

Government of Tamilnadu  
**TEACHERS RECRUITMENT BOARD**

College Road, Chennai-600006

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**SYLLABUS FOR  
COMPETITIVE EXAMINATION FOR RECRUITMENT OF  
PROJECT CO-ORDINATORS & BLOCK RESOURCE  
TEACHER EDUCATORS UNDER SSA SCHEME**

**Index**

<b>Sl. No.</b>	<b>Subjects</b>	<b>Page No.</b>
01	TAMIL	1
02	ENGLISH	3
03	MATHEMATICS	8
04	PHYSICS	10
05	CHEMISTRY	13
06	BOTANY	16
07	ZOOLOGY	19
08	HISTORY	24
09	GEOGRAPHY	26
10	EDUCATION	28
11	GENERAL KNOWLEDGE	30

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Syllabus for Competitive Examination for Recruitment of  
PROJECT CO-ORDINATORS AND BLOCK RESOURCE TEACHER EDUCATORS UNDER SSA SCHEME

TAMIL

அலகு I: இக்கால இலக்கியம் (செய்யுள் மட்டும்)

- |                                |   |
|--------------------------------|---|
| 1) சுப்பிரமணிய பாரதியார்       | கண்ணன் பாட்டு   |
| 2) பாரதிதாசன்                  | அழகின் சிரிப்பு   |
| 3) கவிமணி தேசிக விநாயகம்பிள்ளை | ஆசிய ஜோதி   |
| 4) கண்ணதாசன்                   | ஏசு காவியம் (நான்காம் பாகம்)<br>பாடுகளின் பாதை (பாடல்கள் 1 25 -149) |
| 5) சிற்பி                      | ஒரு கிராமத்து நதி   |

அலகு II: இக்கால இலக்கியம் (உரை நடை, நாடகம், புதினம், சிறுகதை)

- |            |   |
|------------|---|
| 1) உரை நடை | அறிவியல் தமிழ் (ஆசிரியர் வா. செ. குழந்தைசாமி)                           |
| 2) உரைநடை  | நல்வாழ்வு (ஆசிரியர் மு. வரதராசன்)                                       |
| 3) நாடகம்  | ஒளவை (ஆசிரியர் இன்குலாப் )  |
| 4) புதினம் | வனதேவியின் மைந்தர் (ஆசிரியர் ராஜம் கிருஷ்ணன்)                           |
| 5) சிறுகதை | புதுமைப் பித்தன் சிறுகதைகள்<br>(பதி. மீ.ப. சோமு , நேஷனல் புக் டிரஸ்ட் ) |

அலகு III: சமயப்பாடல்களும் சிற்றிலக்கியங்களும்

- |                      |                             |
|----------------------|-----------------------------|
| 1) திருஞான சம்பந்தர் | தோடுடைய செவியன் பதிகம்      |
| 2) திருநாவுக்கரசர்   | கூற்றாயினவாறு பதிகம்        |
| 3) சுந்தரர்          | பித்தா பிறைசூடி பதிகம்      |
| 4) மாணிக்கவாசகர்     | அடைக்கலப்பத்து (திருவாசகம்) |
| 5) ஆண்டாள்           | திருப்பாவை                  |
| 6) தமிழ்விடுதூது     | 1 - 112 கண்ணிகள்            |
| 7) குணங்குடி மஸ்தான் | பராபரக் கண்ணி 1 - 50        |

அலகு IV: காப்பியங்கள்

- |                  |                             |
|------------------|-----------------------------|
| 1) சிலப்பதிகாரம் | புகார்க்காண்டம்             |
| 2) பெரியபுராணம்  | கண்ணப்பநாயனார் புராணம்      |
| 3) கம்பராமாயணம்  | விடைகொடுத்த படலம்           |
| 4) சீறாப்புராணம் | மானுக்குப் பிணை நின்ற படலம் |

**அலகு V: சங்கஇலக்கியம்**

- |                   |   |
|-------------------|---|
| 1) குறுந்தொகை     | 51 - 70   |
| 2) கலித்தொகை      | பாலைக்கலி 1 - 10  |
| 3) அகநானூறு       | களிற்றியானை நிரை 61 - 70  |
| 4) புறநானூறு      | பரணர் பாடல்கள்  |
| 5) பதிற்றுப்பத்து | இரண்டாம் பத்தில் முதல் ஐந்துபாடல்கள்  |
| 6) பத்துப்பாட்டு  | முல்லைப்பாட்டு  |
| 7) திருக்குறள்    | ஒழிபியல்  |
| 8) பரிபாடல்       | வையை பற்றி இரண்டு பாடல்கள்<br>11 ஆம் பாடல் - விரிகதிர் மதியமொடு<br>20 ஆம் பாடல் - கடல் குறைபடுத்த நீர்<br>(இடஞ்சுட்டல் அனைத்திலும் கேட்கலாம்) |

**அலகு VI: இலக்கணம்**

- 1) நன்னூல் முழுவதும் (ஆறுமுக நாவலர் காண்டிகையுரை)
- 2) யாப்பருங்கலக் காரிகை (ஒழிபியல் நீங்கலாக)
- 3) நம்பியகப் பொருள் (ஒழிபியல் நீங்கலாக)
- 4) புறப்பொருள் வெண்பா மாலை (வாகை முடிய )
- 5) தண்டியலங்காரம் (பொருளணியியலில் முதல் பத்து அணிகள் மட்டும்)

