स्रोत, रामायण का साहित्यिक महत्त्व।
- 2.2 महाभारत – महाभारत का क्रम, महाभारत में आख्यान, महाभारतकालीन समाज, परवर्ती ग्रन्थों के लिए महाभारत एक प्रेरणा–स्रोत, महाभारत का साहित्यिक महत्त्व।
- 2.3 पुराण – पुराण की परिभाषा – महापुराण एवं उपपुराण, पौराणिक सृष्टिविज्ञान, पौराणिक आख्यान।
- 2.4 कौटिल्यकृत अर्थशास्त्र (प्रथम दस अधिकार)
- 2.5 स्मृति शास्त्र– मनुस्मृति (प्रथम, द्वितीय तथा सप्तम अध्याय), याज्ञवल्क्यस्मृति (व्यवहाराध्याय मात्र)
- 2.6 पुरालिपि एवं अभिलेख–
    - पुरालिपि– ब्राह्मीलिपि को पढ़ने का इतिहास, भारत में लेखन कला की प्राचीनता, ब्राह्मीलिपि की उत्पत्ति के सिद्धान्त, शिलालेख सम्बन्धी सामग्री के प्रकार, गुप्त एवं अशोक कालीन ब्राह्मीलिपि।
    - अशोक के प्रमुख अभिलेख

इकाई – 6– पद्य, गद्य, नाटक और चम्पू

- 3.1 निम्नलिखित ग्रन्थों का सामान्य अध्ययन :–
    - पद्य : रघुवंश, मेघदूत, किरातार्जुनीय, शिशुपालवध, नैषधीय चरित, बुद्ध चरित।
    - गद्य : दशकुमारचरित, हर्षचरित, कादम्बरी।

- नाटक :– स्वप्नवासवदत्त, अभिज्ञानशाकुन्तल, मृच्छकटिक, उत्तररामचरित, मुद्राराक्षस, वेणीसंहार।
- चम्पू काव्य–नलचम्पू।

- 3.2 निम्नांकित ग्रन्थों का विशिष्ट अध्ययन –
  - अभिज्ञान शाकुन्तल (चतुर्थ अंक)
  - रघुवंश (प्रथम तथा त्रयोदश सर्ग)
  - किरातार्जुनीय (प्रथम सर्ग),
  - शिशुपालवध (प्रथम सर्ग),
  - कुमारसम्भव (पंचम सर्ग),
  - कादम्बरी – (कथामुख भाग से जाबालिआश्रम पर्यन्त)

इकाई – 7– राजस्थानी संस्कृत

- राजस्थान के संस्कृत विद्वान् एवं कवि तथा उनका शास्त्रीय, साहित्यिक अवदान– पं. मधुसूदन ओझा, भट्ट मथुरानाथ शास्त्री, पं. गिरिधर शर्मा चतुर्वेदी, पं. नवल किशोर कांकर, पं. दुर्गाप्रसाद द्विवेदी, पं. हरिशास्त्री दाधीच, पं. विद्याधर शास्त्री, पं. हरिद्विज, पं. जगदीशचन्द्र आचार्य, पं नित्यानन्द शास्त्री, पं. श्रीराम दवे, पं. विश्वेश्वर नाथ रेऊ, पं. गणेश राम शर्मा, पं. गिरिधर व्यास शास्त्री, पं. गिरिधर शर्मा नवरत्न, पं. रामप्रताप शास्त्री, ब्रह्मानन्द शर्मा।

12. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN SOCIOLOGY**

Unit I: Basic concepts

- Meaning, Definition, Subject-matter, Scope, Nature and Perspectives of Sociology, Sociology and Enlightenment.
- Society, Culture, Community, Norms and Values, Institutions, Associations and Social System.
- Social Groups: Meaning and Types, Status and Role, Norms and Values and types of membership.
- Social Control: Meaning, Types, Agencies and Theories.
- Socialization: Meaning, Stages and Theories, Sub concepts of Socialization.
- Status and Role, Meaning, Types, Interplay between Status and Role, Role Conflict, Norms and Values.
- Social Stratification: Meaning, Forms and Theories. Pattern of Inequalities.
- Social Processes- Assimilation, Competition, Conflict and Co-operation, Accommodation, associate and Dissociative process.
- Social Change and Social Mobility- Meaning, patterns, Factors and Theories.
- Social Deviance: Meaning, Types and Theories.
- Social Interaction: Meaning and Types.

Unit II: Western Sociological Thinkers/Thought

- **Auguste Comte:** Comte's views on Sociological Methods and Sociology. Law of Three Stages, Hierarchy of Sciences, Comte's views on Science, Religion of Humanity.
- **Hebert Spencer:** Classification of Social Systems or Society, Stages of Societal Evolution, Societal Institutions. Organic and Super-Organic Analogy, Principles of Sociology.
- **Emile Durkheim:** Division of Labour in society, Social facts and Rules of Sociological Method. Suicide and its types. The Elementary Forms of Religious Life. Durkheim of Education.
- **Max Weber:** Weber's Methodology. Study of Religions. Social Stratification and Types of Authority, Bureaucracy, Social Action.
- **Karl Marx:** Types of Society. Dialectical Materialism. Class Structures. Class Conflict and Social Change. Capital, Labour Theory of Value and Surplus Value.
- **Georg Simmel:** Problem Areas of Sociology. Group Affiliation. Social Differentiation. Conflict as Social Form. Exchanges as Social Form.
- **Vilfredo Pareto:** The Rise and Fall of the Elites. Theory of Sentiments. Pareto's views on General Sociology. The interface between Social, Economic and Political Phenomena. The Social System.

Unit III: Indian Social System: Structure and Change

- Characteristics of Indian Society, Unity Plurality and Diversity.
- Ancient Indian Social System: Varnashram System and Purushartha, Sanskara, Karma and Education.
- Indian Social Institutions: Family, Marriage and Kinship, Education, Religion, Caste, Economy and Polity.
- Class Structure in India: Agrarian, Industrial.
- Dynamics in Caste and Class in Indian Society: Pattern of Mobility and Inequality.

- Gender Relations and Women Empowerment: Status of Women in India and Women Empowerment; Social Legislations for women, Domestic Violence, Dowry and issues of Divorce, Crime against Women.
- Deviance and Crime; Juvenile Delinquency, Cyber Crime, Crime against Children, White Collar Crime.
- Challenges before Indian Society: Poverty, Illiteracy, Unemployment, Regionalism, Communalism, Casteism, Corruption, Terrorism, Socio-Cultural Exclusion.
- Pathologies of Development: Problems of Weaker Sections and Minorities, Problems of SCs, STs, OBCs, Marginalized groups and Children.
- Planned change in India- Indian Society, Five Year Plans, Panchayati Raj, Welfarist Policies and Sustainable Development.
- Globalization and its Impact on Indian Society.

Unit IV: Social Research

- Social Survey and Social Research: Meaning and Types; Scientific Method.
- Issues of Objectivity/Value Neutrality, Biases, Subjectivity and issues of ethics in Social Research.
- Model, Paradigm and Theory building in Sociological Research.
- Research Design: Meaning and Types.
- Hypothesis: Meaning, Nature and Types.
- Sampling: Meaning and Types.
- Techniques of Data Collection: Observation, Interview, Schedule and Questionnaire.
- Methods of Data collection: Case Study Method, Content Analysis, Cultural study Approach, Discourse Analysis, Ethnography.

Unit V: Perspectives on Indian Society

- **Rural Studies:** M.N. Srinivas, S.C. Dube and Andre Beteille.
- **Urban Studies:** MSA Rao, V. S. D'Souza, Meera Kosambi.
- **Tribal Studies:** K.S. Singh, S. L. Doshi, VerginiusXaxa.
- **Gender Studies:**Neera Desai, Sharmila Rege, Beena Agarwal.
- **Development of Sociology in India:** Indological and Textual Perspective. Structural- Functional Perspective, Marxist Perspective, Civilizational Perspective, Synthesis of Textual and Field Views, Subaltern Perspective.

Unit VI: Classical Sociological Theories

The meaning and nature of Sociological theory, Structural-Functionalism, Neo-Functionalism, Conflict Theory, Marxian Theory, Neo-Marxism, Phenomenology, Ethnomethodology, Symbolic-Interactionism, Feminism, Structuralism, Structuration, Post-Structuralism, Post-Modernism.

13. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN URDU**

Unit – I

(a) Various Theories of origin of Urdu Language.

(b) Western Hindi and its dialects namely: Braj Bhasha, Haryanvi, Punjabi and Khari Boli.

(c) Arabic & Persian elements in Urdu Language.

Unit – II

(a) Classical genres of Urdu Poetry: Ghazal, Qasida, Marsiya, Masnavi.

(b) Modern genres of Urdu Poetry and their development: MuarraNazm, NasriNazm and Azad Nazm.

(c) Sonnet, Geet and Doha.

Unit – III

(a) Development of Urdu Language and Literature in Deccan.

(b) Salient features of Deccani Language and Literature.

(c) Role of Quli Qutubshah, Nusrati, Wajhi, Ghawwasi and Wali in the development of Deccani Language and Literature.

Unit – IV:

(a) Delhi School of Poetry and its salient features.

(b) Lucknow School of Poetry and its salient features.

(c) Important Poets of Delhi and Lucknow School:

Ghazal: Meer, Dard, Atish, Nasikh, Ghalib and Momin.

Qasida: Sauda, Zauq and Muneer Shikohabadi.

Marsiya: Meer Anis and Mirza Dabeer.

Masnavi: Meer Hasan, Daya Shankar Naseem and Mirza Shauq.

(d) Development of Jadeed Nazm in Urdu.

Unit – V

(a)Development of Criticism and Tahqiq in Urdu.

b) Role of Rajasthan's Urdu Poets in freedom movement.

(c) Rhetorics.

Unit– VI

Various kinds of Urdu Prose:

(a) Dastan, Novel and Drama.

(b) Short Story, Essays and Biography.

(c) Khutoot Nigari, InshaiyaTazkira Nigari and Khaka Nigari.

Unit – VII

Urdu Prose in Northern India:

(a) Fort William College.

(b) Delhi College.

(c) Aligarh Movement.

Unit– VIII

Socio-reformative aspect of Urdu Literature:

(a) 1857, Urdu Literature and Journalism.

(b) Role of Urdu Poetry in Freedom Movements.

(c) Progressive Movement.

Unit– IX

Urdu Prose - Fictions:

(a) Dastan (1) Bagh-o-Bahar by Meer Amman

(2) Fasanai Ajaib by Rajab Ali Baig Suroor

(b) Novel – (1) Tobatunnasooh by Nazir Ahmed.

(2) Umravjan by Mirza Hadi Ruswa

(3) Godan by Prem Chand

(c) Short Story

(1) Wardat by Prem Chand

(2) Annadata by Krishna Chander

(3) Manto Ke Numainda Afsane (S.H. Manto) Edited by Athar Parvez

Unit– X

Urdu Prose - Non-Fictions:

(a) Nairange-Khayal by M.H. Azad.

(b) Intekhab-e-Mehdi Ifadi published by U.P. Urdu Academy.

(c) Mazameen-e-Sir Sayed by Ale Ahmed Suroor.

(d) Yadgar-e-Ghalib by Hali.

(e) Ghubar-e-Khatir by Abul Kalam Azad.

(f) Mazameen-e-Rasheed by Rasheed Ahmed Siddiqui.

(g) Abe Gum by Mushtaq Yusufi.

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14. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN BOTANY**

1. **Archaebacteria, eubacteria and cyanobacteria** - ultra-structure and reproduction; L-Form Bacteria, Prions, Viroids, Virusoids; Characteristics and ultrastructure of virions; Mycoplasma, Spiroplasma and Phytoplasma - General characters and role in causing plant diseases; Microbiology of water, air and soil.

2. **General account of diseases caused by plant pathogens;** molecular basis of host parasite interaction, pathogen attack and defense mechanism; etiology of red rot of sugarcane, rust of wheat, covered smut of wheat, loose smut of wheat, green ear disease of bajra, leaf spot and smut of jowar, ergot and smut of bajra, root knot and rot diseases of vegetables; disease control and the role of information technology in disease management.

3. **Algae of diversified habitats** (Terrestrial, Fresh water, Marine); Thallus organization, cell structure and reproduction in different classes/groups; Criteria of classification of algae; Economic importance of algae.

4. **General characteristics of different classes/groups of fungi,** cell ultrastructure, cell wall composition, reproduction, heterothallism, para sexuality, recent trends in classification, economic importance of fungi; General account and economic importance of mycorrhiza and lichens.

5. **General characters, structure, reproduction, evolution and inter-relationships** of bryophytes, pteridophytes and gymnosperms. Evolution of stele, heterospory and seed habit; Principles of palaeobotany.

6. **Taxonomic hierarchy, principles of nomenclature, taxonomic tools,** important systems of classification (Bentham and Hooker; Engler and Prantl; Hutchinson and Takhtajan). Role of morphology, anatomy, embryology, palynology, cytology, phytochemistry, genome analysis and nucleic acid hybridization in taxonomy. Taxonomy of some selected families (Leguminosae, Cucurbitaceae, Asteraceae, Asclepiadaceae, Solanaceae, Euphorbiaceae and Poaceae). Phylogeny of angiosperms.

7. **General concepts of plant morphology, origin and evolution of flower** - Primitive living angiosperms, foliar stamens, open carpels. Plant anatomy – types of tissue; Organization of root and shoot apical meristems; Secondary growth (normal and anomalous) and Anomalous primary structures of root and stem.

8. **Development of male and female gametophytes,** pollination, pollen pistil interaction, fertilization, endosperm development and embryogenesis; seed development and fruit formation; polyembryony, apomixis, embryo culture; biochemistry and molecular biology of fruit maturation.

9. **Basic concepts of ecology, ecological factors affecting the plants.** Principle of limiting factors; population characteristics, population interaction, r and K selection, genecology and range extensions, community characteristics, community classification, continuum concept, ecological niche, plant succession in various habitats, concept of climax. Structure and function of ecosystem, energy flow and biogeochemical cycles (N, P, C, S), primary production, plant indicators, major biomes of the world. Phytogeographical regions of India, vegetation of Rajasthan. Ecosystem services.

10. **Environmental pollution**- air, water, noise and soil; Greenhouse effect, Ozone layer depletion, Acid rain; Concept of biodiversity with special reference to India, Hot spots, Rare, Endangered and Endemic plant species of Rajasthan, strategies for conservation of the flora. Bio-monitoring. Environmental Impact Assessment.

11. **Plant civilization, centers of diversity/origin of crop plants,** gene diversity Utilization, cultivation and improvement of food plants (rice, wheat, bajra, pulses, green-gram, moth and beans), Oil seeds (mustard, soybean and ground nut), drugs (Rauvolfia, Ephedra, Papaver, Atropa, Cinchona and Withania), fibre (cotton, jute and coir) and plants of industrial value (Tobacco, sugarcane, tea and coffee). Ethnobotany, under-exploited plants of potential medicinal and food value with special reference to Rajasthan.

12. **Bright field Microscopy, Electron microscopy (TEM & SEM),** Confocal microscopy, phase contrast microscopy; Fixation (of lower and higher plant groups) and staining techniques (for bright field microscopy, cytology and bacterial staining); Chromatography, Electrophoresis, ELISA, Spectrophotometry, centrifugation.

13. **Plant-water relation,** membrane transport and translocation of water and solutes.

14. **Enzymes**– General characteristics, Classification, mechanism of action, kinetics of enzymatic catalysis, regulation of enzyme activity, active sites, coenzymes, activators and inhibitors, isozymes.

15. **Photosynthesis**- Pigments, photophosphorylation, Mechanism of photosynthesis, photorespiration, photosynthesis in C4 plants, CAM.

16. **Nitrogen fixation and Nitrogen metabolism.** Fatty acid metabolism. Signal transduction: overview, receptors and G-proteins, phospholipid signaling, second messengers, two-component sensor-regulator system in bacteria and plants.

17. **Respiration**- Glycolysis, TCA cycle, Oxidative phosphorylation, Glycogen breakdown, inter conversion of hexoses and pentoses.

18. **Seed dormancy and germination.** Concept of growth and development. Physiological effects and mechanism of action of auxins, gibberellins, cytokinins, ethylene, abscisic acid and jasmonic acid. Plant rhythms and biological clock. Secondary metabolites. Plant responses to biotic and abiotic stresses. Physiology of flowering- Photoperiodism and Vernalization.

19. **Ultrastructure of prokaryotic and eukaryotic cells;** Cell membrane- structure and function; Cell organelles- structure and functions; Ultrastructure of nucleus; DNA: Structure, A, B and Z forms, replication, damage and repair; Cells cycle; Structure of chromatin and its organization; Special types of chromosomes; Banding patterns; Chromosomal aberrations and numerical chromosome abnormalities.

20. **Genetics of prokaryotes and eukaryotic organelles;** Mapping of bacteriophage genome; Genetic transformation, Conjugation and Transduction in bacteria; Cytoplasmic male sterility. Mendelism, Allelic and non-allelic gene interactions.