**அலகு VII: இலக்கிய வரலாறு**

புதிய நோக்கில் தமிழ்இலக்கிய வரலாறு தமிழண்ணல்

**அலகு VIII: தமிழ்மொழிவரலாறு, திராவிட மொழிகளின் ஒப்பிலக்கணம்**

- |               |                |
|---------------|----------------|
| 1) மொழிவரலாறு | மு. வரதராசனார் |
| 2) மொழி நூல்  | மு. வரதராசனார் |

**அலகு IX: இலக்கியத் திறனாய்வியல்**

- |                          |                   |
|--------------------------|-------------------|
| 1) இலக்கிய மரபு          | மு. வரதராசனார்    |
| 2) இலக்கியத்திறனாய்வியல் | தா.ஏ. ஞானமுர்த்தி |

**அலகு X: நாட்டுப்புறவியல்**

- |                                |               |
|--------------------------------|---------------|
| 1) நாட்டுப்புறவியல் கட்டுரைகள் | சா. வளவன்     |
| 2) நாட்டுப்புற இயல் ஆய்வு      | சு. சக்திவேல் |

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**ENGLISH**

**Unit I: Social History of England**

1. Medieval Period to Restoration
  - a) Feudalism
  - b) Church during the age of Chaucer
  - c) Monasteries
  - d) Renaissance
  - e) Reformation
  - f) The Puritan War
  - g) Colonial Expansion
  - h) Social Life during the Restoration Period
  
2. The Romantic Period to the Modern Age
  - a) American War of Independence
  - b) French Revolution
  - c) Agriculture Revolution
  - d) Industrial Revolution
  - e) Reform Bills
  - f) Victorian England: Issues and Problems
  - g) Reform Bills
  - h) Colonial Expansions of Britain
  - i) Pre-war and post-war Britain
  - j) Labour Movement
  - k) Welfare State.

**Unit II: History of English Literature**

1. Chaucer to Renaissance
  - a) Beginnings of Drama
  - b) Shakespeare and his Contemporaries
  - c) Elizabethan Prose and Poetry
  
2. Milton to the Eighteenth Century
  - a) Milton
  - b) Restoration Drama
  - c) Poetry during the Restoration Period
  - d) Contributions of Dryden & Pope
  - e) Periodical Essay
  - f) Beginnings of the Novel
  - g) Dr. Johnson
  - h) Goldsmith
  - i) Precursors to the Romantic Movement
  
3. The Romantic Period to the Modern Age
  - a) The Great Romantics : Wordsworth, Keats, Shelley, Byron and Coleridge
  - b) Charles Lamb and William Hazlitt
  - c) Victorian Prose, Poetry and Novel
  - d) Pre-war Literature
  - e) The Movement Poets
  - f) Georgian Poetry

- g) Eliot, Yeats, Auden,
- h) Trends in Modern Poetry
- i) Trends in Modern English Novel.
- j) Development of the Short Story

### **Unit III: British Literature**

#### **POETRY**

John Milton, *Paradise Lost*, Book I

The following selections from THE WINGED WORD Edited by David Green  
(Macmillan, Madras)

- 1) Shakespeare, Sonnet No.60
- 2) John Donne. 'A Hymn to God the Father'
- 3) John Dryden, 'A Song for St. Cecilia's Day'
- 4) Alexander Pope, from 'An Epistle to Dr. Arbuthnot'
- 5) Thomas Gray, 'Hymn to adversity'
- 6) William Wordsworth, 'Tintern Abbey'
- 7) P.B. Shelly, 'Hymn to intellectual Beauty'
- 8) John Keats, 'Bright Star'.
- 9) John Keats. 'Ode to a Nightingale'
- 10) Elizabeth Barret Browning, 'How Do I Love Thee?'
- 11) Alfred, Lord Tennyson, 'Break, break, break'
- 12) Mathew Arnold, 'Shakespeare'
- 13) D.G. Rossetti, 'The Blessed Damozel'
- 14) A.C. Swinburne, 'Before the Beginning of the Year'
- 15) G.M. Hopkins. 'God's Grandeur'
- 16) Robert Bridges, 'Nightingales'
- 17) Francis Thompson. 'The Hound of Heaven'
- 18) W.B. Yeats. 'Easter 1916'
- 19) T.S. Eliot, 'Preludes'
- 20) Robert Graves, 'Warning to Children'
- 21) W.H. Auden, 'The Unknown Citizen'
- 22) Philip Larkin. 'Wants'

#### **PROSE**

- 1) Bacon, 'Of Truth'
- 2) Johnson, Preface to Shakespeare
- 3) Addison & Steele - Coverley Papers (Essays 1,2 & 3)
- 4) Lamb, 'Dream Children'
- 5) Hazlitt, 'Going on a Journey'
- 6) Arnold, 'Study of Poetry'
- 7) Elliot, 'Tradition and Individual Talent'
- 8) Orwell, 'Shooting an Elephant'
- 9) Chesterton, 'On Running after One's Hat'

#### **DRAMA**

- 1) Christopher Marlowe, *Edward II*
- 2) Ben Jonson, *Volpone*
- 3) R.B. Sheridan, *The School For Scandal*
- 4) Bernard Shaw, *Pygmalion*
- 5) Oscar, Wilde, *The Importance Of Being Earnest*
- 6) J. Osborne, *Look Back In Anger*

## FICTION

- 1) Jane Austen, *Pride And Prejudice*
- 2) Walter Scott, *Kenilworth*
- 3) Charles Dickens, *Hard Times*
- 4) Goldsmith, *The Vicar of the Wakefield*
- 5) Joseph Conrad, *Lord Jim*
- 6) D.H. Lawrence, *Sons and Lovers*