21. **Techniques in cell biology**- *in situ* hybridization, FISH, GISH. Genetic code, transcription and translation, RNA processing; Teminism; Regulation of gene expression in prokaryotes and eukaryotes; Genetic mapping; Independent assortment and crossing over, molecular mechanism of recombination, genetic markers. Mutations, molecular basis of spontaneous and induced mutations and their role in evolution. Principles of plant breeding, important conventional methods of self and cross pollinated and vegetatively propagated crops; Mutation breeding.

22. **Basic concepts, principles and scope of Biotechnology,** plant cell and tissue culture. Concept of totipotency; Micropropagation by axillary bud proliferation and adventitious shoot bud differentiation; Embryogenesis and organogenesis; Somatic hybridization, protoplast- isolation, fusion and culture; Artificial seeds; Somaclones and somatic hybrids; *in-vitro* production of secondary metabolites and bioactive compounds.

23. **Recombinant DNA Technology:** Restriction enzymes, Gene cloning- principles and techniques; construction of gene library (genome and cDNA library); DNA sequencing, polymerase chain reaction, RT-PCR, DNA finger printing. Genetic engineering of plants: Aims and strategies for development of transgenics, Methods of gene transfer in plants, intellectual property rights and possible ecological risks and ethical concerns. Microbial genetic manipulation. Structural and functional genomics, microarray, genome sequencing projects (with special reference to rice, wheat, chick pea and tomato) and proteomics.

24. **Principles and practices of statistical methods in biological research,** samples and population, Data collection and processing in research; Basic statistics (averages, statistics of dispersion, coefficient of variation, standard error and deviation); Confidence limits, Probability, Distribution (Binomial, Poisson and Normal), Tests of statistical significance, Simple Correlation and Regression, Analysis of Variance.

15. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN CHEMISTRY**

1. **Chemical Periodicity:** Periodic Table, Electronic Configuration of Various Group Elements. Periodicity in properties of s, p, d and f - block elements and their trends.

2. **Chemical Bonding:** Concept of hybridization VBT, LCAO, MOT of homo and heteronuclear diatomic and polyatomic molecules, Coulson diagrams, Valence Shell Electron Pair Repulsion Theory, Hydrogen bonding, Fajans Rule and Polarity in Covalent Compounds.

3. **Transition Metal Chemistry:** Properties with special reference to variable oxidation state, magnetic, colour and complexation behaviour. Metal to Ligand and Ligand to Metal charge transfer spectra, Metal atom clusters, Nomenclature and Isomerism in co-ordination compounds, Ligand field theory, high spin and low spin complexes, CFT, CFSE and Jahn-Teller effect.

4. **Green Chemistry and Nano Chemistry:** Principles of Green Chemistry and Sustainable Development, Green Reagents and Green Synthesis. Introduction to Nano particles, Nano Science and Nano Technology. Optical and Magnetic properties of Nano material. Characterization of Nano materials by TEM, SEM, SPMT, AFM, X-Ray Diffraction and ASCA.

5. **Environmental Chemistry:**

    1. **Air Pollution-** Pollution due to SOx, NOx, Ozone Depletion and Green House Effect, photochemical smog, reaction of hydroxyl radical with CH4, SOx and NOx.

    2. **Water Pollution:** International Standards of drinking water, water quality parameters COD, BOD, TDS, pH etc., Treatment of potable and sewage waste water.

    3. **Soil-** Types of soil, soil profile and analysis of physical and chemical parameters.

6. **Nomenclature of Organic Compounds:** Common and IUPAC nomenclature of Aliphatic, Aromatic, Heteroaromatic, Bicyclo Compounds and Spiranes.

7. **Isomerism:** Structural Isomerism, Stereoisomerism both geometrical and optical with E/Z and R/S systems respectively. Conformational analysis of alkanes and cyclo alkanes, Asymmetric Synthesis Stereoselective and Stereospecific reactions.

8. **Basic principles of Organic Chemistry and Reaction Mechanism:** Inductive, Electromeric, Mesomeric, Hyperconjugative and Resonance effects. Reactive Intermediate species i.e. carbocation (classical and non classical), Carbanion, Carbene, free Radicals, Nitrene and Benzyne. Types of reagents- electrophiles and nucleophiles. Basic reaction mechanism - Addition, Substitution, Elimination and Rearrangements.

9. **Name Reactions and Mechanisms:** Aldol, Benzoin, Cannizzaro's, Perkin's, Stobbe, Dieckmann Condensations. Pinacol - Pinacolone, Wagner- Meerwein, Hoffmann, Schmidt, Lossen, Curtius, Beckmann, Fries, Baeyer Villiger, Wittig, Reformatsky Rearrangements.

10. **Aromatics Heteroaromatics, annulenes and heteroannulenes:** Basics of Aromaticity and anti-aromaticity. Synthesis and reactions of anthracene, phenanthrene, biphenyl, furan, thiophene, pyrrole, pyridine, quinoline, isoquinoline and indole. UV, IR, NMR and mass spectroscopy of organic compounds.

11. **(a) Chemical kinetics:** Ionic Reactions, Kinetic salt effect, Steady State Kinetics, Kinetic and Thermodynamic Control of reactions, Dynamic chain, photochemical reaction, acid base and enzyme catalysis, fast reaction: study by stop flow method.
(b) Acid-bases and Non-aqueous Solvents: Basic theories, HSAB concept. Non aqueous solvents: DMSO, THF and Liquid NH3 their reactions and solvent action.

12. **Electrochemistry:** Electrochemistry and Ionic Equilibrium, Theory of strong and weak electrolytes pH, Buffer and Buffer action, Electrolysis and electrolytic Cell, Electrochemical cells and reactions, Nernst equation, emf measurement, Calculation of Gibbs free energy and equilibrium constants. Primary and Secondary cells, fuel cell, corrosion and its prevention.

13. **Nuclear and Radio Chemistry:** Nuclear Models, Radioactive decay, mass defect, binding energy, fission and fusion, Isotopes, Isobars, Isodiaphers and application of Isotopes in medicinal Science.

14. **Solution and Colligative Properties:** Types of Solutions Concentration measurement methods. Normality, Molarity, Molality etc. Raoults law (deviation from ideal behaviour), Nernst law, Henry law, Relative lowering of Vapour Pressure, Elevation in Boiling Point, Depression in Freezing Point, Osmosis and Osmotic Pressure.

15. **Thermodynamics:** First law: relation between Cp and Cv, enthalpies of physical and chemical changes, temperature dependence of enthalpies, Joules Law, Joules Thomson coefficient, Second law: entropy, Criteria of Spontaneity Gibbs and Helmholtz functions, evaluation of entropy and Gibbs function, Gibbs-Helmholtz equation, Maxwell relations. Thermodynamics of ideal and non-ideal gases and solutions. Third Law of Thermodynamics.

16. **Chemistry of Non-Transition and Inner Transition Elements:**
(i) Preparation, properties and bonding in diborane and higher boranes, polyhedral borane anions and carboranes, borazines, borane nitrile. Silicones and silicates, phosphonitrilic compounds, interhalogen Xenon compounds.

    (ii) Lanthanides and actinides Contraction, oxidation states, super heavy elements, analytical and Medicinal applications.

17. **Organometallic Compounds:** Synthesis, structure, bonding, reactions and reactivity, Applications in homogeneous catalysis. Cage and Cluster Compounds.

18. **Bioinorganic and Supra Molecular Chemistry:** Iron storage and transport, oxygen carriers and transport, electron transfer reactions, Metalloenzymes; Zinc Iron and Copper enzymes, Vita B12 Co-enzyme. Metal deficiency and disease. Supra molecular reactions and Catalysis, supra molecular devices.

19. **Group Theory:** Symmetry elements and operations, point groups, Mulliken symbol, GMT and character Table, Great Orthogonality Theorem and application hybridization and vibrational Spectroscopy. Concepts of inorganic ESR, Mass and IR Spectroscopy.

20. **Statistical Data Analysis and Analytical Technique:** Mean, Mode, Median, Standard Deviation, Regression analysis and Correlation principles and applications of AAS, DTA, TGA. Partition and adsorption chromatography.

21. **Pericyclic Reactions:** Molecular orbital symmetry, Frontier orbitals of ethylene, buta-1,3-diene, hexa- 1,3,5-triene. Classification of pericyclic reactions. Woodward Hoffmann correlation diagrams. Electrocyclic and cycloaddition reactions and sigmatropic rearrangements, eg. Cope, Claisen, Aaza-Cope, Sommelet-Hauser rearrangements.

22. **Organic Transformation and Reagents:** Functional group interconversions, oxidative and reductive processes. Common catalyst and reagents (organic, inorganic organometallic and enzymatic like LiAlH4, NaBH4, iodobenzene diacetate, thallium (III) nitrate RuO4, OsO4, CH3Li, (CH3)2Hg, (CH3)2Zn etc.

23. **Synthetic Application of Organometallics and Reactive Methylene Compounds:** Grignard reagent, Organo lithium compounds, Aceto acetic ester and Malonic ester. Their Synthesis, identification, estimation and important applications in the Synthesis of organic compounds.

24. **Organic Photochemistry:** Jablonski diagram, photochemistry of alkenes, carbonyl compounds and aromatic compounds, photodegradation of polymers, singlet molecular oxygen reactions. Paterno-Buchi reaction, Norrish Type I and II reactions and Barton reaction.

25. **Natural Products and Medicinal Chemistry:** Classification and structure of Carbohydrates, proteins, nucleic acids and fatty acids. Classification, Nomenclature and isolation techniques of Terpenoids, Carotenoids, Alkaloids and terpenes. Drug design and introduction to pharmacodynamics, Some Cardio Vascular Psychotic and Antipsychotic drugs.

26. **Quantum Chemistry:** Basic principles and application of quantum mechanics. Schrodinger equation, hydrogen atom, hydrogen molecule ion and angular momentum. Variational and Perturbational method, term symbols and spectroscopic status. Atomic structure and its theoretical treatment.

27. **Solid State:** Types of solids, Bravais lattices, determination of unit cell parameters, defects in solids- Frenkel, Schottky, Point, Line and Plane defects. Structural classification of binary and ternary compounds, diffraction techniques, bonding, thermal, electrical and magnetic properties. Insulators, Semiconductors and Super conductors.

28. **Statistical Thermodynamics and Phase equilibria:** Boltzmann distribution law, kinetic theory of gases, partition function: vibrational, rotational, translational and electronic properties and applications of partition functions and the relation with thermodynamic quantities. Basic principles of phase equilibria.

29. **Physical Chemistry of Polymers:** Molecular weight determination of polymers: Number average and Weight average molecular weights, End-group analysis, Sedimentation, Light scattering and Viscosity methods. Stereochemistry and mechanism of polymerization. Crystallisation and melting in polymers. Relation between Tm and Tg.

30. **Colloids and Surface Chemistry:** Absorption and Adsorption, Adsorption isotherms and surface area analysis, Types and properties of colloids, Micelles, Micelle action and Critical Micelle Concentration. Applications of colloids.

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16. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN MATHEMATICS**

1. **Differential and Integral Calculus:**

   Partial Differentiation, Euler's Theorem for homogeneous functions, Total Differentiation, Maxima and Minima of two and three variables, Lagrange's Multipliers Method, Curvature, Asymptotes, Envelopes and Evolutes, Singular Points. Rectification, Multiple Integral, volume and surface of revolution of curves. Beta and Gamma functions.

2. **Two Dimensional Coordinate Geometry (Cartesian and Polar coordinates):**

   Polar equation of conics. Polar equation of tangent, normal, asymptotes and chord of contact. Auxiliary and Director circle. Second degree equation of General Conic. Centre, Asymptotes, eccentricity, foci, directrix axes and latus rectum of a conic, Co-ordinate of center, equation of conic referred to center as origin, lengths and position of axes of a standard conic.

3. **Three Dimensional Coordinate Geometry:**

   Straight Line, Sphere, Cylinder, Cone and their properties (Rectangular Coordinates only), Central Conicoids and their properties (Referred to principal axes only).

4. **Vector Calculus:**

   Differentiation of Vectors, Del operator, Gradient, divergent, Curl and directional derivative, their identities and related theorems. Integration of Vectors, line, Surface and Volume integration of vectors. Gauss Divergence, Stokes and Green theorem.

5. **Ordinary Differential Equations:**

   First order non-linear differential equation, singular solutions and extraneous Loci, Second order linear differential equation with constant and variable coefficients. Simultaneous and Total Differential Equations.

6. **Partial Differential Equations:**

   Linear and Non-linear Partial differential equation of first order. Linear Partial Differential Equations of Second Order. Solution of Partial Differential Equations by Lagrange's, Charpit's and Monge's Method.

7. **Mechanics:**

   Equilibrium of coplanar forces, Moments, Friction, Catenary. Simple harmonic motion, Rectilinear motion under variable laws, Motion in resisting medium. Projectile.

8. **Abstract Algebra:**

Groups– Normal Sub-groups, Quotient groups, Homomorphism, Isomorphism of groups. Classification of finite groups. Cauchy's Theorem for finite abelian groups, Permutation groups, Solvable groups and their properties. Rings, Morphism, Principal Ideal domain, Euclidean Rings, Polynomial Rings, Irreducibility criteria, Fields, Finite fields, Field extensions. Integral domain.

9. **Linear Algebra:**

Vector Spaces, Linear dependence and independence, Bases, Dimensions, Linear transformations, Matrix representation of Linear transformations, Change of bases. Inner product spaces, Orthonormal basis, Quadratic forms, reduction and classification of quadratic forms. Algebra of Matrices, Eigenvalues and Eigenvectors, Cayley-Hamilton theorem. Canonical, Diagonal, Triangular and Jordan forms, Rank of Matrix.

10. **Complex Analysis:**

Analytic Functions, Cauchy's Theorem, Cauchy's Integral Formulae, Power Series, Laurent's Series, Singularities, Theory of Residues, Complex Transformations, Contour Integration.

11. **Special Functions:**

Hypergeometric, Confluent Hypergeometric Functions and their properties. Bessel, Legendre Function/Polynomial of first kind and their properties. Hermite, Laguerre Polynomials and their properties.

12. **Integral Transforms:**

Laplace, Inverse Laplace transform and their properties. Fourier transform, Inverse Fourier transform and their properties, Hankel, Mellin transform and their properties.

13. **Differential and Integral Equations:**

Classification of Second Order Partial Differential Equations, Green's Functions, Sturm-Liouville Boundary Value Problems, Cauchy's Problems and Characteristics. Calculus of variation-Variation of a functional, Euler-Lagrange's equation, Necessary and sufficient condition for extrema, Variational method for Boundary Value Problems in ordinary and partial differential equations. Integral Equations of first and second kind of Fredholm and Volterra type, solution by successive substitutions and successive approximations.

14. **Metric spaces and Topology:**

Metric spaces, compactness, Connectedness, Topological spaces, closed sets, closure, Dense set, Neighbourhood. Interior, exterior and boundary points, Accumulation points and derived sets.

Bases and sub-bases. First and Second Countable spaces, Separable spaces, Separation axioms, compactness, continuous functions and compact sets, connected spaces.

15. **Differential Geometry:**

Curves in space (Osculating, Normal and rectifying planes, Serret-Frenet formulae, curvature, torsion, circle of curvature and sphere of curvature), Envelopes, curves on surfaces.

16. **Tensors:**

Covariant, Contravariant and Mixed tensors, Invariants and algebraic properties of tensors. Contraction of tensors, Quotient Law of tensors. Fundamental and Associated tensors, Christoffel symbols, Covariant differentiation of tensors.

17. **Mechanics:**

D'Alembert's Principle, Moment and Product of inertia, Motion in two-dimensions. Lagrange's equations of Motion, Euler's Equations of Motion, Motion of a top.

18. **Numerical Analysis:**

Interpolation, Difference schemes, Lagrange's interpolation, Numerical differentiation and integration. Numerical solution by Bisection, Secant, Regula-Falsi and Newton's Methods, Roots of polynomial. Linear Equation – Direct Methods (Jacobi, Gauss and Seidel Method).

19. **Operations Research:**

Simplex methods, Duality, Degeneracy, Revised Simplex Method, Integer Programming Problems, Assignment and Transportation Problems, Game Theory– Two person zero sum game, Inventories- Single item deterministic inventory models with finite replacement, simple probabilistic models.

20. **Mathematical Statistics:**

Probability, Conditional Probability, Addition and Multiplication theorems of probability, Baye's Theorem, Expectations, Moment Generating Function, Probability Distributions: Binomial, Poisson, Uniform and Normal, Correlation and Regression, Line of Regressions.

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17. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN PHYSICS**

I: Electromagnetic Theory-

Electrostatics: Gauss's Law and its applications; Laplace and Poisson equations, boundary value problems; Magnetostatics: Biot-Savart law, Ampere's theorem, electromagnetic induction; Maxwell's equations in free space and linear isotropic media; boundary conditions on fields at interfaces; Scalar and vector potentials; Gauge invariance; Electromagnetic waves in free space, dielectrics, and conductors; Reflection and refraction, polarization, Fresnel's Law, interference, coherence, and diffraction; Dispersion relations in plasma; Lorentz invariance of Maxwell's equations; Dynamics of charged particles in static and uniform electromagnetic fields; Radiation from moving charges, dipoles and retarded potentials.