## Unit IV: Shakespeare

- 1) *Twelfth Night*
- 2) *Macbeth*
- 3) *Henry V*
- 4) *The Tempest*

## Unit V: American Literature

### POETRY

The following poems from American Literature: An Anthology of Poems Edited by C. Subbian (Emerald, Madras)

- 1) Emerson, 'Hamatreya'
- 2) Edgar Allan Poe, 'The Raven'
- 3) Robert Frost, 'The Road not Taken'
- 4) Robinson Jeffers, 'Science'
- 5) Wallace Stevens, 'Anecdote of the Jar'
- 6) Theodore Roethke, 'The Meadow Mouse'
- 7) Emily Dickinson, 'Wait Till the Majesty of Death'
- 8) E.A. Robinson, 'Reuben Bright'
- 9) Robert Frost. 'Mending Wall'
- 10) Carl Sandburg. 'Chicago'
- 11) John Crowe Ransome, 'Blue Girls'
- 12) Archibald Macleish, 'Ars Poetica'

### PROSE

- 1) Emerson, 'Shakespeare: Or the Poet'
- 2) Thoreau, 'Civil Disobediance'
- 3) Edgar Allan Poe, 'The Philosophy of Composition'.
- 4) Abraham Lincoln, 'Gettysberg Speech'.
- 5) Martin Luther King Jr, 'I Have a Dream'

### DRAMA

- 1) Arthur Miller, *Death of a Salesman*.
- 2) Tennessee Williams, *The Glass Menagerie*.

## FICTION

- 1) Nathaniel Hawthorne, *The Scarlet Letter*
- 2) Ernest Hemingway, *The Old Man and the Sea*.

## Unit VI: Indian Writing in English

### POETRY

Indo English Poetry: A Selection Edited by S. Jeevanagarathinam (Emerald, Madras).

- 1) Henry L. Derozio, 'The Harp of India'

- 2) Toru Dutt, 'The Lotus'
- 3) Sri Aurobindo, 'Transformation'
- 4) Rabindranath Tagore, 'The child'
- 5) Kamala Das. 'Punishment in Kindergarten'.
- 6) A.K. Ramanujam, 'Obituary'
- 7) R. Parthasarathy, 'Under Another Sky'
- 8) Sarojini Naidu, 'The Queen's Rival'
- 9) Humayun Kabir, 'Trains'
- 10) V.K. Gokak, 'English Words'
- 11) Nizzim Ezekiel, 'Happening'
- 12) Gieve Patel, 'Servants'

### PROSE

A. Representative Selection from Indian Prose Edited by S.P. Appasamy and C.D. Govinda Rao. (Macmillan, Madras).

- 1) Swami Vivekananda, 'To Madras Disciples'
- 2) Mahatma Gandhi, 'Some Reminiscences of the Bar'
- 3) V.S. Srinivasa Sastri, 'The Joy of Freedom'
- 4) Jawaharlal Nehru, 'Ashoka - Beloved of the Gods'
- 5) Dr. S. Radhakrishnan, 'An Ideal Before of Youth'

B. Selections from Picador Book of Modern Indian Literature. Ed.Amit Chaudhuri.

- 1) Bankim Chandra Chatterjee, 'A Popular Literature for Bengal'
- 2) Premchand, 'The Chess Players'
- 3) U.R. Ananthamurthy, 'A Horse for the Sun'
- 4) Ambai, 'Gift'

### DRAMA

- 1) Rabindranath Tagore : *Chandalika*
- 2) Vijay Tendulkar, *Silence : The Court is in Session*
- 3) Girish Karnard, *Hayavadhana*

### FICTION

- 1) Mulk Raj Anand, *Two Leaves and a Bud.*
- 2) R.K. Narayan, *The English Teacher.*
- 3) Raja Rao, *The Serpent and the Rope*
- 4) Anitha Desai, *Cry, the Peacock*
- 5) Arundhati Roy, *The God of Small Things*

### Unit VII: Literary Forms

- 1) Tragedy
- 2) Comedy
- 3) Satire
- 4) Drama
- 5) Novel
- 6) Short Story
- 7) Essay
- 8) One-act Play
- 9) Biography
- 10) Autobiography
- 11) Farce
- 12) Epic

- 13) Ballad
- 14) Lyric
- 15) Ode
- 16) Sonnet
- 17) Elegy
- 18) English Prosody.

### **Unit VIII: Language and Linguistics**

#### **A. History of the English Language**

- 1) English as a member of the Indo-European Family, including Grimm's Law and Verner's Law and the Teutonic Accent
- 2) Landmarks in the History of the English: Old English, Middle English and Modern English.
- 3) Foreign influences on English (a) Greek, (b) Latin, (c) Scandinavian, (d) French and (e) Non-Indo-European.
- 4) Makers of English: (a) The Bible Translators, (b) Shakespeare, (c) Spenser, (d) Milton.
- 5) The Great Vowel Shift
- 6) Dictionaries in English
- 7) The General Character of English, and English today.

##### Books for Reference

1. The English Language – by C.L. Wrenn
2. An Outline History of the English Language - by F.T. Wood
3. A History of the English Language – by A.C. Bauah

#### **B. Linguistics**

- 1) What is Language?
- 2) Spoken and Written Language
- 3) Cardinal Vowels
- 4) English Vowels and Consonants
- 5) Phonemes and Morphemes
- 6) Articulation
- 7) Stress and Intonation

##### Book for Reference

Language and Linguistics – by J.F. Wallwork

#### **C. Grammar**

- 1) Traditional Grammar
- 2) Structural Linguistics
- 3) T.G. Grammar

##### Book for Reference

Grammar – by Frank Palmer

#### **D. Use of English**

Identification of Grammatical Errors

##### Books for Reference

1. *Examine your English*
2. *Common Mistakes in English*  
- both published by Oriental Longman



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## MATHEMATICS

### Unit I: Algebra

Summation of Series - Binomial, exponential and logarithmic Series – Theory of Numbers - Prime numbers, Composite numbers, decomposition of composite numbers as a product of prime numbers uniquely.