II: Electronics-

Physics of P-N junction, Diode as a circuit element, clipping and clamping, Rectification, Zener regulated power supply Transistor as a circuit element, CC, CB and CE configuration, Transistor as a switch, Feedback in amplifiers, Oscillators, FET, MOSFET and their applications, Operational amplifiers and its applications, inverting and non-inverting amplifiers, adder, integrator differentiator, wave form generator, multivibrators, comparator, Schmidt trigger. Boolean Algebra, Digital integrated circuits: Logic gates, NAND and NOR gates as building blocks, X-OR gate, Half and Full adder circuits, Karnaugh map, Flip – Flops, counters and registers.

III: Circuit Analysis-

Energy sources, Active and Passive elements, Kirchhoff's laws and their applications. Four terminal networks, Z, Y and h parameters, Thevenin's and Norton's Theorem, Maximum Power Transfer Theorem, Superposition Theorem, Reciprocity Theorem, Miller Theorem, T and PI Network, Mean and rms values in AC circuits. LR, CR and LCR circuits- series and parallel resonance. Quality factor. Principal of transformer.

IV: Atomic & Molecular Physics-

Quantum states of an electron in an atom; Electron spin; Stern-Gerlach experiment; Spectrum of Hydrogen, helium and alkali atoms; Relativistic corrections for energy levels of hydrogen; Hyperfine structure and isotopic shift; width of spectral lines; LS & JJ coupling; Zeeman, Paschen Back & Stark effect; X-ray spectroscopy; Electron spin resonance, Nuclear magnetic resonance, chemical shift; Rotational, vibrational, electronic, and Raman spectra of diatomic molecules; Frank–Condon principle and selection rules; Spontaneous and stimulated emission, Einstein A & B coefficients; Lasers, optical pumping, population inversion, rate equation.

V: Condensed Matter Physics-

Crystal structure, Miller Indices, Bravais lattices; Reciprocal lattice, diffraction and the structure factor; Bonding of solids; Elastic properties, phonons, lattice specific heat; Free electron theory and electronic specific heat; Einstein and Debye model, Response and relaxation phenomena;

Drude model of electrical and thermal conductivity; Boltzman transport equation, Sommerfield theory of electrical conductivity, Mathiessen's rule, Hall effect and thermoelectric power; Origin of Atomic Magnetism, Diamagnetism, paramagnetism, and ferromagnetism; Curie, Langevin and Quantum theories of magnetism, Electron motion in a periodic potential, band theory of metals, Kronig-Penny model, Effective mass, concept of holes, insulators and semiconductors; Superconductivity, type– I and type - II superconductors, BCS theory, DC and AC Josephson Effects, Semiconductor: laws of mass action, Impurity conductivity, Recombination mechanism, Photo conductivity and Photo luminescence.

VI. Mathematical Methods of Physics-

Dimensional analysis; Vector algebra and vector calculus; Linear algebra, matrices, Cayley Hamilton theorem, eigen value problems; Linear differential equations; Special functions (Hermite, Bessel, Laguerre and Legendre); Fourier series, Fourier and Laplace transforms; Elements of complex analysis; Elementary ideas about tensors; Introductory group theory; Elements of computational techniques: roots of functions, interpolation, extrapolation, integration by trapezoid and Simpson's rule, solution of first order differential equations using Runge-Kutta method; Finite difference methods; Elementary probability theory, random variables, binomial, Poisson and normal distributions.

VII. Classical Mechanics-

Newton's laws; Phase space dynamics, stability analysis; Central-force motion; Kepler's laws, Gravitational field and potentials; Two-body collisions, scattering in laboratory and centre-of-mass frames; Rigid body dynamics, Angular momentum, moment of inertia tensor, non-inertial frames and pseudoforces; Variational principle, Lagrangian and Hamiltonian formalisms and equations of motion; Poisson brackets and canonical transformations; Symmetry, invariance and conservation laws, cyclic coordinates; Periodic motion, small oscillations and normal modes; Damped harmonic oscillations, Driven harmonic oscillations; Waves in media, Superposition of waves; Special theory of relativity, Lorentz transformations, relativistic kinematics and mass–energy equivalence. Kinematics of moving fluids: Bernouli's theorem, Viscosity, Surface tension.

VIII. Quantum Mechanics-

Wave-particle duality; Wave functions in coordinate and momentum representations; Commutators and Heisenberg's uncertainty principle; Matrix representation; Dirac's bra and ket notation; Schroedinger equation (time-dependent and time-independent); Eigen value problems such as particle-in-a-box, harmonic oscillator, etc.; Tunneling through a barrier; Motion in a central potential; Orbital angular momentum, Angular momentum algebra, spin; Addition of angular momenta; Hydrogen atom, spin-orbit coupling, fine structure; Time-independent perturbation theory and applications; Variational method; WKB approximation; Time dependent perturbation theory and Fermi's Golden Rule; Selection rules; Semi-classical theory of radiation; Elementary theory of scattering, phase shifts, partial waves, Born approximation; Identical particles, Pauli's exclusion principle, spin-statistics connection; Relativistic quantum mechanics: Klein Gordon and Dirac equations.

IX. Thermodynamic and Statistical Physics-

Laws of thermodynamics and their consequences; Thermodynamic potentials, Production of low temperature and its applications; Maxwell relations; Chemical potential, phase equilibria; Phase space, micro- and macro states; Micro canonical, canonical and grand-canonical ensembles and partition functions; Free Energy and connection with thermodynamic quantities; First and second-order phase transitions; Classical and quantum statistics, ideal Fermi and Bose gases; Principle of detailed balance; Blackbody radiation and Planck's distribution law; Bose-Einstein condensation; Random walk and Brownian motion; Introduction to non-equilibrium processes; Diffusion equation.

X. Nuclear and Particle Physics-

Basic nuclear properties: size, shape, charge distribution, spin and parity; Binding energy, semi-empirical mass formula; Liquid drop model; Fission and fusion; Nature of the nuclear force, form of nucleon-nucleon potential; Charge-independence and charge-symmetry of nuclear forces; Isospin; Deuteron problem; Evidence of shell structure, single- particle shell model, its validity and limitations; Rotational spectra; Elementary ideas of alpha, beta and gamma decays and their selection rules; Nuclear reactions, reaction mechanisms, compound nuclei and direct reactions; Classification of fundamental forces; Elementary particles (quarks, baryons, mesons, leptons); Spin and parity assignments, isospin, strangeness; Gell-Mann-Nishijima formula; C, P, and T invariance and applications of symmetry arguments to particle reactions, parity non-conservation in weak interaction; Particle accelerators and detectors.

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18. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN ZOOLOGY**

UNIT- I: Taxonomy:

(a) Principles, rules and basis of Taxonomy and classification.
(b) Binomial system of nomenclature.
(c) General survey of animal kingdom, classification up to order and inter-relationship of the various phyla.

UNIT- II: Diversity of Life Forms:

Structure and functions of the invertebrates (Protozoa to Echinodermata) and their economic importance.
(a) Levels of structural organizations- Unicellular, colonial and multicellular forms, Coelom, segmentation and metamerism.
(b) Locomotory organs and their mechanisms.
(c) Food, feeding and digestion.
(d) Respiration.
(e) Excretory and osmoregulatory organs.
(f) Primitive and advanced nervous systems.
(g) Reproduction: Asexual, sexual and parthenogenesis.
(h) Larval forms.

UNIT- III: Structural organization of Chordates:

(a) Protochordates, Balanoglossus, Herdmania, Branchiostoma.
(b) Comparative anatomy of integument, skeletal, digestive, respiratory, circulatory, urinogenital & nervous systems of vertebrates.
(c) Adaptation in vertebrates (fishes, amphibians, reptiles, birds and mammals).
(d) Economic importance of chordates.

UNIT- IV: Developmental Biology:

(a) Gametogenesis
(b) Fertilization.
(c) Early embryonic developments (Cleavage, Blastulation, Fate maps, Morphogenetic movements, Gastrulation).
(d) Organisers and Organogenesis.
(e) Development of Frog and Chick including Metamorphosis.
(f) Formation of extra embryonic membranes in Chick.
(g) Function and types of placenta in mammals, gestation and Parturition.
(h) Cell differentiation and teratogenesis.
(i) Sex differentiation in humans.

UNIT- V: Genetics:

(a) Mendelian laws of inheritance, recombination, linkage, linkage maps and crossing over, Multiple alleles, gene interaction.
(b) Mutation – Natural and induced mutations. Chromosome number and forms, structural rearrangements; Polyploidy.
(c) Cytoplasmic inheritance.
(d) Human genetics – normal and abnormal, pedigree analysis, karyotypes, genes and diseases, eugenics.
(e) Sex chromosomes and sex determination.
(f) Quantitative genetics- polygenic inheritance, heritability and its measurements, QTL mapping.

UNIT- VI: Evolution:

(a) Origin of life; history of evolutionary thoughts.
(b) Lamarckism and Darwinism. Sources and nature of variations. Natural selection. Hardy-Weinberg law, Causes of speciation.
(c) Concept of species and sub-species.
(d) Fossils and their studies, outline of Geological eras. Origin and evolution of man.
(e) Principles and theories of continental distribution of animals.
(f) Zoogeographical realms of the world.

UNIT- VII: Ethology:

(a) Approaches and methods in study of behaviour.
(b) Proximate and ultimate causation, altruism and evolution- Group selection, kin selection, reciprocal altruism.
(c) Neural basis of learning, memory, cognition, sleep and arousal.
(d) Biological clocks, Development of behaviour, Social communication; Social dominance; Use of space and territoriality. Aggressive behaviour.
(e) Parental investment and Reproductive success; Parental care, Mating systems.
(f) Habitat selection and optimality in foraging; Migration, orientation and navigation; Domestication and behavioural changes.

UNIT- VIII: Cellular Organization and Molecular Biology

a. Structure and function of cell and cytoplasmic constituents: Structure of nucleus, mitochondria, Golgi bodies, endoplasmic reticulum, lysosomes and ribosomes. Cell cycle and cell division.
b. Membrane structure and function: Structure of model membrane, Lipid bilayer and membrane protein, diffusion, osmosis, ion channels, Active transport membrane pumps, mechanism of solving and regulations of intracellular transport, Electrical properties of membrane.
c. Structure and types of nucleic acids.
d. DNA replication, repair and recombination (Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extra chromosomal replicons, DNA damage and repair mechanisms, homologous and site-specific recombination).

e. RNA synthesis and processing (transcription factors and machinery, formation of initiation complex, transcription activator and repressor, RNA polymerases, capping, elongation, and termination, RNA processing, RNA editing, splicing, and polyadenylation, structure and function of different types of RNA, RNA transport).
f. Protein synthesis and processing (Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA-identity, aminoacyl tRNA synthetase, and translational proof-reading, translational inhibitors, Posttranslational modification of proteins).
g. Control of gene expression at transcription and translation level (regulating the expression of phages, viruses, prokaryotic and eukaryotic genes, role of chromatin in gene expression and gene silencing).

UNIT- IX: Cell Cell Communication

a. Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.
b. Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two-component systems, light signaling in plants, bacterial chemotaxis and quorum sensing.
c. Cancer: Changes in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.

UNIT- X: Biological Techniques and Biotechnology

a. Microscopic techniques: Light microscopy, Confocal, Fluorescence, Phase contrast, Electron and Atomic force microscopes and image processing methods in microscopy.
b. Histochemical staining of Nucleic acids and Enzymes. Antibody generation, ELISA, RIA, Blotting techniques, Immunocytochemical techniques, FISH, GISH.
c. Radiolabelling Techniques; Types and properties of Radio isotopes, Tracer techniques, Autoradiography and safety guidelines.
d. Electrophoresis, Centrifugation, Chromatography, Colorimetry, Spectrophotometry.
e. Isolation and purification of RNA, DNA (genomic and plasmid) and proteins. Different separation methods.
f. Analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, Isoelectric focusing gels.
g. Molecular cloning of DNA & RNA fragments in bacterial and eukaryotic systems.
h. Expression of recombinant proteins using bacterial, animal and plant vectors.
i. Isolation of specific nucleic acid sequences, Generation of genomic and cDNA libraries.
j. Plasmid, phage, cosmid, BAC and YAC vectors.
k. In vitro mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms.
l. Protein sequencing methods, detection of post translation modification of proteins. DNA sequencing methods, strategies for genome sequencing.
m. Methods for analysis of gene expression at RNA and protein level, large scale expression, such as micro array based techniques.
n. Isolation, separation and analysis of carbohydrate and lipid molecules.

o. RFLP, RAPD and AFLP techniques.
p. Statistical applications in Biology – Mean, Median, Mode, Student's 't' test, Chi square test, Standard Deviation. Correlation and Regression, Variance and Analysis of Variance. Computer applications in biology – fundamentals of computers.

UNIT- XI: Animal Ecology Biodiversity and Wildlife Studies

a. Environment - Biotic and Abiotic Components, Population and its Ecology: Characteristics of population, growth curves, regulation. Life history strategies, concept of meta population, demes and dispersal, interdemic, extinction, age structured populations.
b. Population, interspecific and intraspecific relationships.
c. Community ecology and succession, concept of ecosystem.
d. Biogeochemical cycles. Limiting factors. Concepts of habitat and ecological niche.
e. Major biomes and their communities and Biogeography.
f. Pollution - its control and management, Biodegradation and Bioremediation.
g. Concepts, principles and types of biodiversity.
h. Major Biodiversity areas and hotspot in India.
i. Conservation and major wild life sanctuaries in Rajasthan.
j. Rare, Endangered species or Threatened species and their conservation strategies.

UNIT- XII: Human Physiology

a. Chemistry of carbohydrates, proteins, lipids and nucleic acids. Enzymes and hormones. Biological oxidation. Metabolism of carbohydrates, proteins and lipids.
b. Cell Physiology- Structure, types and mechanism of muscle contraction. Structure of neuron and transmission of axonic and synaptic nerve impulse.
c. Functions of sensory organs concerned with vision, sound perception, taste, smell and touch.
d. Physiology of Gastrointestinal tract: Contractility, Secretion of digestive juices, GI hormones. Mechanism of digestion and absorption.
e. Physiology of Respiration: Pulmonary ventilation and gaseous exchange.
f. Structure and Circulation of Blood: Blood structure and functions, blood groups, clotting of blood, elementary idea of immunology. Structure and functions of the heart, Cardiac Cycle, Heart Beat, and its chemical regulation.
g. Physiology of Excretion: Kidney structure, urine formation, counter current mechanism, regulation of electrolyte and water balance of the body.
h. Endocrine Physiology: Structure, functions of Pituitary, Thyroid, Parathyroid, Adrenal, Islets of Langerhans and pineal gland.
i. Physiology of Reproduction: Structure and hormones of Ovary & Testis. Hormonal control of gametogenesis and menstrual cycle.

19. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN ACCOUNTANCY AND BUSINESS STATISTICS**

A- Financial Accounting

Introduction, meaning of Book-Keeping, Accounting and Accountancy, Distinction between Book-Keeping and Accounting, Accounting Process, Objectives of Accounting, Various users of Accounting information, Limitations of Accounting, Accounting Terminologies, Accounting Concepts, Principles and Conventions. Accounting Standards (Indian Accounting Standards), International Financial Reporting Standards (IFRS), Recording of Transactions Secondary Books, Trial Balance and Rectification of Errors, Final Accounts with adjustment entries, Closing entries, Financial Statements. Bank Reconciliation Statement, Bills of Exchange, Partnership Accounts- Admission of a Partner, Retirement of a Partner, Death of a Partner, Piecemeal Distribution of Cash and Amalgamation of firms, Depreciation Accounting, Price Level Changes Accounting, Hire Purchase and Instalment Payment Methods, Voyage Accounts, Accounting from Incomplete Records, Accounting Methods for Non-Profit making organisations.

B - Corporate Accounting

Introduction to Company Accounts, Kinds of Companies, Formation of Companies, Share Capital, Issue of Shares, Under Subscription and Over Subscription, Issue of shares at premium and discount, Buy-back of shares and Treasury stock, Accounting treatment and Ledger Preparation, Issue of Bonus and Right shares, Consolidation and split of shares, Redemption of Preference shares and Issue and Redemption of debentures, Preparation of final accounts with calculation of Managerial Remuneration, Disposal of Company profits and Distribution of Dividend, Accounts of Banking and Insurance Companies, Valuation of Goodwill, Valuation of shares, Amalgamation of Companies, Internal and External Reconstruction of companies (including scheme of Reconstruction) Accounts of Holding and subsidiary companies Liquidation of a Company, Double Account system (Accounting for public utilities companies Problems of merger and acquisition. Accounting for agricultural forms, Government Accounting, corporate social Accounting Accounts of Solicitors, Accounts of Hospitals. Forensic Accounting, Accounting for tour and travel agencies, Basic financial and Accounting System for MFIS.

C - Cost Accounting

Concept of Cost and Cost Control, Cost Accounting methods (Job costing, Batch costing, Contract costing or Terminal costing, process costing including inter process profit, Single output or unit costing, Operating costing, Operation costing, Multiple or composite costing, Departmental costing and uniform costing), Non-Integrated and Integrated cost Accounting system. Marginal Costing and Break-Even Analysis, Decisions based on Marginal Costing techniques, Budgetary Control and Preparation of various types of Budgets, Standard Costing and Ascertainment of Material, Labour, Overhead and Sales Variances, Activity Based Costing.

Transfer Pricing, Life Cycle Costing, Strategic Cost and Performance Evaluation, Mechanic Accounting and E.D.P, Productivity Accounting and Implication of Computers for Cost Control and Cost reduction, Programmes and Planning, Employee's Participation in cost reduction programmes.

D - Management Accounting

Objectives and Scope of Management Accounting, Ratio Analysis, Preparation of Fund Flow Statement and Cash Flow Statement. Capital Structure- Theories and Decisions, Cost of Capital, Working Capital Management, Capital Budgeting and Expenditure Decisions, Dividend Decisions, Balance Score Card, Measurement and Performance - ROI, MVA, EVA and Risk Analysis. Value added Accounting, Human Resource Accounting, Responsibility Accounting, Operating and Financial leverages, Trading on Equity, Lease Financing, Inventory management.

E. Taxation: Direct Tax

Income Tax Law and Rules with reference to assessment of Individuals, HUF, Firm, AOP and Companies, Assessment Procedure and types of Assessment, Advance payment of tax, Tax deduction at source, Refund of tax, Double taxation, Tax Avoidance and Tax Evasion. Introductory part of Tax Planning with special reference to salaried employees and individuals. Minimum Alternate Tax Net.

Indirect Tax

Custom duty - Role of custom in International Trade, Important Terms and definitions under the custom Act, 1962, Assessable value , Baggage, Bill of entry Dutiable goods, Duty Exporter, Foreign going Vessel, Aircraft goods, Import Manifest, Importer, prohibited goods, Shipping Bill, Stores, Bill of lading, Export manifest, Letter of credit, Kind of Duties, Prohibition of Export and Import of Goods and Provisions regarding notified and specified goods, Import of Goods- Free import and Restricted import, Types of Import- Import of cargo, Import of personal Baggage, Import of stores, Tax Liability and Valuation of goods, computation of custom duty. Appeals and revisions.

CGST/SGST

Important terms and definitions under Central Goods and Service Tax Act 2017 and State and Service Tax Act 2017. Basics of GST. Meaning and scope of Supply, Levy and collection of Tax. Time and value of supply of goods and/or Services, Input Tax Credit, Transitional Provisions, Registration under CGST/SGST Act. Filing of Returns and Assessment, Payment of Tax including payment of tax on reverse charge basis, Refund under the Act. Maintenance of Accounts and Records, Composition Scheme, Job work and its Procedure, Various Exemptions Under GST. Demand and recovery under GST. Miscellaneous provisions. IGST-Scope of IGST, important terms and definitions for determining the place of supply and place of supply of goods and services, Zero rated supply.

F. Auditing:

Meaning, Objectives and Types of Audit. Internal Control, Vouching and Verification of Assets and Liabilities. Assurance and Audit standards, Audit Programme, Working Papers, Documentation, Audit Reports Audit of Companies Appointment, Removal, Rights, Duties and Liabilities of Auditor. Audit of Banks, Insurance Companies, Charitable Trust and Educational Institutions, Management Audit, Efficiency Audit, Cost Audit, EDP Audit, Environmental Audit, Social Audit, Performance Audit, Tax Audit and Audit of Accounting Information System.

G. Business Statistics and Operation Research:

Introduction, Definition and Functions of Statistics, Measures of Central Tendency, Dispersion, Skewness, Moments, Kurtosis, Sheppard's Correction and Conditions for applying it, Index Numbers, Analysis of Time Series, Interapolation and Extrapolation, Vital Statistics, Correlation and Regression Analysis, Multiple Regression, Association of Attributes, Statistical Decision Theory, Sampling, Test of Hypothesis, Sampling and Non-Sampling errors, Sampling distributions and Standard Error, Sampling Methods, Large and Small Sample Analysis, Sampling of Attributes and Variables, Test of Significance. Z-Test, T-Test, F-Test, Theoretical Frequency Distributions, Probability, Analysis of Variance and Design of Experiments. Linear Programming, Network Analysis-PERT and CPM, Game Theory, Replacement Theory. Statistical Quality Control Discriminant Analysis.

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20. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN BUSINESS ADMINISTRATION**

1: Theory and Practice of Management-

- Nature and Importance of Management, Process of Management, Managerial Roles, Functions of Management, Skills of Effective Manager, Schools of Management Thought.
- Planning, Managerial Decision making, MBO, Departmentalization, Power and Distribution of Authority.
- Leadership styles, Group Behavior and Team Building, Effective Communication System, Designing Control System, MIS.
- Motivation: Concepts, Contemporary Views on Motivation, Management of Change, Conflict Management, Management of Stress, Time Management, Total Quality Management.
- Global Environment of Management, Ethics in Management, Corporate Social Responsibility, Corporate Culture.
- Strategic Management: Role and functions of Strategic Management, Process of Strategic Management, Organizational Mission, Vision and Objectives, strategy and structure.
- Emerging trends in Management.

2: Organization Behavior-

- Organization Behavior: Definition, Scope, Importance, Concepts of organizational behavior, Models of organizational behavior.
- Individual behavior: Perception, Attribution, Personality, Attitude, Learning, Values, Motivation, Job satisfaction.
- Group Dynamics and Team Building: Theories of group formation, formal and informal groups, Importance of team building, Conflict- Definition, Traditional Vs Modern view of Conflict, Types of conflict- Intra personal, Interpersonal, Organizational, Constructive and Destructive Conflict, Conflict Management.
- Stress Management: Definition, causes, types, Management of stress, Interpersonal Relations.
- Personality- Development of personality attributes of personality, Ego state, Transactional Analysis.
- Organization Cultures and climate; Organization effectiveness.

3: Human Resource Management-

- Human Resource Management: Concept, Objectives, Scope and Importance of Human Resource Management, Human Resource Environment in India, Changing Role of HRM, Organization of Human Resource Department.
- Job Analysis and Job Design: Human Resource Planning, Job Analysis, Job Description and Specifications, Job Design Approaches.
- Recruitment and Selection: Factors affecting Recruitment, Sources of Recruitment (Internal and External) Selection Process, Psychological tests for selection, Requirement of a good test for selection, Interviewing, Placement and Induction.
- Human Resource Development: Theories of Learning, Learning interventions, Transfer of learning, Coaching and Mentoring.
- Performance Appraisal: Concept and Objectives, Traditional and Modern Methods, Promotion, Transfer, Separation.
- Compensation Management, Job Evaluation, Base Compensation and Supplementary Compensation, Innovations in Compensation Management.
- Career Planning, Succession Planning.
- Grievances Redressal: Mechanism and Procedure of grievance redressal.
- Trade Unions: Status, Regulations, Union and Management Relations.

4: Legal Aspects of Business-

- The Indian Contract Act, 1872- Essentials of valid contract, Offer and Acceptance, Consideration, Free consent, Void and Voidable agreements, Discharge of contract.
- The Sale of Goods Act, 1930- Sale and Agreement to sell, Conditions and Warranties, Transfer of ownership in goods, Performance of Contract.
- The Companies Act, 2013- Formation of company, Memorandum of Association, Articles of Association, Prospectus, Raising capital, Raising debt- funds, Book building, Management of companies, Board of Directors, Key management personnel; Dividend payment; Accounts and Audit; Winding up.
- Secretarial Practice- Board and Shareholder's meetings, drafting notices, Proposals, Conducting meetings, Recording minutes, corporate reports, Compliance reports.
- The Indian Trade Union Act, 1926.
- The Payment of Wages Act, 1936.

- The Minimum Wages Act, 1948.
- The Factories Act, 1948.
- The Industrial Disputes Act, 1947.
- The Consumer Protection Act, 1986.

5: Marketing Management-

- Marketing Management: Concept, Importance, Scope, Approaches to Marketing, Marketing process, Marketing Environment, Social, Legal and Ethical Issues in Marketing.
- Product Planning: Product Policy, Decisions, Brands and Trade Marks, Packaging, Product Planning in India, Brand Equity.
- Pricing: Factors to be considered in Pricing, Pricing Objectives and Strategy, Breakeven Analysis, Price Maintenance, Discount Policy, Special Selling Terms, Credit Terms.
- Channels of Distribution: Types of Channels, Evaluating the Major Channel Alternatives, Channels of Distribution in India.
- Advertising and Sales Promotion: Advertising Programmes, Advertising strategies, Media management, Impact assessment, Sales Promotion Tools and Techniques, Sales Forecasting, Direct Marketing, Event Management, Integrated Marketing Communication, Customer Relationship Management.
- Market Segmentation, Market Analysis, Market Research.
- Trends in Marketing: Service Marketing, Green Marketing, Digital Marketing, Rural Marketing, Social Media Marketing.
- Sales Management: Sales Planning and Organization, Salesmanship, Sales Evaluation and Control.
- Consumer Behavior: Buying Process, Buying Decision, Making Process, Perception, Attitude, Consumer involvement, Consumerism.
- Supply Chain Management: Logistic activities, Logistic mix, and Logistic organization.
- Export marketing: Regulation, Facilitation and Documentation.
- International Marketing: Nature, Importance, Scope, Domestic and international marketing, International marketing environment.

6: Corporate Governance and Business Environment-

- Social and Cultural environment of business- Company and Stakeholders, Ownership and Control, Shareholder activism, Diversity, Foreign Institutional Investors.
- Corporate Governance, Board of Directors- Composition. Independence, Board Committees- Role and functions.
- Social Responsibility of Business- CSR Strategies, CSR Activities.
- Business and Corporate Ethics- Code of ethics, Ethical dilemmas, Crony Capitalism, Whistle Blower Policy, Insider trading.
- Legal Environment of Business, Changing Dimensions of Legal Environment, Intellectual Property Rights.
- Environment Protection, Government Policy on Environment, Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981, Environment (Protection and Control of Pollution) Act, 1988.
- Globalization: Its implications, Competition Act, 2002.
- Spirituality and Management: Concept of spirituality, Indian Ethos and Values, Application of Yoga in Management, Meditation and Management of Stress.
- Concept of Entrepreneurship, Characteristics, Role of Entrepreneurship in Economic Development, Competence and Qualities of Entrepreneur Small Business Management: Characteristics.
- Ecommerce: Characteristics, Process, Key drivers of Ecommerce, Elements, Standards, Technologies, Ecommerce Models, Mobile Commerce.

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21. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN ECONOMIC ADMINISTRATION & FINANCIAL MANAGEMENT (E.A.F.M.)**

Unit – I- Theory of Economics & Growth:

- Concept, Nature and Scope of Micro and Macro Economics.
- Consumer Behaviour, Demand Analysis, Indifference Curve Analysis.
- Pricing under Various Market Conditions.
- Production Function and Theories of Production.
- Theory of Distribution - Theory of Rent, Wage, Profit and Interest.
- National Income- Concept, Methods, Components, Importance and Limitations.
- Consumption and Investment Function.
- Concept of Economic Growth and Development, Concept of Knowledge Economy (K-Economy).

Unit – II- Indian Economy:

- Problems of Indian Economy- Poverty, Population and Unemployment.
- Industrial and Agricultural Development, Industrial Policy.
- Privatisation and Globalisation.
- Public Private Partnership in Infrastructure Management.
- NITI Aayog.
- Rural Development in India.
- Cooperative Movement in India.
- Demonetisation and its Impact on Indian Economy.

Unit – III- Public Finance:

- Nature, Concept, Features and Importance of Public Finance.
- Cannons of Taxation.
- Direct and Indirect Taxes, Goods and Services Tax (GST).
- Impact and Incidence of Tax, Tax Evasion and Tax Avoidance.
- Theory of Maximum Social Advantage.
- Public Revenue, Public Expenditure, Public Debt and Deficit Financing.
- Union (Central) Budget: its Components and Major Challenges.
- Business Cycles: Concepts, Causes and Phases.

Unit – IV- Monetary Economics:

- Concept, Scope, Importance and Components of Money.
- Determinants of Demand for Money and Supply of Money.
- Monetary Policy – Concept, Objectives and Limitations.

- Techniques of Monetary Control.
- Monetary Policy in India.
- Inflation and Deflation – Concept, Kinds, Causes, Effects and Remedies.
- Money and Capital Market in India.
- Multiplier and Accelerator.

Unit – V- Economy of Rajasthan:

- Basic Features of Economy of Rajasthan.
- Economic Problems in Rajasthan.
- Agriculture – Problems, Prospects and Challenges.
- Industries – Problems, Prospects and Challenges.
- Tourism Development in Rajasthan.
- Economic Planning in Rajasthan.
- Special Area Development Programmes in Rajasthan.
- Environment Pollution and the Problems of Sustainable Development.

Unit – VI- Banking and Financial Institutions:

- Banks: Types, Functions and Importance.
- Reserve Bank of India, NABARD, Rural Banking.
- Banking Sector Reforms in India.
- E-Banking.
- Development Banking: IDBI, IFCI, SFCs, UTI, SIDBI.
- Challenges before Commercial Banks in 21st Century.
- Problems of Banking Sector in India.
- Financial Sector Reforms in India.

Unit – VII- International Finance and Foreign Exchange:

- Nature and Scope of International Finance.
- Foreign Direct Investment and Foreign Institutional Investors.
- International Capital Markets, GDRs and ADRs.
- Balance of Payment & Balance of Trade.
- W.T.O. and India.
- International Financial Institutions- IMF, IBRD, ADB, EXIM BANK and ECGC.
- Foreign Exchange Rate - Mechanism, Risk and its Management.
- Convertibility of Rupee, Devaluation of Currency.

Unit – VIII- Security Analysis and Portfolio Management:

- Management of Securities.
- Investment Spectrum.
- Primary and Secondary Market Operations.
- Credit Ratings in India.
- Government Securities Market.
- Theories of Portfolio Management.
- Mutual Funds, Investors' Protection.
- Regulation of Capital Market.

- Securities and Exchange Board of India (SEBI): Objectives, Functions and Role.

Unit – IX- Financial Management:

- Meaning, Nature and Scope of Financial Management, Concept of Financial Technology (FinTech).
- Capital Budgeting – Concept, Techniques and Importance.
- Cost of Capital.
- Capital Structure, Leverage.
- Ratio Analysis.
- Fund Flow and Cash Flow Analysis.
- Working Capital Management.
- Marginal Cost Analysis, Dividend Policy, Bonus Issue.

Unit – X- Quantitative Techniques:

- Correlation and Regression for Business Decisions.
- Probability – Basic Concepts, Different Approaches.
- Index Numbers, Time Series Analysis.
- Hypothesis: Definition, Types, Objectives, Steps in Hypothesis Testing.
- Sampling, Probability and Non-Probability Sampling, Sampling Methods.
- Chi-Square Test, Goodness of Fit.
- ANOVA (Analysis of Variance).
- Linear Programming, Queuing Theory, Game Theory, PERT and CPM

22. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN LAW**

UNIT-I: Constitutional Law:

Preamble, Fundamental Rights and Duties, Directive Principles of State Policy, President and his Powers, The Union & the State Judiciary, Parliamentary Privileges, Legislative Relations between the Union and the States, Services under the Union and States, Emergency Provisions and Amendment of the Constitution.

UNIT-II: Jurisprudence:

Meaning, Nature, Scope, Sources, Schools and Concepts.

UNIT-III: Public International Law:

Nature and Sources of International Law, Relation between International Law and Municipal Law, Subjects of International Law, Acquisition and loss of State Territory, Recognition, Extradition, Asylum, Intervention, Diplomatic Agents, Treaties, United Nations Organization and its Organs.

UNIT-IV: Human Rights:

Human Rights: Nature, Concept, Origin and Development, Classification, Protection of Human Rights under the Indian Constitution and Other Laws, Enforcement of Human Rights, The Protection of Human Rights Act, 1993.

UNIT-V: Environmental Law:

The Environment (Protection) Act, 1986; The Air (Prevention & Control of Pollution) Act, 1981, The Water (Prevention & Control of Pollution) Act, 1974, The Wild Life Protection Act, 1972.

UNIT-VI: Law of Torts

Torts: Nature, General Exceptions, Vicarious Liability, State Liability, Strict Liability, Negligence, Nuisance, Defamation, Malicious Prosecution and False Imprisonment.

UNIT-VII: Law of Crimes

Crimes: Mens Rea, Actus Reus, Preparation and Attempts, Abetment, General Explanations, General Exceptions, Joint and Constructive Liability, Offences against Public Tranquility, Offences against Human Body, Offences against Women, Offences against Property. Offences under The Information Technology Act, 2000.