Matrices:- Symmetric, Skew Symmetric, Hermitian, skew hermitian, orthogonal and unitary matrices – Eigen values and eigen vectors of a square matrix, rank of a matrix, consistency of linear equations and solutions. Cayley Hameltan theorem.

Theory of Equations: Polynomial equations – Formation of equations – Irrational roots.

### Unit II: Analytical Geometry and Trigonometry

**Analytical Geometry:** Parabola, Ellipse, Hyperbola and rectangular hyperbola – Pole, polar, conjugate points, conjugate lines and conjugate diameters.

Polar coordinates – distance between two points – general equation of a straight-line – Parallel lines and perpendicular lines.

**Trigonometry:** Complex numbers – deMoiures Theorem – Expansions of  $\sin\theta$ ,  $\cos\theta$ ,  $\tan\theta$  in terms of  $\tilde{\theta}$

Expansions of  $\sin n\theta$ ,  $\cos n\theta$ ,  $\tan n\theta$  Expansions of  $\sin^n \theta$ ,  $\cos^n \theta$

### Unit III: Calculus

Rolles Theorem – Mean value theorem – Maxima and Minima of functions of one and two variables.

n-th derivative – Leibnitz theorem and applications – total differential.

Jacobians of two and three variables – Properties of Jacobians.

Curvature – radius of curvature, centre of curvature in Cartesian coordinates. Evolutes and envelopes.

Reduction formulae for integration.

### Unit IV: Differential Equations

Ordinary differential equations,- Exact differential Equations - first order and first-degree equations of Bernoulli, first order but not of first-degree equation.

Second order equations with constant co-efficients, P.I for  $e^{ax}V$  where V is  $x^m$ ,  $\cos mx$ ,  $\sin mx$  (m is positive integer), total differential equation  $Pdx+Qdy+Rdz=0$ .

Laplace transform and its application to first and second order linear differential equations

### Unit V: Vector Analysis and Analytical Solid Geometry

**Vector analysis:** Gradient, divergence, curl, directional derivative, unit normal to a surface, tangent and normal planes to a surface. Line, surface and volume integrals and their evaluation – Gauss, Green, Stokes theorems.

**Analytical solid geometry:** Planes and lines. Reduction to symmetric form for a line given by a pair of planes.

**Sphere:-** Equations of sphere in centre-radius form, diameter form and general form.

**Unit VI: Modern Algebra**

Groups – Sub groups – Lagrange Theorem – Normal subgroup.

Rings – Definition and examples – Integral Domain.

Vector spaces – Basic concepts – Linear independence – Bases.

**Unit VII: Real Analysis**

Set, function, real valued function, equivalence, countability, real numbers, least upper bound, open set, closed set, connected set.

Sequence of real numbers – Limit of a sequence – Convergent, divergent and bounded sequences.

Series – convergence and divergence – uniform and absolute convergence.

**Unit VIII: Complex Analysis**

Functions of a complex variable, mappings, limits, theorems on limits, derivatives – Cauchy – Riemann equations

Formula for derivatives of analytical functions, convergence of sequence and series – Singularities – Residue theorem – Contour integration.

**Unit IX: Statics**

**Types of forces:** Forces acting on a particle, triangle of forces, polygon of forces, Lamis theorem, conditions of equilibrium of a particle, under several coplanar forces, parallel forces.

Coplanar forces acting on a body.

Friction, equilibrium of a body on a rough inclined plane acted by external forces.

**Unit X: Dynamics**

**Kinematics of a particle:** Velocity, acceleration, relative velocity, relative acceleration, angular velocity, acceleration components in a coplanar motion, along

a) two fixed perpendicular directions.

b) tangential and normal directions.

**Newton's Laws of motion:** work, power energy, principle of work and energy

**Plane motion:** Projectiles, ranges, motion on an inclined plane, circular motion.

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**PHYSICS**

**Unit I: Thermal Physics and Acoustics**

**Thermal Physics:**

Calorie – Relation between Heat and Work – Thermal capacity – change of state – latent heat- Newton's law of cooling. Definition of  $C_p$  and  $C_v$  – Meyer's relation – Equation of perfect gas – Vanderwaal's equation of state – Definition of critical points – critical constants and their determination. Thermal conductivity – conductivity of good and poor conductors – Forbe's and Lees Disc methods. Second law of Thermodynamics – Concept of Entropy – Entropy of an ideal gas – Reversible and irreversible processes – Carnot theorem – Proof - Carnot engine – Indicator diagram – Rankine's cycle – Petrol and Diesel engines.

**Acoustics**

Progressive waves – Characteristics – SHM – free, damped and forced oscillations – Composition of two SHMs in the same straight line – Beats – Velocity of sound in air – Newton – Laplace formula.

Ultrasonics – Production by piezoelectric method – Application to flaw detection and sonography.

**Unit II: Mechanics, Properties of Matter and Mathematical Methods**

**Mechanics:** Impulse – Impact – Impulsive forces – Laws of impact Direct and oblique impacts between two smooth spheres – loss of kinetic energy

**Properties of matter:** Elasticity -Young's modulus, Rigidity modulus, Poisson's ratio – Relation between Elastic moduli and Poisson's ratio – Determination of elastic constants by Searle's method.

**Surface Tension:** Explanation – Angle of contact - determination by capillary rise method – Formation of drops – Relation between curvature pressure and surface tension.

**Viscosity:** Definition – Poiseuille's flow method.

**Mathematical Methods:** Gradient of a scalar field – Divergence of a vector function – Curl of a vector – their physical significance - Vector identities. Line, surface and volume integrals.

**Unit III: Optics**

**Interference:** Theory of interference fringes – Colours of thin films – Newton's rings – determination of wavelength of light and refractive index of liquid

**Diffraction:** Fresnel and Fraunhofer diffraction – plane diffraction grating – determination of wavelength. Resolving power – Rayleigh's criterion – Resolving power of telescope, microscope, prism and grating. Relation between resolving power and magnifying power.

**Fibre optics:** Construction of optical fibres – propagation theory – Reflection and refraction – Step index and graded index fibre – Numerical aperture – Applications.

**Unit IV: Magnetism and Electricity**

**Magnetism:** Magnetic permeability and susceptibility – Properties of dia, para and ferromagnetic materials. B-H curve – hysteresis – energy loss.

**Electrostatics:** Electric charges – Permittivity - relative permittivity – electric intensity – electric induction – Gauss’s theorem in electrostatics. Electric potential - relation between potential and intensity. Capacitance – spherical parallel and cylindrical condensers – effect of dielectric.

**Current Electricity:** EMF and internal resistance of a cell – Potentiometer Calibration of ammeter – high and low range voltmeter. Thermo electricity – Peltier and Thomson coefficient – magnetic effect of electric current – Biot- Savart law – definition of ampere. Magnetic field intensity due to a solenoid – Force on a current carrying conductor in a magnetic field. Moving coil ballistic galvanometer – theory – damping correction – Alternating current circuits – growth and decay of charges in LCR circuit. Transformer – Step-up and Step-down – energy loss.

#### **Unit V: Modern Physics**

Positive Ray Analysis – e/m of positive ions – Aston and Bainbridge mass spectrographs – isotopes. X-rays- Bragg’s law – Miller indices – Crystal Structure – Crystal packing Photo electric effect – Einstein’s theory – Millikan’s experiment – photo electric cells and application.

**Atom Models:** Bohr’s theory of hydrogen atom – energy level diagram. Sommerfeld’s relativistic atom model – Vector atom model – spatial quantization – electron quantum numbers. Pauli’s exclusion principle. Zeeman effect and its application.

#### **Unit VI: Spectroscopy**

Classification of line, band and continuous spectra

**Microwave spectroscopy:** Rotational spectra of diatomic molecules – instrumentation – magnetron and klystron

**Infrared spectroscopy:** Vibrational study of diatomic molecules – IR spectrometer.

**Raman spectroscopy:** Raman effect – Raman shift – stokes and anti stokes lines – Raman spectrometer.

**Lasers:** Population inversion – optical pumping – construction, principle and working of He-Ne and Ruby Lasers – Holography.

#### **Unit VII: Basic Quantum Mechanics and Relativity**

Inadequacy of classical mechanics – Schrodinger wave equation – Physical significance of wave function – Postulates of Quantum mechanics – Heisenberg’s uncertainty principle.

**Relativity:** General theory – Newtonian relativity – Galilean transformation – Postulates of special theory of relativity – Lorentz transformation – Length contraction and Time dilation – Relativistic mass. Mass – energy equivalence.

#### **Unit VIII: Nuclear Physics**

Radioactivity – theory of alpha decay – Geiger – Nuttal law – beta decay – neutrino hypothesis – Gamma ray spectra.

Nuclear detector – Geiger Muller Counter – scintillation counter.

Particle accelerator – linear, cyclotron, synchro cyclotron, betatron

Nucleus- Nuclear size , charge , mass, radius. Mass defect and binding energy. Characteristics of nuclear forces – nuclear model – liquid drop model Neutron – discovery - sources – classification of neutrons – nuclear fission – self sustained chain reaction – fusion – thermo nuclear reaction.

Elementary particles – classification – properties and interaction with matter.

**Unit IX: Materials Science**

Bonding in solids – ionic – covalent – metallic – vander waals bonds point defects – line defects - surface defects – volume defects – production and removal.

Single and multi-phase solids – alloys – stress and strain - Hook's law – strength, elasticity, plasticity, ductility, malleability, hardness, brittleness tests.

Superconductors – super conductivity - nature and occurrence – type I and type II superconductors.

Introduction to ceramics – classes and properties – polymers – polymerization mechanism.

**Unit-X: Electronics:**

Semiconductors – energy bands – intrinsic and extrinsic semiconductors – n-type and p-type semiconductors – Diodes – Zener Diodes – Voltage regulation.

Rectifiers – Half wave, full wave and bridge rectifiers – Amplifiers – RC coupled amplifier – frequency response – feed back amplifiers – oscillators – Hartley and Colpitt oscillators.

Transistors – p-n-p and n-p-n transistors – I-V characteristics of UJT, FET and MOSFET. Multivibrators – astable, monostable, bistable.

Fabrication of Integrated circuits.

Logic gates – universal gates – Boolean Algebra – De Morgan's theorem – K-map simplification.

Television – Transmission and reception – principle of colour TV.

Radar - Principle and applications.

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Syllabus for Competitive Examination for Recruitment of  
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## CHEMISTRY

### Unit 1: Inorganic Chemistry I

Atomic structure – atomic orbitals, quantum numbers, shapes of s, p and d orbitals.

Aufbau principle, Pauli exclusion principle, Hund's rule, electronic configuration of atoms. Screening effect, effective nuclear charge and its calculation using Slater rules. Periodic classification of elements based on electronic configuration, atomic and ionic radii, ionization energy, electron affinity and electronegativity. Trends in periodic table.