UNIT-VIII: Law of Contract, Transfer of Property and Intellectual Property Rights

- **Contract:** General Principles of Law of Contract (Sections 1 to 75 of Indian Contract Act, 1872).
- **Transfer of Property:** General Principles of Transfer of Property (Sections 1 to 53 A of The Transfer of Property Act, 1882). Sale, Mortgage, Lease, Exchange and Gifts.
- **Intellectual Property Rights:** Meaning and Scope of Intellectual Property Rights, International and Regional Influence, TRIPS and Intellectual Property Rights in India.

UNIT-IX: Family Law

- **Hindu Law:** Relating to Marriage, Divorce, Adoption, Maintenance, Guardianship, Hindu Joint Family, Coparcenary and Succession.
- **Muslim Law:** Relating to Marriage, Dower, Divorce, Hiba, Pre-emption, Will and Wakf.

UNIT-X: Research Methodology

Research Methods, Formulation of Research Problem, Hypothesis, Data Collection and Report Writing.

23. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN HORTICULTURE**

1.Fruit Production-

Importance, scope and constraints of horticulture with especial reference to Rajasthan. Climate change and fruit production, biodiversity and conservation of fruits, export-oriented fruit production and cropping system of fruit production. Overview of commercial varietiesof regional, national and international importance, soil & climate, recent trends in propagation, rootstock influence, planting systems, root zone and canopy management, High Density and Meadow orcharding, Training & pruning, nutrient and water management, fertigation, roleofbio-regulators, abiotic factors limiting, physiological disorders- causesand their remedies, plant protection measures, maturity indices, harvesting, grading, packing, storage and ripening techniques of:-

A. Mango, banana, papaya, sapota, jackfruit, aonla, pomegranate, phalsa, ber, datepalm and other minor fruits viz. lasoda, mulberry, fig, tamarind and karonda.

B. Apple, plum, litchi, strawberry, grapes, guava, citrus, custard apple and other minor fruits viz. bael, jamun, ker, Pilu and khejri.

2.Propagation and Nursery Management-

Importance and scope of plant propagation and nursery management. Sexual propagation, cellular basis for propagation, apomixes, polyembryony, chimeras, principal factors influencing seed germination of horticultural crops, dormancy, hormonal regulation of germination and plant growth, seed quality, treatment, packing, storage, certification. Asexual propagation- rooting of cuttings, physiological, anatomical and bio chemical aspects of root induction in cuttings, layering-its principles and methods. Budding and grafting-selection of elite mother plants, methods, establishment of bud wood bank, stock, scion and inter stock relationship. Role of PGRs in propagation. Rejuvenation of old orchards through topworking, progeny orchard and scion bank. Micro propagation-principles and concepts. Techniques-in vitro clonal propagation, direct organogenesis, embryogenesis, micro grafting, meristem culture, shoot tip grafting/micro grafting. Nursery-types, structures, components, planning and layout. Nursery management and practices for healthy propagule productionand recent trends in propagation.

3.Breeding and Physiology of Fruit Crops-

History, development and importance of fruit breeding. Genetics of diversity, distributionand domestication of fruit species. Problems in fruit breeding Polyploidy, heterozygosity, polyembryony, parthenocarpy and seedlessness etc. Incompatibility and sterility system, Apomixis, Variability, germplasm and its selection. Breedingstrategies- clonal selection, bud mutation and chimeras, mutagenesis and its application. Hybridization, resistance breedingfor biotic and abiotic stresses. Role of genetic engineering and biotechnology in important fruitcrops. Parameters of growth and development, morphogenesis, effect of light, temperature, photosynthesis & photoperiodism, vernalisation. Physiology of flowering, pollination, fruit set and development.

4.Post-HarvestTechnologyofHorticulturalCrops –

Importance and scope of PHT & preservation. Maturity indices, harvesting, minimal processing, practices for specific market requirements, influence of post-harvest practices, enzymatic and non-enzymatic changes, respiration, transpiration of fruits & vegetables, physiology and biochemistry of fruit ripening factors leading to post harvest losses, pre- cooling, methods of storage-ventilated, refrigerated, MA & CA storage, physical injuries and disorders, packaging methods and transportation, principles and methods of preservation,food processing,

canning, fruit juice beverages, pickles, jam, jellies, sauces and ketchup, candies, preserves, dried and dehydrated products. Nutritionally rich products, fermented fruitsandbeveragesand processing of waste management. Recent trends in food preservation and value addition, food additives, ripening of fruits and vegetables. Food safety standards and food laws.

5.Vegetable Production-

Importance and scope of Vegetables. Classification of vegetables, Types of vegetable gardening, hydroponic, roof top vegetable gardening and protected cultivation of vegetable crops (Hi-tech horticulture), Introduction of organic vegetable farming, Brief about underutilized vegetable crops. General constraints in vegetable production, climatic and soil requirements, commercial varieties/hybrids, sowing/planting time and methods, seed rate and seed treatment, Plant Growth regulators, nutritional and irrigational requirements, inter cultural operations, weed control, mulching, physiological disorders, harvesting, post-harvest management, plant protection measures and economics of crop production.A. Tomato,brinjal, hot and sweet peppers, potato, okra, vegetable cowpea, vegetable cluster bean, cucurbitaceous crops, colocasia, sweet potato and green leafy vegetables.B. Cabbage, cauliflower, knol-khol, sprouting broccoli, exotic vegetables, carrot, radish, onion, garlic and peas.

6.Floriculture and Ornamental Gardening–

Importance and scope of floriculture in India. Varietal wealth and diversity, propagation, nursery management, pro-tray nursery under shade nets, transplanting techniques, soil and climatic requirements, precision farming techniques, water and nutrient management, weed management, training and pruning, pinching and disbudding, special horticultural practices, useofgrowthregulators, physiologicaldisorders andremedies, IPMand IDM,flowerforcing and year round flowering, harvesting techniques, post harvest handling and grading, packing and storage, value addition, concrete and essential oil extraction of cut/scented roses, chrysanthemum, gerbera, gladioli, tuberose, carnation, dahlia, Jasmine, marigold, gaillardia, ixora, lilies, aster and cut foliages. Landscape gardening, styles of gardening, different features of garden, arboretum, shrubbery, fernery, palmatum, arches and pergolas, edges and hedges, climbers and creepers, cacti and succulents, herbs, annuals and flower borders and beds, ground covers, carpet beds, establishment and maintenance of lawn. Bio-aesthetic planning. Eco-tourism and its relationship with landscaping, theme parks, indoor gardening, xeriscaping, hardscaping, waterscaping and non-plant components.

7.BreedingandSeedProductionofVegetableCrops–

Origin, botany, taxonomy, cytogenetics, breeding objectives, breeding methods (introduction, selection, hybridization, mutation), varieties and varietal characterization, resistance breeding for biotic and abiotic stress, quality improvement, biotechnology and their use in breeding in Solanaceous, cucurbitaceous, cole crops, legume, bulb and root crops etc. Scope of vegetable seed industry in India. Use of growth regulators and chemicals in vegetable seed production, methods of hybrid seed production, categories of seed, seed certification, seed standards, physiological maturity, seed harvesting and extracting, curing, drying, grading, seed processing, seed coating & pelleting, packaging and storage of seeds.

8.Spice, Plantation, Medicinal and Aromatic Crops–

National and international importance of spice, medicinal and aromatic crops. Climatic and soil requirement, commercial varieties, hybrids, sowing, plantingtime and methods, seed rate and seed treatment, nutritional and irrigation requirements, intercultural operations, weed control, mulching, physiological disorders, harvesting and post harvest management, plant protection measures, organic resource management, organic certification, quality control and cultivation of:

Spices: Clove, black pepper, cardamom, cinnamon, turmeric, ginger, coriander, fenugreek, cumin, fennel, ajowain, dill, celery, vanilla.

Medicinal crops: Isabgol, aloe, ashwagandha, gugal, senna, safed musli and opium poppy.

Aromatic crops: lemon grass, vetivar, basil, citronella, mint etc. Salient production techniques of coconut, cashew nut, tea, coffee, areca nut and rubber.

24. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN AGRICULTURAL ENGINEERING**

Unit 1: Soil and Water Conservation Engineering–

Hydrological cycle and measurement of its components; Precipitation-analysis of precipitation data; runoff estimation; Hydrograph analysis, Unit hydrograph Infiltration – Indices and equations, drought and it' s classification. Mechanics of soil erosion - wind and water erosion: soil erosiontypes, factors affecting erosion; Soil loss measurement techniques; biological and engineering measures to control erosion; terraces and bunds; vegetative waterways; gully control structures, drop, drop inlet and chute spillways; earthen dams. Water harvesting and its techniques. Universal Soil Loss Equation. Watershed Management, watershed characterization and land use capability classification; water budgeting in watershed, rainwater harvesting, check dams and farm ponds. Darcy's Law, steady and unsteady flow in confined and unconfined aquifers.

Unit 2: Irrigation and Drainage Engineering–

Water requirement of crops; consumptive use and evapotranspiration; measurement of infiltration, soil moisture & Water requirement. Design of irrigation channels and underground pipelines; irrigation scheduling; surface, sprinkler and micro irrigation methods, designand evaluation of irrigation methods; irrigation efficiencies. Measurement of irrigation water. Classification of pumps; pump characteristics; pump selection and installation. Planning, design and layout of surface and sub-surface drainage systems; Drainage coefficient; leaching requirement.

Unit 3: Agricultural Structures and Process Engineering-

Site selection, design and construction of farm steps – farm house, cattle shed, dairy barn, poultry house, goat housing, machinery and implement sheds, storage structure for food grains, feed and forage, construction of silos. Green house technology: Introduction of green and net house, Types of Green Houses. Planning and design of greenhouses, Design criteriaof green house for cooling and heating purposes. Green house equipment, materials of construction for traditional and low cost green houses. Importance of Engineering properties such as physical, thermal, rheological and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation. Basic concepts of cleaning & grading, drying and dehydration. drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, circulatorydryerand solardryer). Material handling equipment; conveyer and elevators, their principle, working and selection.

Unit 4: Dairy Processing Engineering –

Dairy development in India, Engineering, thermal and chemical properties of milk and milk products, Process flow charts for product manufacture, Unit operation of various dairy and food processing systems. Cleaning of dairy utensils, Principles and equipment related to receiving of milk, pasteurization, sterilization, homogenization, centrifugation and cream separation. Preparation methods and equipment formanu facture of cheese, paneer, shrikhand, butter and ice cream, Filling and packaging of उपसेा and milk products; Spray and roller drying; Dairy plant design and layout, Plant utilities.

Unit 5: Farm Power

Sources off arm power, Status off arm mechanizationin India.Thermodynamic principles of I.C. engines; I.C. engine cycles; Engine components, diesel vs petrol ignition engines, two stroke & four stroke engines, various systems of diesel and petrol engines– fuel supply, cooling, lubrication, ignition and power transmission. Clutch & Breaks.Calculation of power, Torque heat load & power losses. Power tiller, farm tractors and types, design,

mechanical and power steering, tractor chassis mechanics, hitching systems and hydraulic control, for tractors, automatic position control, draft control system used in tractors, types of dynamometers, tractor testing.

Unit 6: Farm Machinery

Animal and power operated equipments – (design, construction, operation & maintenance) of tillage, seeding, land development, sowing, calibration of seed drills, zero ferti-drills, intercultivation, planters – corn planters, potato planters, sugarcane planters, rice trans planters, vegetable trans planters, Plant protection equipment – manual and power operated sprayers and dusters, calibration of sprayers, harvestingequipment – mower, reaper, combine harvester, potato harvester, thresher- different types, installation, operation and safety considerations, calculation of field capacity, field efficiencyand cost analysis of implements.

Unit 7: Renewable Energy

Classification of energysources, contribution of these sources in agricultural sector, biomass, typesofbiogasplants –design, construction, operation and maintenance; gasifies, biogas, bio alcohol, biodiesel and bio oil production and their utilization, Briquetting. Introduction of solar energy, collection and their application, solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation, solar photo voltaic system and their applications. Solar radiation and its measurements. Introduction of wind energyand their applications. Construction and workingof wind mill, applications of wind energy in irrigation.

Unit 8: Surveying and Leveling

Measurement of distance and area; instruments for surveying and leveling; chain surveying, Compass Survey, methods of traversing; measurement of angles and bearings, plane table surveying; Leveling; theodolite, traversing; contouring; total station, introduction to GPS survey.

Unit 9: Computer Applicationin Agriculture engineering-

Application of microprocessors in data acquisition and control of agricultural engineering processes. Computer introduction, input / output devices, central processing unit, memory devices, operating systems, processors, keyboards and printers. Use of ICT in agricultural engineering, Drone operated aerial spray.

25. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN AGRICULTURAL ECONOMICS**

Unit 1: Economic Theory –

Basic concepts of micro and macroeconomics; economic theory, nature and tools ofeconomic analysis; theory of consumer behaviour; production theory; costs theory; theory of firm; price determination under different market forms, price discrimination, effects of taxation and subsidies under different market conditions monopoly, duopoly, Cournot model, oligopoly; welfare economics; market failure; nature of macroeconomic analysis; national income; consumption; saving and investment, employment, theory of business cycle, functions and demand for money; inflation; income and interest determination; IS-LM functions; general equilibrium analysis; monetary and fiscal policies, economic reforms.

Unit 2: Agricultural Development and Policy–

Role of agriculture in economic development; economic growth and development; present development challenges, theories of development; role of economic, technological, social, political and environmental factors; Green GNP, nature, sources and impact of technological change; Theories of agricultural development; growth models – Harrod-Domar, Neo- Classical, Rostow's growth stages, five-year plans and agriculture; land reforms; institutions and development; agricultural growth analysis determinants of agricultural growth and their measurements; features of planning in capitalists, socialist and mixed economies; role of infrastructure and technological change; agricultural policy analysis and reforms – input and output price policy, credit policy etc; policies and programmes for development of agro- industry, dairy and fisheries; policy options for sustainable agriculture development, measurement of poverty and poverty alleviation programmes.

Unit 3: Natural Resource and Environmental Economics–

Characteristics and classification of natural resources, sustainability issues in natural resources, sources and types of pollution – air, water, solid waste, land degradation environmental and economic impacts; property rights, externalities, transaction costs, needfor collective action, role of economics in natural resources accounting, planning, management and policy formulation; social welfare function; allocation of renewable and non-renewable resources (forests, fisheries, minerals, water, land etc.) under various market structure; valuation of non-market resources; government programmes for conservation and development of natural resources; environmental regulations.

Unit 4: Production Economics-

Concepts of production economics; basic principles of farm management; marginal returns, opportunity cost, input-output, output-output and input-input relationships; time comparison and comparative advantage, cost principles, farm efficiency measures and financial analysis; farm planning and budgeting; farm records; management of risk and uncertainty in agriculture; diversification and insurance in agriculture and allied sectors; yield gap analysis, forms, characteristics and applications of production functions – linear, quadratic, squareroot, spillman, cubic, semi-log, Cobb-Douglas, Constant Elasticity of Substitution (CES), Variable Elasticity Of Substitution (VES) etc; cost and profit functions; derivation of supply and factor demand functions from production and profit functions; optimization of resource allocation, resource-use efficiency and returns to scale; frontier production function; total factor productivity; decision making under risk and uncertainties.

Unit 5: Agricultural Finance–

Importance of agricultural finance; objectives, functions and principles of agriculturalfinance; sources of capital acquisition; rural credit structure- demand, supply, credit gap; classification of agricultural credit – sources and forms; cost of credit/ capital; credit appraisal- 3Rs, 3Cs and 7Ps of credit, estimation of credit requirement; reforms inagricultural credit policy; financial system – NABARD, commercial banks, cooperatives- cooperative movement in India- organization, structure and development of different types of cooperatives in India, RRBs,

Micro-Finance Institutions (MFIs), NGOs, and SHGs; innovations in agricultural financing microfinance, Kisan credit cards; e-banking.

Unit 6: Project Management –

Definition and characteristics of projects; need for project approach for agricultural development; SWOT analysis and project identification, project life cycle, project feasibility- technical, financial and economic feasibility; social cost-benefit analysis; project riskanalysis; project scheduling and resource allocation; financial and economic appraisal/measures, choice of discount rate, Net Present Value (NPV), Internal Rate ofReturn (IRR), Benefit-Cost Ratio (BCR); networth analysis – PERT & CPM; fundamentalsof accounting and book-keeping; analysis of financial statements- balance sheet, income statement, cash flow statement, etc.

Unit 7: Agricultural Marketing and Price Analysis–

Concepts of agricultural marketing; marketing functions- buying and selling, processing, transportation, financing, grading, market information, storage and warehousing; channels of marketing agricultural produce-price spread and efficiency, structure, conduct and performance analysis; market integration; marketing institutions- role and functions; government interventions including administered price policy; regulated markets, farmer- producer companies, market segmentation, supply chain and value chain analysis in agricultural commodities, buffer stock operations, price stabilization measures and policies etc; use of information technology and market intelligence, price forecasting, marketing of agricultural inputs, role of private sector in input and output marketing; forward trading and futures market; e-NAM and marketing under e-NAM, commodity boards and contract farming; marketed surplus models; competitive and comparative advantage in trade, trade policies, models and agreements; regulations and reforms for marketing and trade, WTO,SPS measures and competitiveness; ecological concerns and marketing ethics.