Vertical and diagonal relationships. Hydrides of s-block elements. Hydrides, oxides and oxyacids of p-block elements. Synthesis, properties and structures of boranes, carboranes and borazines. Chemistry of silicates, silicones and carbides. Interhalogen compounds. Isolation of noble gases from air, properties and uses of noble gases, compounds of noble gases. Acids and bases – Bronsted definition, Lewis definition and Usanovich's generalised definition.  $K_a$ ,  $K_b$ ,  $pK_a$  and  $pK_b$  of Bronsted acids and bases.

### Unit II: Inorganic Chemistry II

Coordination compounds – Werner's theory of coordination compounds, effective atomic number rule, nomenclature of coordination compounds, isomerism in coordination compounds, chelates. Stability of complexes. Pearson's HSAB concept – hard and soft acids, hard and soft bases.

Crystal field theory and its application to octahedral and tetrahedral complexes, explanation of magnetic properties of octahedral and tetrahedral complexes based on crystal field theory.

Lanthanides – occurrence, properties, lanthanide contraction, isolation of lanthanides, oxidation states of lanthanides.

Actinides – occurrence, chemistry of thorium and uranium.

Nuclear chemistry – nuclear radii, nuclear spin, nuclear magnetic moment, nuclear binding energy and its calculation, variation of nuclear binding energy with n/p ratio, shell model of nucleus, magic numbers.

### Unit III: Organic Chemistry I

Types of hybridization of carbon. structures of methane, ethane, ethylene and acetylene.

C-C bond length in ethane, ethylene and acetylene.

Types of organic reactions, intermediates in organic reactions – carbocations, carbanions and radicals – factors influencing the stability of these intermediates.

Aliphatic nucleophilic substitution reactions –  $S_N1$ ,  $S_N2$  and  $S_Ni$  mechanisms.

Aromatic electrophilic substitution reactions – electrophilic substitution reactions of monosubstituted benzenes, orientation and reactivity.

Electrophilic addition to C=C bond, Markownikoff's rule. 1,4-addition to 1,3-butadiene, Diels-Alder reaction.

Nucleophilic addition to C=O bond – addition of HCN,  $NaHSO_3$ ,  $RMgX$ ,  $NH_3$ ,  $H_2O$  and alcohols to C=O bond.

Elimination reactions – formation of C=C bond – E1 and E2 mechanisms, orientation of C=C bond, Saytzeff and Hoffmann rules.

#### **Unit IV: Organic Chemistry II**

Geometrical isomerism about C=C bond – E-Z notation, geometrical isomerism of fumaric and maleic acids.

Optical isomerism – enantiomers, Fischer projection formula of representing enantiomers, R-S notation, optical isomerism in compounds with two asymmetric carbons.

Conformations of ethane and 1,2-dibstitutedethanes – representation of the conformations using Newmann projection.

Relative strengths of aliphatic acids, aliphatic bases, monosubstitutedbenzoic acids and monosubstitutedanilines.

Distinction of primary, secondary and tertiary amines.

Synthetic applications of ethyl acetoacetate, diethyl malonate, diazomethane, diazoacetic ester, diazonium salts and Grignard reagents.

Synthesis of furan, pyrrole, thiophene and pyridine. Electrophilic and nucleophilic substitution reactions of pyridine.

Cannizzaro reaction, aldol reaction, Benzoin condensation, Perkin reaction

#### **Unit V: Physical Chemistry I**

Gas laws and kinetic theory of gases, equation of state for real gases.

First law of thermodynamics, heat capacities at constant pressure and constant volume and their relationships. Joule-Thomson coefficient and inversion temperature.

Thermochemistry – Hess's law of constant summation of heats and its applications. Heat of reaction at constant pressure and constant volume, heat of neutralization.

Bond dissociation energy and its calculation from thermochemical data, calculation of lattice energy using Born-Haber cycle, Kirchoff's equation.

Chemical kinetics – rate of chemical reaction, measurement of rate, order and molecularity of chemical reaction. Characteristics of zero, first, second and third order reactions. Derivation of rate constant and half-life period.

Arrhenius equation – effect of temperature on the rate of reaction, concept of energy of activation. Calculation of the rate constant of a bimolecular reaction from collision theory.

#### **Unit VI: Physical Chemistry II**

Electrolytic conductance – specific, equivalent and molar conductance. Measurement of conductance, variation of conductance with dilution for strong and weak electrolytes.

Hydrolysis of salts, degree of hydrolysis. pH, buffer solutions and Henderson's equation.

Rotational spectrum of diatomic molecules – rotational energy, selection rules for rotational spectrum and calculation of bond length.

Vibrational spectrum of diatomic molecules as harmonic oscillators – vibrational energy, selection rules for vibrational spectrum and calculation of force constant.

Second Law of thermodynamics - Law and its need, Carnot cycle, efficiency of Carnot engine, entropy, free energy, Gibbs-Halmholtz equation, Clausius - Clapeyron equation.

#### **Unit VII: Industrial Chemistry**

Fuels – calorific value, refining of crude petroleum, various fractions and their uses.

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Octane number of petrol, cetane number of diesel, antiknock compounds.

Gaseous fuels – LPG, water gas, producer gas and natural gas.

Fertilizers – urea, diammonium phosphate and superphosphate of lime

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**Insecticides – DDT and BHC**

Natural and synthetic rubber, synthetic fibres, plastics, glass and cement.

Prevention of corrosion by surface coatings

Air pollution – green house effect, acid rain and depletion of ozone layer

Water pollution – pollutants from dyeing industries and tanneries, BOD and COD, waste water treatment.

**Unit VIII: Biological Chemistry**

Amino acids – essential and nonessential amino acids, synthesis and properties of amino acids, isoelectric point

Proteins – classification, properties and important colour reactions

Denaturation, dialysis and electrophoresis of proteins.

Primary, secondary and tertiary structures of proteins.

Carbohydrates – classification, reactions of glucose and fructose, conversion of glucose into fructose and vice-versa, mutarotation and cyclic structure of glucose.

Enzymes – definition, classification, coenzyme and cofactors, prosthetic group of enzymes.

Nucleic acids – nucleoside and nucleotide, RNA and DNA, different types of RNA

Vitamins – classification, structure of vitamins A, C, D, E, K and B-complex.

Diseases caused by the deficiency of these vitamins.

Hormones – definition, functions of adrenaline, pituitary hormones, insulin, thyroxin oxytocin and sex hormones(estrone, progesterone, testosterone).

**Unit IX: Pharmaceutical Chemistry**

Definition of pharmacopia, pharmacodynamics, fungi, virus, bacteria and antimetabolites. Synthesis and properties of prontosil, sulphadiazine, sulphapyridine, sulphathiazole and sulphafurazole.

Analgesics and antipyretics – aspirin, paracetamol, morphine and pethidine.

Anaesthetics – ether, thiopental sodium and benzocaine

Diazepam, phenobarbital, antacids, drugs for curing anemia, hypoglycemic drugs

Cardiovascular drugs – atenolol, propranolol, calcium channel blockers, amylodopine

And vasodilators.

**Unit X: Analytical Chemistry**

Qualitative analysis – theory behind separation of groups – tests for various cations and anions – interfering anions and their removal.

Significant figures, precision and accuracy.

Principles involved in acid-base, precipitation and complexometric titrations – indicators and their choice.

Gravimetric analysis – co-precipitation and post-precipitation, organic precipitants used in inorganic analysis.

Purification of organic compounds – crystallization, distillation, fractional distillation and steam distillation - distillation under reduced pressure.

Chromatography – column, paper, thin layer and gas chromatographies.

Spectrophotometry and fluorimetry.

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## BOTANY

### Unit I: Algae and Fungi

Algae: Classification and General Characters of Cyanophyceae, Chlorophyceae, Phaeophyceae and Rhodophyceae.

Structure and reproduction of following genera – *Oscillatoriopsis*, *Nostoc*, *Volvox*, *Oedogonium*, *Coleochaete*, *Caulerpa*, *Chara*, *Sargassum*, *Gracilaria*. Economic importance of Algae.

Fungi: General characters and modes of nutrition in fungi, Structure and Reproduction of the following genera – *Albugo*, *Mucor*, *Peziza*, *Agaricus*, *Puccinia* and *Colletotrichum*. Economic importance of Fungi.

### Unit II: Lichens, Plant Viruses, Bacteria and Plant Diseases

Lichens: Occurrence, structure and reproduction. Economic importance. Role in succession and in monitoring pollutants. Example – *Usnea*.

Plant Virus: General characters – transmission, structure of TMV and T4 Bacteriophages – Life cycles – Lytic and Lysogenic.

Bacteria: Ultra structure of *E.coli* – Classification based on shape, nutrition, respiration, staining behaviour and reproduction.

Plant Diseases: Detailed study of Citrus Canker, Tikka Disease of ground nut and Leaf Mosaic disease of Tobacco.

### Unit III: Bryophytes, Pteridophytes, Gymnosperms and Paleobotany

Bryophytes: General Characters and Classification by Reimer. Study of thallus structure and reproduction of *Riccia*, *Marchantia*, *Anthoceros*, and *Polytrichum*. Economic importance of Bryophytes.

Pteridophytes: General Characters and Classification by Reimer.

Stelar evolution of Pteridophytes, Sporangial organization – Homospory and Heterospory. Apogamy and Apospory. Life cycles of *Lycopodium*, *Selaginella*, *Equisetum*, *Adiantum* and *Marsilea*.

Gymnosperms: General characteristics and classification by K.R. Sporne. Life history of *Cycas*, *Pinus* and *Gnetum*.

Paleobotany: Fossils and kinds of fossils Ideal conditions for fossilization. Geological time scale. Brief study of *Lepidodendron*, *Lepidocarpon* and *Calamites*.

### Unit IV: Taxonomy of Angiosperms

Morphology – Inflorescences

Taxonomy: Principles of taxonomy and its importance – Herbarium techniques. Systems of Classification – Linnaeus, Bentham and Hooker, Cronquist. Taxonomic hierarchy. Plant nomenclature – I.C.B.N.

Detailed study of the following families – Annonaceae, Sterculiaceae, Rutaceae, Fabaceae, Cucurbitaceae, Sapotaceae, Asteraceae, Asclepiadaceae, Verbenaceae, Euphorbiaceae, Orchidaceae and Poaceae.

### **Unit V: Plant Anatomy and Embryology**

Plant Anatomy: Types of cells, structure and functions of the following tissues: Meristematic, Simple and Complex tissues. Epidermal tissue system.

Theories of apical meristem. Apical organization of Vegetative shoot and root.

Lateral meristem – Vascular Cambium, Phellogen, Primary and secondary structures of Stem and root of dicotyledons and monocotyledons. Anomalous secondary thickening in *Bignonia*, *Boerhaavia* and *Dracaena*.

Structures of dicot and monocot leaves.

Embryology: T.S. of anther – Stages of development. Types of ovules. Micro and mega sporogenesis. Embryo development in Dicot and Monocot. Types of Endosperm.