Unit 8: Operations Research and Research Methods–

Importance and scope of research in agricultural economics, objective, types and process of research; role and uses of quantitative technique in business decision making; sampling techniques and sample size determination; sampling and non sampling errors; index numbers; hypothesis- meaning, types and testing. Data analysis, ANOVA, factor analysis, measures of central tendency, measures of variation, skewness and kurtosis; correlation and regression, discriminant and dummy variable analysis; OLS, MLE estimation- assumptions and their violations, properties; simultaneous equation systems- identification and estimation; Linear programming objective, assumptions, formulation of linear programming problem, simplex method- primal and dual problems, role of business decision making models.

Unit 9: Econometrics-

Nature and scope of econometrics: relationship between economic theory, mathematical economics, models and econometrics, methodology of econometrics; regression analysis; two variable regression– assumptions, estimation and interpretation; assumptions and estimation of OLS and their properties – extensions to multi-variable models; multiple regression, estimation and interpretation; violation of assumptions– identification, consequences and remedies for multi-collinearity, heteroscedasticity, autocorrelation; data problems and remedial approaches; model mis-specification; use of dummy variables; types and estimation of simultaneous equation models; identification problem.

26. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN AGRICULTURAL EXTENSION AND COMMUNICATION**

Unit 1: Fundamentals of Extension Education and Communication

Extension Education - concept, principles and approaches; extension education, adult education and continuing/distance education;Community Development, MGNREGA and Viksit Bharat-GRAM G Act; Role of agricultural extension in different sectors of agriculture and rural development; National Agricultural Extension System and Reforms; Public extension systems- ATMA and KVK; National Mission on Agricultural Extension and Technology; Private extension system; Pluralism in extension; Research-Extension-Farmer Interface- Farming System Research & Extension; Agricultural Knowledge and Information System (AKIS); Farmers Field School, Technology Assessment and Refinement; Programmes and schemes for agriculture, animal husbandry, dairy, fisheries, and rural development implemented by Govt. of India; Concept, elements and models of communication; Credibility, fidelity, empathy and feedback in communication; Problems and barriers in communication ; Group and mass communication, Interpersonal and Intrapersonal communication, social networks in communication; Public speaking, Human behavioural dimensions in extension education- perception, attitude and emotions;Personality and motivation; Understanding of basic rural institutions, culture and norms; Social change process.

Unit 2: Extension Methods & Agricultural Journalism

Human behavioural dimensions in extension-behaviorism, cognitivism, constructivism; Factors influencing human behaviour; Domains of learning-cognitive, affective and psychomotor; Learning theories; Experiential learning; Concepts and elements of teaching and learning processes; Principles and types of learning; Edgar Dale's Cone of experience; Classification and features of different extension methods; Selection, planning and use of Extension methods like - demonstration, exhibition, farmersfairs, field days, tours, extension literature, etc.; Preparation and presentation of different projected and non-projected audio-visual aids; Basics of agricultural journalism; Types of publications-bulletins; Folders, leaflets, booklets, newsletters, popular and scientific articles; Basics of writing, readability andits indices: Preparation of radio/video script; Principles of photography and its use in extension, traditional media for communication.

Unit 3: Information Communication Technologies

Concept of ICT and its role in agriculture; ICT tools-print and electronic media, community/ internet radio, e-mail, Internet, use of multimedia, use of mobile apps, video and teleconferencing, touch screens, micro-computers, web technologies and information kiosks; Social media- features and applications; Websites, portals, expert system, Decision Support Systems (DSSs) and apps related to agriculture, dairy, veterinary, fishery, and marketing, etc.; m-learning, e-learning; e-learning platforms- MOOCs, OER, etc.; Digital agriculture- applications of artificial intelligence (AI), IoT, GIS, GPS, Blockchain Technology; Marke tintelligence and information systems in agriculture, networking system of information and challenges in the use of ICT; Types of network-PAN, LAN, WAN, human computer interactions- meaning; Basic principles of multimedia learning.

Unit 4: Training & Human Resource Development

Concept of human resource management and its importance in agricultural development; Training Need Assessment- concept, methods and impact assessment; Training- types; training process- different phases of training; Models of training; Designing training curriculum; Training strategies- academic strategy, laboratory strategy, activity strategy, personal development strategy, organizational development strategy; Training methods; Factors determining selection of methods; Need ,principles and process of capacity development; Levels of capacity individual, organization, enabling environment; Human resource development- manpower planning, role analysis, role efficacy, induction training, job enrichment, self- learning mechanisms, counseling, mentorship, performance appraisal and feedback; Evaluation of training.

Unit 5: Research Methodology in Extension Education

Types of social research. Hypothesis; Variables-concept and types; Research design- MAXMINCON Principle; Types of research designs-experimental, quasi-experimental, cross-sectional, longitudinal, case study, comparative; Mixed methods designs; Levels of measurement; Reliability and Validity of instruments; Sampling designs- probability and non-probability sampling; Methods of observation- interviews and interviews schedules, semi-structured interviews, sociometry, semantic differential, Q methodology ; Focus group discussion; Participant and non-participant observation; Techniques of scale construction- paired-comparison, equal appearing interval, summated rating; Item analysis; Scalogram analysis; Development of knowledge test; Methods of constructing indexes; Qualitative research; Parametric and non-parametric statistics for data analysis in social research; Tests of significance; Processing of data, coding-tabulation; Analysis and interpretation; Report writing; Ethics in social research.

Unit-6: Program planning, evaluation and impact assessment

Program planning and development-concepts ,steps and principles; Logic framework approach (LFA) Program Evaluation- concept, objectives,,steps, principles and criteria ; Types of Evaluation; Objective oriented, management oriented; Context evaluation, input evaluation, process evaluation, product evaluation, consumer oriented evaluation, expertise oriented evaluation, adversary oriented evaluation, naturalistic and principal oriented evaluation, Goal free evaluation and meta evaluation; Evaluation models- Logic model, Kirkpatrick's model, Stufflebeam's model; Programme management techniques; SWOT analysis, Bar Charts, Programme Evaluation and Review Technique (PERT), Critical PathMethod (CPM), differences. between PERT and Impact assessment vs impact evaluation; Social impact assessment -stages and approaches; Quantitative and qualitative techniques for impact assessment.

Unit 7: Extension Management and Organizational behaviour

Concept and principles of administration and management, classical and modern theories. Functions of management- planning, organizing, staffing, directing and leading, controlling, coordinating, reporting and budgeting; Leadership-identification, styles and theories; Decision-makinginorganization; Organisational effectiveness, organizational climate, organizational development, job satisfaction and morale; Time management; Performance appraisal; methods of coordination; Management by Objective (MBO) and Total Quality Management (TQM); Project Management Techniques; Organizational Communication-; Organizational climate, Characteristics of organizational culture, creating and maintaining organizational culture; Organizational change, individual and group behaviour in organization; Team building process; Problem solving techniques, & negotiation, motivational theories & techniques, Transactional analysis; Managing Stress, conflict and Emotions; Creativity-concept and process, mobilization and empowerment skills; Concept and strategies in mobilization, concretisation and empowerment of rural people.

Unit 8: Entrepreneurial Development

Entrepreneurship- concepts, traits, classification and characteristics. Entrepreneurial motivation- need for power; Achievement, affiliation and autonomy; Simulation games and exercises for developing entrepreneurial competencies- risk taking, self- efficacy, creativity, achievement planning, influencing process, problem solving; Entrepreneurship development cycle; Entrepreneurial environment- internaland external factors influencing emergence of entrepreneurship; Barriers to entrepreneurship; Women Entrepreneurship, social entrepreneurship; Programmes and agencies promoting entrepreneurship for youth ; Agripreneurship-agri-clinics, agribusiness centers and agro-tourism. Micro Finance, start-ups, SHGs, FPO, cooperatives.

Unit 9: Agricultural Innovation System and extension approaches

Innovation-concepts and attributes, Innovation generation process, Role of innovation brokers, scaling up knowledge for innovation, identification, characterization, documentation, validation and upscaling of ITKs and grassroots innovations, Diffusion of innovations- concept, elements, models, and theories, Innovation development process (technology generation and promotion), Adoption concept, process, models, adopter

categories and their characteristics, Factors influencing adoption, Change agents, Stages ofinnovation-decisionprocess, Consequences of innovations, New approaches and domains of extension- demand-driven extension, market-led extension (value chain extension), farmers-led extension, group-led extension, public-private partnership based extension system, Engagement of voluntary and farmers' organizations in extension, Privatization of extension, Nutri-sensitive agriculture, and urban and peri- urban agriculture, Extension and Sustainable Development Goals (SDGs),

Unit 10: Gender Sensitization and Empowerment

Concepts of Gender- gender roles, gender equality, gender equity; Gender relations, gender balance, gender bias, gender blindness, gender needs- practical and strategic, Gender mainstreaming- approaches and methodsGender empowerment measures; Gender impact assessment; Gender budgeting; Gender specific technologies; Gender dimensions in food and nutritional security: Women's empowerment- principles, framework and dimensions; Strategies and barriers for women empowerment; Empowerment through SHG, financial inclusion, micro-finance, internet and education; Public-private partnership forthe economic empowerment of women; Digital women rights, constitutional provisions; Global and national policies and mission for empowerment of women; Government programmes and schemes for women.

27. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN AGRONOMY**

Unit 1: Crop Ecology and Agrometeorology–

Principles of crop ecology; Ecosystem concept and determinants of productivity of ecosystem; Physiological limits of crop yield and variability in relation to ecological optima; Crop adaptation; Climate shift and its ecological implication; Agro-ecological and agro- climatic regions of India and Rajasthan; Geographical distribution of cereals, legumes, oilseeds, vegetables, fodders and forages, commercial crops, seed spices, medicinal and aromatic plants; Adverse climatic factors and crop productivity; Photosynthesis, respiration, net assimilation, solarenergyconversion efficiencyand relativewatercontent, light intensity, water and CO2 in relation to photosynthetic rates and efficiency; Physiological stress incrops; Remote sensing: Spectral indices and their application in agriculture, Atmospheric weather variables; Atmospheric pressure, Wind, types of wind, daily and seasonal variationof wind speed, cyclone, anticyclone, land breeze and sea breeze; solar radiation, short wave, long wave and thermal radiation, net radiation, albedo; Atmospheric temperature, Atmospheric humidity, process of condensation, Precipitation, process and types of precipitation ; Artificial rain. Monsoon-importance in Indian agriculture, Weather hazards - Agriculture and weather relations; Weather forecasting-types and theiruses. Climatechange, global warming. Greenhouse effect.

Unit 2: Weed Management –

Scope and principles of weed management; Weeds classification, biology, ecology and allelopathy; Crop weed competition, weed threshold; Herbicides classification, formulations, mode of action, selectivity and resistance; Persistence of herbicides in soils and plants; fate of herbicides, adjuvants, herbicidal resistance, Application methods and equipment; Biological weed control, bio- herbicides: Integrated weed management; Special weeds, parasitic and aquatic weeds and their management in cropped and non-cropped lands; weed control schedules in field crops, vegetables and plantation crops; Role of GM crops in weed management.

Unit 3: Soil Fertility and Nutrient Management–

Soil fertility and productivity - factors affecting, history of soil fertility and fertilizer use; Concept of essentiality of plant nutrients, their critical concentrations in plants, nutrient interactions, diagnostic techniques with special emphasis on emerging deficiencies of secondary and micro-nutrients; Fertilizer materials including liquid fertilizers, their composition, mineralization, availability and reaction products in soils; Water solubility of phosphate fertilizers; Slow release fertilizers, nitrification inhibitors and their use for crop production; Principles and methods of fertilizer application; Integrated nutrient management and bio-fertilizers; Agronomic and physiological efficiency and recovery of applied plant nutrients; Criteria for determining fertilizer schedules for cropping systems direct, residual and cumulative effects; Fertilizer related environmental problems including ground water pollution; Site-specific nutrient management.

Unit 4: Dryland Farming and Watershed Management–

Concept of dry land farming; dryland farming vs rainfed farming; History, development, significance and constraints of dryland agriculture in India; Climatic classification and delineation of dry land tracts; Characterization of agro-climatic environments of drylands; Rainfall analysis and length of growing season; Typesof drought, drought syndrome, effect on plant growth, drought resistance, drought avoidance, drought management; Mulches, antitranspirants, Crop Planning including contingency, crop diversification, varieties, cropping systems, conservation cropping and mid-season corrections for aberrant weather conditions; Techniques of moisture conservation in-situ to reduce evapotranspiration, runoff and to increase infiltration; Rain water harvesting and recycling concept, techniques and practices; Timelines and precision key factors for timely sowing, precision in seeding, weed control; Fertilizer placement, top dressing and foliar application, aqua-fertigation; Concept and importance of watershed management in dryland areas.

Unit 5: Sustainable Land Use Systems–

Concept of sustainability; Sustainability parameters and indicators; Conservation agriculture; Alternate land use systems; Types, extent and causes of wasteland; Shifting cultivation; Agro forestry systems; Agricultural and agro-industrial residues and its recycling, safe disposal; Allelopathyand biomass production, Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance, Cropping system and pattern, multiple cropping system, crop diversification, Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages.

Unit 6: Agricultural Statistics –

Frequency distribution, standard error and deviation, correlation and regression analyses, co- efficient of variation; Tests of significance-t, F and chi-square; Data transformation; Designof experiments and their basic principles, completely randomized, randomized block, split plot, strip-plot, factorial and simple confounding designs; Efficiency of designs; Methods of statistical analysis for cropping systems including intercropping; Pooled analysis.

Unit 7: Crop Production-

Crop production techniques for cereals, millets, legumes, oilseeds, fiber crops, sugarcane, tobacco, fodder and pasture crops including origin, history, distribution, adaptation, climate, soil, season, modern varieties, fertilizer requirements, intercultural operations, water requirement. weed management, quality components, industrial use, economics and post- harvest technology.

Unit 8: Soil Water Relationship–

Soil and water as vital resources for agricultural production; Occurrence of groundwater, groundwater aquifers, exploration of groundwater; Hydrological cycle; Soil-plant water relationship; Fate of rain water received at the soil surface, run off and in filtration reciprocity,factors affectinginfiltration, means to enhanceinfiltrabilityofsoil, mechanical and biological means to reduce runoff and soil loss; Cropping patterns, alternate land use and crop diversification in rainfed areas, Soil water relations, water retention by soil, soil moisture characteristics, field capacity, permanent wilting point, plant available water and extractable water; Soil irrigability, classifications, factors affecting profile water storage; Determination of soil water content, computation of soil water depletion, soil water- potential and its components, Movement ofsoil water under saturated and unsaturated waterflow; Fieldwater budget, water gains and water losses from soil, deep percolation beyond root zone, capillary rise; Evapotranspiration (ET), scope for economizing water, measures for reducing direct evaporation from soil and crop canopies; Soil physical properties in relation to plant growth and development; Erodability of soils and their prevention.

Unit 9: Plant Water Relationship-

Plant water relations: Concept of plant water potential, cell water relations, plant water potential and its components; Significance of osmotic adjustment, leaf diffusive resistance, canopy temperature, Water movement through soil – plant atmosphere systems, uptake and transport of water by roots; Development of crop water deficit, crop adaptation to water deficit, morpho physiological effect of water deficit; Drought tolerance, mechanisms of drought tolerance, potential drought tolerance traits and their measurements, management and strategies to improve crop productivity under different patterns of drought situations of limited water supplies; Effect of excess water on plant growth and production; Types of droughts, drought indices.

Unit 10: Irrigation Water Management-

History of irrigation in India; Major irrigation projects in India; Water resources development; Crop water requirements; Concepts of irrigation scheduling, Different approaches of irrigation scheduling; Soil water depletion, plant indices and climatic parameters; Concept of critical stages of crop growth in relation to water supplies; Crop modelling, crop coefficients, water production functions; Methods of irrigation viz. surface

methods, overhead methods, drip irrigation and air conditioning irrigation, merits and demerits of various methods, design and evaluation of irrigation methods; Measurement of irrigation water, application and distribution efficiencies; Management of water resources (rain, canal and ground water) for agricultural production; irrigation legislation; Water quality, conjunctive use of water, irrigation strategies under different situation of water availability, optimum crop plans and cropping patterns in canal command areas; Socio-economic aspects of on-farm water management; Irrigation water distribution, Irrigation efficiencies; Interaction between irrigation and fertilizers.

Unit 11: Management of Problematic Soils and Water-

Problem soils and their distribution in India and Rajasthan; Salt-affected, acidic, water logged soils; Ground water resources, water quality criteria and use of brackish waters in agriculture; Reclamation of problem soils, role of amendments and drainage; Crop production techniques in problem soils-crops, varieties, cropping system and agronomic practices; Excess salt and salt tolerant crops; Drainage for improving water logged soils for crop production; quality of irrigation water, Crop production and alternate use of problematic soils and poor qualitywater for agricultural production; Amelioration of salt affected soils.

Unit 12: Organic Farming-

Natural farming, Zero budget natural farming- concept, components, principle, Organic farming – concept, definition, relevance and future prospects; principles; organics and farming standards; selection and conversion of land, soil and water management - land use; Organic farming and water use efficiency; soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures, bio-fertilizers and Farming systems, Control of weeds, diseases and insect pest management, biological agents and pheromones, bio-pesticides. inspection, certification, labelling and accreditation procedures; organic farming and national economy.

Unit 13: Modern Concepts in Crop Production-

Crop growth and development, growth curves, Quantitative agro-biological principles and inverse yield nitrogen law; Mitscherlich equation, Baule unit., physiology of grain yield in cereals; plant population and planting geometry in relation to different resources, ideal plant type. Scientific principles of crop production; soil plant relations; yield and environmental stress, use of growth hormones and regulators for better adaptation in stressed condition. modern concept of till age; determining the nutrient needs for yield potentiality of crop plants, precision agriculture. use of GIS, GPS and remote sensing in modern agriculture.

28. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN ANIMAL SCIENCE**

Unit 1 : General

Present status and future prospects of livestock and poultry development in India and special focus on Rajasthan. Effect of industrialization and mechanization of agriculture in livestock sector.

Breed study on the aspect of phenotype appearance, lactation length, milk production and adaptation of following breeds -

Cattle- Gir, Sahiwal, Haryanwi, Mewati, Tharparkar, Nagori and other common breeds. Buffalo- Murra, Jafarawadi, Bhadawari, Surti and Mehasana.

Sheep-Malpura, Chokala, Magra, Bikaneri and Pugal.

Goat- Beetal, Jamanapari, Black Bangal, Pashmina Kashmiri. Camels- Bikaneri, Jaisalmeri, Kutchi, Mewari and Jalori.

Poultry- WLH, Rhode Island Red, Sussex, Cornish Windottle, Menarka, Australorp, Asiatic breed Asil, Kadaknath, Chatgaon, exotic and other famous breeds like Holestein Friesian, Jersey, Red Sindhi, exotic sheep breed, Rambouillet, Merino etc. Various livestock programmes conducted by ICAR in India and Rajasthan.Domestication andbehavior ofanimals. Mating behavior of animals and poultry. Social order in farm animals. Adaptation of different breeds of livestock and poultry cloning in animal and advances in Embryo Transfer Technology (ETT) in cattle.

Unit 2: Feeding Management-

Nutrients and their functions. Nutritional requirements and feeding managements of different categories of livestock and poultry. Feed additives including antibiotic and probiotic feeding in farm animals and poultry. Formulation and compounding of rations for various categories of livestock and poultry. Least cost ration formulation. Systems of feeding livestock and poultry. Feeding standards for livestockandpoultry. Feed conversion efficiency of various categories of livestock and poultry. Processing and storage of conventional and non-conventional feed ingredients. Agro-industrial by- products in animal and poultry feeds. Feeding of various categories of animals on TDN/DCP & Energy based.

Unit 3 : Reproduction Management-

Reproductive systems of farm animals and poultry. Climate and nutrition affecting reproductive performance in farm animals. Importance of early pregnancy diagnosis. Methods of heat detection. Artificial insemination. Oestrus prediction and synchronization. Causes of disturbed fertility and its prevention in farm animals. Factors affecting reproductive efficiency. Summer and winter management problems and their solutions.

Unit 4: Shelter Management-

Housing systems, selection of site and lay out of animal and poultry houses. Space requirement for livestock and poultry. Housing designs in different agro-climatic regions. Macro and micro-climaticchanges affectingdesigns of animal and poultry houses. Construction of cheap animal and poultry housing utilizing local resources. Automation in livestock farming. Disposal of animal wastes under urban and rural conditions. Disposal of carcasses. Open and close housing TXT and FXF system with merits and demerits.

Unit 5: Health Management-

General approach to livestock health programmes. Prevention of diseases. Hygiene and sanitation on animal and poultry farm. Symptoms of illhealth, important infectious diseases of livestock and poultryand their control.

Vaccination schedules in animals and poultry. Internal and external parasites and their control. Accidental health disorders and their control. Common disinfectants used on animal farms. Concept of first aid at farms. Segregation and quarantine management for large animals and birds. Quarantine Act, Zoonotic diseases, labour health programme.

Unit 6: Animal Husbandry and Management of farm animals-

Role of livestock in Indian Economy with special reference to Rajasthan. Animal Husbandry in India- present and future, Cattle, buffalo, sheep, goat, camel production trends and factors affecting them. Identification, castration, dehorning, ageing, handling and restraining of farm animals, milk and its composition, clean milk production, hormonal regulation of lactation. Care of the cow and calf during and after parturition. Management strategies for reducing mortality in farm animals. Management to improve productive and reproductive efficiency in livestock.

Unit 7: Production and Management of Poultry-

Brooding of chicks. Management of growing, laying and breeding flocks. Shelter management. Biosecurity and environmental considerations. Cage layer management and well being of poultry. Light management in poultrysheds. Hatchery business management. Management duringstress. Chick sexing. Maintenance of poultry farm records. Health and sanitation problems. Prevention and disease control. Poultry shows. Handling care of table eggs and processing of birds for meat. Moulting in Poultry and effect of lighting on Production.

Unit 8: Animal Nutrition and Conservation-

Composition and classification feed stuffs, roughages. Nutritive value of feeds and fodders, conservation and preservation of feeds and fodders, annual and perennial fodder crops, pasture development and management. The digestive organs, digestive process of Rumiants. Desirable characteristics of aration, computation of ration for cattle and buffaloes, balanced ration. Strategies for round the year fodder production.

Unit 9: Breeding Management-

Basic principles of inheritance. Concept of heritability, repeatability and selection. Important methods of selection and systems of breeding in farm animals and poultry. Importance of maintaining breeding records and their scientific interpretation.

Unit 10: Economics and Marketing of Livestock and Poultry and their products

Economic principles as applied to livestock and poultry production. Production functions. Farm size, resources and product combinations. Cost concepts. Effect criteria in use of resources in livestock production. Maintenance of evaluation of different production records. Insurance and financing of livestock enterprises. Project formulation for setting up livestock and poultry farms. Different approaches to marketing of livestock and poultry products. Present status of cattle fairs and methods of selling livestock in India and Rajasthan. Market news and information. Determination ofpricesof livestock and poultry products. Vertical integration in livestock products industries. Basic principles of inheritance. Concept of heritability, repeatability and selection. Important methods of selection and systems of breeding in farm animals and poultry. Importance of maintaining breeding records and their scientific interpretation.

29. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN ENTOMOLOGY**

Unit 1: Systematics-

History and development of Entomology, evolution of insects, position of insects in the animal world, insect dominance. Characteristics of phylum Arthropoda, structural features of important arthropod groups such as Trilobita, Chelicerata and Mandibulata, structural features of important classes of phylum Arthropod viz. Arachnida, Crustacea, Chilopoda, Diplopoda and Hexapoda. Classification of insects upto order level, habits, habitats and distinguishing features of different order and important families of economic importance.

Unit 2: Morphology-

Body wall, its structure. Head and head appendages, types of mouth parts, antennae, their structure and types. Thorax structure, thoracic appendages: legs and their modification. Wings, their modification and venation. Abdomen; structure, abdominal appendages. External genitalia, general structure and modification.

Unit 3: Embryology, Internal Anatomy and Physiology-

Embryonic and post embryonic development, physiology of ecdysis. Growth and metamorphosis, general features and types of larvae and pupae. Structure, function and physiology of digestive, circulatory, respiratory, reproductive, nervous and excretorysystems. Sense organs; structure and types. Insect food and nutrition; minerals, carbohydrates, proteins and amino acids, lipids, vitamins and their role in growth and development, Extra and intra cellular microorganisms and their role in digestion, artificial diets.

Unit 4: Ecology-

Concept of ecology, Environment and its components- biotic and abiotic factors and their effects on growth, development, population dynamics, distribution migration and dispersal. Principle of biogeography and insects biodiversity. Biotic potential, carrying capacity and environmental resistance. Ecosystems, agroecosystems analysis, their characteristics and functioning. Intra and inter specific relationship; competition, predator-preyand host-parasite interactions, ecological niche and habitat. Life table studies, population models. Tropic level, food chain and food web. Food pyramids. Arthropod population monitoring, surveillance and pest forecasting. Diapause and causes of pest out breaks, pest risk analysis.

Unit 5: Arthropod Vector sof Plant Diseases-

Common arthropod vectors viz., aphids, leaf hoppers, plant hoppers, whiteflies, thrips, psyllidae, beetles, weevils, flies, bees and mites and their relationship with the plant pathogenic fungi, bacteria, viruses, mycoplasma. Mechanism of pathogen transmission: Active mechanical transmission, biological transmission. Toxicogenic insects, mitesand phytotoxemia. Some important arthropod vector transmitted diseases and their epidemiology in India. Management of vector and its effect on control of diseases.

Unit 6: Beneficial Insects-

Honey Bees- Honey bees and their economic importance. Bee species, their behaviour, habit and habitats. Bee Keeping: bee pasturage, hives and equipments, seasonal management. Bee enemies including diseases and their management, Bee poisoning.

Silkworm- Silkworm species, their systematic position and salient features. Rearing techniques of mulberry-muga-eri and tussar silkworms. Nutritional requirements of silkworms. Sericulture: rearing house and appliances, silkworm breeds, principles of voltism and nioultism, seed production and its economics. Enemies and diseases of silkworms and their management. Sericulture organization in India.

Lac Insect- Lac insect, its biology, habit and habitats. Host Trees: pruning, inoculation, lac cropping techniques, and harvesting. Enemies of lacinsect and their management.

Other Useful Insects-Pollinators, biocontrol agents of weeds, soil fertility improving agents, scavengers. Use of insects and insect products in medicines. Usefulness of insects inscientific investigations, insects as food.

Unit 7: Pestsof FieldCrops-

Distribution, host range, biology and bionomics, nature of damage and management of arthropod pests ofcereals, millets, oilseed, pulses, forage, fibre crops, sugarcane and tobacco. Polyphagous pests: locusts, termites, hairy catepillars, cut worms, fall armyworm and white grubs.

Unit 8: Pests of Horticultural Crops-

Distribution, host range, biology and bionomics, nature of damage and management of arthropod pests of vegetables, fruits and plantation crops, spices, condiments, medicinalplants and ornamentals.

Unit 9: Pests of Stored Products –

Fundamentals of storage of grains and grain products. Storage losses, sources of infestation/infection, factors influencing losses. Microflora in storage environment and their control. Storage structures, bulk storage and bag storage, their relative efficacy and demerits. Grain drying methods and aeration. Non-insect pests (rodents, birds, mites) of stored products and their control. Stored grain pests and Integrated approach for their management.

Unit 10: Biological Control-

Importance and scope of biological control, history of biological control: Important biocontrol agents-Parasites, predators and insect pathogens. Important entomophagous insect orders and families. Ecological, biological, taxonomic, legal and economic aspects of biological control, phenomena of parasitism, its types and their applied importance.

Principles and procedures of using exotic biocontrol agents. Utilization of natural biocontrol agents: conservation, habitat management and augmentation. Mass multiplication techniques of important bioagents. Effective evaluation techniques, Biocontrol organizations in world and India. Successful cases of biological control of pests. Entomophilic pathogens: bacterial, fungi, viruses, protozoan and nematodes, modes of transmission, methods of uses, symptoms of infection. Microbial insecticides and their formulation. Merits and demerits of microbial control. Role of biocontrol agents and microbial insecticides in Integrated Pest Management.

Unit 11: Chemical Control and Toxicology-

History, scope and principles of chemical control. Insecticides and their classification. Formulations of insecticides, physical, chemical and toxicological properties of different groups of insecticides: chlorinated hydrocarbons, organophosphates, carbamates, synthetic pyrethroids, chlordimeform, chitin synthesis inhibitors, avermectins, nitroguanidines, phenylpyrazoles, botanicals (natural pyrethroids, rotenone, neem products, nicotine, pongamia etc). Combination insecticides. Problems of pesticide hazards and environmental pollution. Pesticide risk analysis, safe use of pesticides, precautions and first aid treatments. Insecticides Act 1968, registration and quality control of insecticides. Evaluation of toxicity, methods of toxicitytesting, determination of LD 50, LT 50, RL 50 etc. Pesticides residues in the environment and their dynamics of movements, methods of residue. Pharmacology of insect poisons. Mode of action of different groups of insecticides; neuroactive (axonal and synaptic) poisons, respiratorypoisons, chitin synthesis inhibitors. Metabolism of insecticides; activative and degradative metabolism, detoxification enzymes and their role in metabolism. Selectivity of insecticidal actions; insecticide resistance; mechanism, genetics and management of insecticide resistance.

Unit 12: Host Plant Resistance-

Chemical ecology: mechano and chemo receptors. Host plant selection by phytophagous insects. Secondary plant substances and their defenses against phytophagous insect. Basis of resistance (Antixenosis, Antibiosis, Tolerance). Biotypes development and its remedial measures. Tritrophic interactions, induced resistance. Breeding for insect resistant plant varieties. Resistance development and evaluation techniques. Genetics of Resistance: vertical resistance, horizontal resistance, oligogenic resistance, polygenic resistance. Role of

biotechnology in development of transgenic insect resistant plants, its advantages and limitations. Case histories. Insect resistance to transgenic plants and its management.

Unit 13: Innovative Approaches in Pest Management-

Behavioral control: pheromones- types and uses, advantages and limitations. Hormonal control: types and functions of insect hormones, insect hormone mimics, advantages and limitations. Chemosterilants, antifeedants, attractants, repellents; their types, method of applications, advantages and limitations. Genetic control: concepts and methods, advantages and limitations. Potentialities in IPM.

Unit 14: Integrated Pest Management-

History, concept and principles of IPM. Components of IPM: Cultural, mechanical and physical methods, chemical methods, biocontrol agents utilization, genetic and behavioral control strategy etc. IPM strategies for field and horticultural crops. IPM case histories. Concept of damage levels- Economic Threshold Levels (ETL), Economic Injury Levels (EIL) and their determination. System approach, Agro ecosystem and cropping system vs. IPM. Constraints and Strategies of IPM implementation.

Unit 15: Pesticide Application Equipments-

Types of appliances: sprayers, dusters, fog generators, smoke generators, soil injecting guns, seed treating drums and flame throwers, etc. Power operated sprayers and dusters. Types of nozzles and their uses. Maintenance of appliances. Aerial application of pesticides, principles of aerial application, factors affecting the effectiveness of aerial application. Equipments for aerial applications. Advantages and disadvantages of aerial application.

30. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN GENETICS AND PLANT BREEDING**

Unit 1: Basic Genetics and Plant Breeding

Cell structure and division. Mendels laws, modifications of Medelian ratios. Gene concept, allelism and fine structure of gene. Extra chromosomal inheritance. DNA structure, function, replication and repair. Genetic code. Gene- enzyme relationship. Replication, Transcription and Translation. Gene regulation in prokaryotes and eukaryotes. Spontaneous and induced mutations and their molecular mechanisms. Multiple alleles, sex determination, sex linkage, sex-influenced and sex limited traits. Crop domestication, evolution of crops and centres of diversity. Gametogenesis and fertilization. Modes of reproductions, apomixis, self incompatibility and male sterility systems and their use in plant breeding.

Breeding methods for self- pollinated, cross-pollinated and clonally propagated crops. Mutagenesis and mutation breeding. Population improvement, hybrid breeding, heterosis and genetic basis of heterosis.

Origin, distribution, classification, botanical description and floral biology of cereals (wheat, rice, maize, sorghum, pearl millet, minor millets); pulses (pigeon-pea, chickpea, black gram, green gram, cowpea, soyabean, pea, lentil, horse gram, lab-lab, rice bean, winged bean, lathyrus, Lima bean; oilseeds (groundnut, sesamum, castor, rapeseed mustard, sunflower, Niger, linseed); fibers and sugar crops, fodder and green manures.

Unit 2: Genome organization and Cytogenetics of Crop Plants

Chromosome structure, functions and replication. Linkage and crossing over. Karyotype analysis, banding techniques and In situ hybridization. Special types of chromosomes. Chromosomal aberrations and their utility. Wide hybridization and chromosomal manipulations for alien gene transfer. Pre-and post-fertilization barriers in wide hybridization. Genome organization and cytogenetics of importantcrop species- wheat, maize, rice, brassica, cotton, bajra, sorghum vigna, potato and sugarcane. Cytogenetic techniques for gene location and gene transfer.

Unit 3: Quantitative Genetics

Quantitative characters, Additive-Dominance Model, Genetic advance and types of selection and correlated response. Hardy Weinberg law, Linkage disequilibrium, Genetic load, Polymorphism, Breeding value, heritability. Response to selection, correlated response, genetic divergence analysis. Estimates of variance components and covariance among relatives. Multiple factor inheritance. Genetic control of polygenic characters. Mating designs with random and inbred parents. Estimation of gene effects and combining ability. Effects of linkage and epistasis on estimation of genetic parameters. Maternal effects. Mating designs- classification, diallel, partial diallel, line x tester, North Carolina Designs and triple test cross analysis, approaches to estimate and exploit component of self and cross-pollinated crops. Genotype x environment interaction and stability analysis.

Unit 4: Biotechnology and Bio-informatics in Plant Breeding

Somatic hybridization, micropropagation, somaclonalvariation, invitromutagenesis. Artificialsynthesis of gene. Genetic and molecular markers, generations of molecular markers and their application in genetic analysis and breeding. Molecular markers in genetic diversity analysis and breeding for complex characters. Multiple factor inheritance. Genetic control of polygenic characters. Tissue culture and it' s application in crop improvement. Gene tagging, QTL mapping and marker aided selection. Genome projects and utilization of sequence formation. Vectors, DNA libraries, DNA fingerprinting, DNA sequencing. Nuclei acid hybridization and immunochemical detection. Chromosome walking, Recombinant DNA technology, Gene cloning strategies. Genetic transformation and transgenic. Antisense RNA, RNAi and micro-RNA techniques in crop improvement. Bio-informatics tools, biological data bases (primary and secondary) and their implications in crop improvement.

Unit 5: Plant Breeding for Stress Resistance, Nutritional Quality and Climate Change

Genetic basis and breeding for resistance to diseases and insect-pests. Breeding for vertical and horizontal resistance to diseases. Genetic and physiological basis of abiotic stress tolerance. Breeding for resistance to heat, frost, flood, drought and soil stresses. Important quality parameters in various crops, their genetic basis and breeding forth esetraits. Role of molecular markers in stress resistance breeding: MAS, MARS and MABB.

Unit 6: Plant Genetic Resources, IPR, Seed Science and Technology

Plant exploration, germplasm introduction, exchange, conservation, evaluation and utilization of plant genetic resources. Convention on Biological Diversity and International Treaty on Plant Genetic Resources for Food and Agriculture. Intellectual Property Rights (IPR). Biodiversity Act. Plant Variety Protection and Farmers' Rights Act. Varietal development, release, notification and maintenance breeding. Seed, it's types and seed chain. Seed production, processing, storage, certification and marketing. Seed quality control.

Unit 7: Statistical Methods and Field Plot Techniques

Frequency distribution. Measures of central tendency, probability the oryandits application singenetics. Probability distribution and tests of significance. Correlation, linear, partial and multiple regression. Genetic divergence. Multivariate analysis. Design of experiments- basic principles, completely randomized design, randomized block design and split plot design. Complete and incomplete block designs. Augmented design, Grid and honeycomb design. Hill plots, un-replicated evaluation. Data collection and interpretation.

31. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN PLANT PATHOLOGY**

Unit-1: Fundamentals of Plant Pathology –

History of Plant Pathology, importance of plant diseases, factors affecting plant diseases, classification of plant diseases, causes of plant diseases, general characters of fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, Spiro plasmas, viruses, viroids, algae, protozoa, rickettsia, phanerogamic parasites and nematodes. Disease triangle and tetrahedron, pathogenesis, symptoms & signs of plant diseases.

Unit-2: Diseases of Field and Horticultural Crops and their Management–

Symptoms, etiology, disease cycle and management of major diseases of rice, maize, bajra, groundnut, soyabean, pigeonpea, finger millet, green gram, castor, wheat, gram, mustard, sugarcane, sunflower, cucurbits, onion, garlic, chillies, turmeric, coriander, cabbage, cauliflower, brinjal, tomato, okra, beans, ginger, aonla, ber, guava, banana, papaya, pomegranate, marigold, rose, tea and coffee.Types of phanerogamic parasites, Importantplant diseases caused by stem and root parasites of phanerogams, Environmental factors and nutritional deficiency, primary and secondary air pollutants, methods of management.

Unit-3: Mycology–

Introduction, terminology and history of mycology, general characters of fungi, types of fungal thalli, reproduction in fungi (Sexual and asexual), classification of fungi, comparative morphology and characters of different groups of fungi upto generic level, lichens and its importance.

Unit-4: Plant Bacteriology–

Introduction, terminology and history of plant bacteriology, cell structure of bacterial cell, chemical composition of prokaryotes viz: MLOs/phytoplasmas, spiroplasmas and other fastidious prokaryotes. Importance of phytopathgenic bacteria, classification and nomenclature of phytopathogenic prokaryotes, important plant diseases caused by bacteria and MLOs, reproduction of bacteria, general biology of bacteriophage, L-form bacteria, plasmids and Bdellovibrio.

Unit-5: PlantVirology–

History of plant viruses, composition and structure of viruses, symptomatology of important plant viral diseases, chemical and physical properties of viruses, virus-vector relationship, classification, replication and movement of viruses. Isolation and purification of viruses, mycoviruses, arbo- and baculoviruses, satellite viruses, viroids and prions.

Unit-6: Laboratory and Analytical Techniques–

Preparation and sterilization of media, methods of isolation, methods of purification and preservation in pureculture, methods of inoculation, molecular detection of pathogensin seeds and other planting material. ELISA, ISEM and PCR. Laboratory equipments and their uses: Autoclave, Hot air oven, Laminar air flow, spectrophotometer, electrophoresis, lightand electron microscopy.

Unit-7: Principles of Plant Pathology –

Plant disease complex, Survival and dispersal of plant pathogens, Role of environment and host nutrition on disease development, Host-parasite interaction, Infection process, Disease development: role of enzymes, toxins, growth regulators, Defense mechanisms. Effect of plant pathogens on host metabolism, Genetics of resistance, 'R' genes, Variation and variability of plant pathogens.

Unit-8: Principles of Integrated Disease Management (IDM)–

Introduction, history, importance, concepts and principles of Integrated Disease Management (IDM). Methods of control: host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control methods, constraints and strategies of IDM implementation.

Unit-9: Epidemiology and Forecasting of Plant Diseases–

Basic concepts of plant disease epidemiology, factors affecting epidemic development (influence of pathogen, host and environment on disease development), crop loss assessment, disease forecasting, Epidemic analysis and prediction models, Survey and surveillance (including through remote sensing), disease severity and disease intensity.

Unit-10: Physiological and Molecular Plant Pathology–

Molecular mechanisms of pathogenesis, mechanism of resistance, PR proteins, Phytoalexins, Antiviral proteins, SAR, HR and active oxygen radicals, Tissue culture, Elementary genetic engineering, Management of pathogens through satellite, Antisense-RNA. Ribozymes, coat protein, hypovirulence cross protection/useful genes and promoter technology, Biosafety and bioethics.

Unit-11: Post-Harvest Plant Pathology –

Concept of post-harvest diseases, principles of plant disease management as preharvest and post-harvest, Types of post-harvest diseases, Factors governing postharvest diseases, Role of bio-control agents and chemicals in controlling post –harvest diseases, Role of different storage structures, control of aflatoxigenic and mycotoxigenic fungi.

Unit-12: Mushroom Production Technology–

History and importance of mushroom, Edible and poisonous mushroom, cultivation technology of Pleurotus, Agaricus and Volvariella species, Maintenance of pure culture of mushroom fungi. Equipment's required for establishment of Mushroom unit, Nutritive value and uses of mushroom, economic aspects of mushroom cultivation and diseases of cultivable mushroom.

32. SYLLABUS FOR COMPETITIVE EXAMINATION FOR THE POST OF **TEACHING ASSOCIATE IN SOIL SCIENCE & AGRICULTURAL CHEMISTRY**

Unit1: Soil Genesis and Classification-

Concept of land, soil and soil science. Composition of earth crust and its relationship with soils; Rocks, minerals and other soil forming materials; Weathering of rocks and minerals; Factors of soil formation; Pedogenic processes and their relationships with soil properties; Soil development; Soil horizons and their nomenclature, subsurface horizons and other diagnostic characteristics, soil moisture and temperature regimes. Assessment of soil profile development by morphological mineralogical and chemical analysis. Concept of Soil individual, Soil classification systems- historical development and modern systems of soil classification with special emphasis on soil taxonomy; application of soil taxonomy.

Unit 2: Soil Physics-

Soil physical constraints affecting crop production. Soil texture-textural classes. Soil structure-classification, soil aggregation and significance, soil consistency, soil crusting, bulk density and particle density of soils and porosity, their significance and manipulation. Soil water- retention and potentials. Soil moisture constants. Movement of soil water -infiltration, percolation, permeability, drainage and methods of determination of soil moisture. Thermal properties of soils, soil temperature, Soil air- composition, gaseous exchange, influence ofsoil temperature and air on plant growth. Soil erosion by water and wind, their types, effects, mechanics. Runoff - methods of measurement, factors and management, runoff farming. Soil conservation measures.

Unit 3: Soil Fertility-

Essential elements in plant nutrition; Soil fertility& soil productivity; Nutrient cycles in soil; Transformation and transport of nutrients (Macro and micro nutrients) in soil; Manures and fertilizers; Fate and reactions of fertilizers in soils; Chemistry of different fertilizers; Slow release fertilizers and nitrification retarders; Quality control of fertilizers. Soil fertility evaluation – soil testing, plant and tissue tests and biological methods; Common soil test methods for fertilizer recommendation; Soil test-crop response correlations; Integrated nutrient management; Use of isotopic tracers in soil research; Fertility status of major soil groups of India. A concept of soil health and soil quality; causes of deterioration of soil health, chemical, physical and biological parameters of soil health indicators. Methods to improve soil health for sustainable agriculture production. Organic residue management.

Unit 4: Soil Microbiology-

Soil biota, soil microbial ecology, types of organisms. Soil microbial biomass, microbial interactions, unculturable soil biota. Microbiology and biochemistry of root-soil interface. Phyllosphere. Soil enzymes, origin, activities and importance. Soil characteristics influencing growth and activity of microflora. Microbial transformations of N, P, K, S, Fe and Zn in soil.

Biochemical composition and biodegradation of soil organic matter and crop residues. Humus formation. Cycles of important organic nutrients. Biodegradation of pesticides, organic wastes and their use for production of biogas and manures. Bio-fertilizers –definition, classification, specifications, method of production and role in crop production.

Unit 5: Soil Pollution-

Pollution: types, causes, methods of measurement, standards and management. Heavy metal toxicity and soil pollution; Chemical and bio-remediation of contaminated soils; Soil factors in emission of greenhouse gases; Carbon sequestration in mitigating greenhouse effect; Radio-active contamination of soil.

Unit 6: Statistics-

Experimental designs for pot culture and field experiments; Statistical measures of central tendency and dispersion; Correlation and regression; Tests of significance– t and F tests; Computer use in soil research.

Unit 7: Soil Chemistry–

Chemical composition of soil; Soil colloids- structure, composition, constitution of clay minerals, amorphous clays and other non-crystalline silicate minerals, oxide and hydroxide minerals; Charge development on clays and organic matter; pH-charge relations; Buffer capacity of soils. Chemical equilibria, electrochemistry and chemical kinetics. Inorganic and organic colloids- surface charge characteristics, diffuse double layer theories, zeta potential stability, coagulation/ flocculation, peptization, electrometric and sorption properties of soil colloid. Soil organic matter- fractionation, clay-organic interactions. Cation exchange- theories, adsorption isotherms, Donnan membrane equilibrium concept, clay-membrane electrodes and ionic activity measurement, thermodynamics, anion and ligand exchange- inner sphere and outer sphere surface complex formation, fixation of oxyanions, sorption- desorption ofoxyanions and anions. Nitrogen, potassium, phosphateand ammonium fixation in soils and management aspects.

Unit 8: Management of Problem of Soil and Water-

Area and distribution of problem soils- acidic, saline and sodic soil; origin of problematic soils, and factors responsible. Morphological features of saline, sodic and saline-sodic soil; characterization of salt-affected soils-soluble salts, ESP, pH; physical, chemical and microbiological properties. Management of salt-affected soils; salt tolerance of crops – mechanism and ratings; monitoring of soil salinity in the field; management principles for sandy, clayey, red lateriticand dryland soils. Acid soils-natureofsoil acidity, sources ofsoil acidity; effect on plant growth, lime requirement of acid soils; management of acid soils; biological sickness of soils and its management. Quality of irrigation water; management of brackish water for irrigation; characterization of brackish waters; relationship in water useand quality. Agronomic practices in relation to problematic soils; cropping pattern for utilizing poor quality ground waters. Chemistry of submersed soil.

Unit 9: Methods of Soil Analysis-

Particle size distribution, bulk and particle density, moisture constants, Modern methods of soil, plant and water analysis; Flame photometry and inductively coupled plasma optical emission spectroscopy; Spectrophotometry - visible, ultra-violet and infrared; Atomic absorption spectrophotometry; Potentio-metry and conducti-metry; X-ray diffracto-metry; Mass spectrometry.

Unit 10: Remote Sensing and Landuse Planning-

Remote sensing and its application in agriculture; GIS and GPS- basic features and uses in agriculture, Elementary concepts of radio isotopes and uses in agriculture. Application of Remote Sensing in Soil fertility mapping. Remote Sensing and GIS in Carbon sequestration studies. Concept and techniques of land use planning; factors governing present land use. Land evaluation methods and soil-site suitability evaluation for different crops; land capability classification and constraints in application. Agro-ecological regions/sub-region of India and their characteristics in relation to crop production. Status of LUP in India. Water harvesting – concept,

significance, types, methodology; use of harvested water in agriculture to increase water productivity. Watershed development/ management – concept, objectives, characterization, planning, execution, community participation and evaluation; rehabilitation of watershed.

Unit 11: Nano-Technology –

General introduction: Basics of quantum mechanics, harmonic oscillator, magnetic phenomena, band structure in solids, Mössbauer effect and spectroscopy, optical phenomena, bond in solids, an isotropy. Nanostructures: growth of compound semiconductors, super lattices, self-assembled quantum dots, Nano-particles, Nano tubes and nanowires, fullerenes (buck balls, graphene). Nanofabrication and Nano-patterning: Optical, X-ray, and electron beam lithography, self-assembled organic layers, process of synthesis of Nano-powders, electrode position, important Nano-materials. Mechanical properties, magnetic properties, electrical properties, electronic conduction with nanoparticles, investigating andmanipulating materials in the nanoscale: Electron microscopy. Nano-biology: Interaction between biomolecules and Nano-particle surface, different types of inorganic materials used for the synthesis of hybrid Nano-bio-assemblies, application of Nano- in agriculture, current statusof Nano-biotechnology, future perspectives of Nano-biology and Nano-sensors.

बोर्ड द्वारा आयोजित की जाने वाली सभी वस्तुनिष्ठ परीक्षाओं में किसी प्रश्न का उत्तर नहीं दिये जाने के संबंध में अभ्यर्थी से पुष्टि करवाये जाने हेतु ओ.ए म.आर. उत्तरपत्रक में पाँचवा विकल्प के संबंध में निम्नलिखित विशेष निर्देश लागू किये गये है :–

1.प्रत्येक प्रश्न के 05 विकल्प **A, B, C, D, E.** अंकित रहेगें। उनमें से अभ्यर्थी को केवल ए क विकल्प को नीले बॉल पेन से गहरा गोल उत्तरपुस्तिका में सही उत्तर दर्शाने हेतु करना होगा।
Each question has five options marked as A, B, C, D, E. You have to darken only one circle (bubble) indicating the correct answer on the Answer Sheet using BLUE BALL POINT PEN.

2.प्रत्येक प्रश्न के लिये विकल्पों में से केवल ए क विकल्प को भरना आवश्यक होगा।
It is mandatory to fill only one of the options for each question.

3.यदि अभ्यर्थी द्वारा किसी प्रश्न को हल नहीं किया है तो उसके लिये पाँचवा विकल्प **E** को गोला गहरा करना होगा। यदि पाँचों विकल्पों में से किसी को भी गहरा नहीं किया जाता है तो ए`से 10 प्रतिशत प्रश्नों तक प्रत्येक प्रश्न के 1/3 अंक घटाये जावेगें।
If you are not attempting a question then you have to darken the circle 'E'. If none of the five circles is darkend, one third (1/3) part of the marks of question shall be deducted.

4.प्रश्न पत्र हल करने के बाद अभ्यर्थी को यह सुनिशिचित करना होगा कि उसने प्रत्येक प्रश्न का ए क गोला गहरा भर दिया है। इस हेतु निर्धारित समय के बाद अभ्यर्थी को 10 मिनट अतिरिक्त समय दिया जावेगा। ताकि वह प्रत्येक अनुतरित प्रश्न का 'E' गोला गहरा भर सकें।
After solving question paper, candidate must ascertain that he\she has darkened one of the circles (bubbles) for each of the question. Extra time of 10 minutes beyond scheduled time, is provided for darkening the circle of option "E" for all unanswered questions.

5.जिस अभ्यर्थी द्वारा 10 प्रतिशत से अधिक प्रश्नो को किन्ही पाँच गोलों में से गहरा नहीं भरने पर उसे अयोग्य किया जावेगा।
A candidate who has not darkened any of the five circles in more than 10% question shall be disqualifed.