### **Unit VI: Cell Biology and Genetics**

Cell Biology: Prokaryotic and Eukaryotic cell structure, chemical composition and functions of cell wall, plasma membranes.

Cell organelles – occurrence, structure, function and origin of mitochondria, plastids, ribosomes, Endoplasmic reticulum, Golgi bodies and Lysosomes.

Nucleus – Structure, Types and variation in Chromosome number. Cell division – Mitosis and Meiosis. Cell cycle.

Genetics: Concepts of Mendelian genetics – interaction and inheritance of genes. Linkage and Crossing over. Sex determination in plants. Sex linked disease – Haemophilia, Colour blindness. Extra nuclear inheritance. Population genetics – Hardy – Weinberg principle.

### **Unit VII: Plant Breeding and Evolution**

Plant Breeding: Methods of crop improvement – introduction, acclimatization. Different methods of selection (mass, pureline and clonal). Hybridization techniques – interspecific and intergeneric hybridization – Heterosis. Polyploidy and its application in plant breeding. Breeding for disease resistance, mutation breeding. Breeding for crop improvement with reference to Paddy, Wheat and Sugarcane.

Evolution: Origin of life, theories related to origin of life and evolution. Chemosynthetic theory on the origin of life. Evolutionary theory of Lamarck, Darwin. Modern Synthetic theory of Evolution. Variation in nature – mutation, recombination, adaptation and selection.

### **Unit VIII: Plant Bio-Chemistry and Plant Physiology**

Plant Biochemistry: Structure, classification and properties of Carbohydrates, Lipids, Proteins and Nucleic acids.

Enzymes- Properties, nomenclature and classification. Co-enzymes and co-factors.

Photosynthesis – Structure of photosynthetic pigment systems – Absorption spectrum – Cyclic and Noncyclic photophosphorylation. Carbon assimilation – Calvin cycle and Hatch and Slack pathway.

Respiration – Aerobic, anaerobic. Glycolysis, Krebs' cycle, ATP synthesis.

Nitrogen metabolism – Role of nitrogen and sources. Conversion of Nitrate to ammonia. Mechanism of biological nitrogen fixation. Protein synthesis.

Plant Physiology: Imbibition, diffusion, osmosis – Translocation of water, ascent of sap, transpiration, guttation. Growth hormones – Auxins, Gibberellins, Cytokinins – Applications of hormones in agriculture.

Photomorphogenesis – Photoperiodism, Vernalization, Phytochrome. Physiology of germination.

**Unit IX: Ecology and Toxicology**

Ecology: Biotic and abiotic factors and their influence on vegetation – a brief account of microbes, plants, animals, soil, wind, light, temperature, rainfall and fire.

Ecosystem – Concept, processes and components. Types of ecosystems.

Detailed study of mesophytes, hydrophytes, xerophytes and halophytes.

Different vegetation types – Evergreen, mangrove and deciduous forests.

Natural resources – Forest resources, conservation, afforestation, social forestry, agroforestry. Grazing and deforestation.

Types of pollution – Air, water, soil and noise pollution – Controlling measures.

Toxicology: Classification, Occurrence, source and effects toxicants on plants. Atmospheric toxicants – Carbon monoxide, Sulphur oxides.

Heavy metal toxicity – lead and chromium. Bioaccumulation. Pollution indicators.

**Unit X: Biotechnology – Genetic Engineering and Tissue Culture.**

Biotechnology: Definition, demands and achievements. Aims of genetic engineering. Recombinant technology – Outline of Cloning. Southern, Western blotting and PCR technique.

Agricultural biotechnology: Biomass food (SCP- single cell Proteins) Bio-fertilizers – Blue green algae and *Azolla*.

Industrial biotechnology: Fermentation technology, microbial growth, advantages of microbial enzymes, industrial applications.

Environmental Biotechnology: Waste treatment – solid (compost), liquid (Industrial effluents), sewage treatment (domestic sewage).

Tissue culture: Plant tissue culture methods preparation of culture media, chemical and physical sterilization, inoculation and maintenance of culture. Micropropagation – root and shoot culture and its uses.

Protoplast culture – isolation, direct and sequential methods.

Application of Plant Tissue Culture in agriculture, horticulture and forestry.

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## Syllabus for Competitive Examination for Recruitment of

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# ZOOLOGY

### Unit 1 : Life and Diversity of Animals

**Invertebrata:** Principles of Taxonomy – Binomial nomenclature

**Protozoa:** General characters and classification up to orders with examples. Type study: *Plasmodium*, *Entamoeba*, *Paramecium* – Economic importance in relation to agriculture and health.

**Porifera:** General Characters and classification up to orders with examples. Type study: Ascon sponge. Economic importance of Porifera.

**Coelenterata:** General characters and classification upto orders with examples. Type study: *Obelia* and *Aurelia* - Polymorphism - Coral reefs

**Platyhelminthes:** General characters and classification upto orders with examples. Type study: *Fasciola hepatica* and *Taenia solium*.

Helminth parasites and diseases, parasitic adaptations *Ascaris* sp., *Wuchereria bancrofti*.

**Annelida:** General characters and classification upto orders with examples. Type study: Earthworm and *Nereis*-Adaptive radiation in polychaetes.

Metamerism - Vermiculture - Trochophore Larva and its significance.

**Arthropoda:** General characters and classification up to orders with examples. Type study: Prawn and Scorpion-affinities and systematic position of *Peripatus*, Mouth parts in insects, economic importance of insects.

Social life in insects- Crustaceans as food.

**Mollusca:** General characters and classification up to orders with examples – Type study: Pila and Fresh Water mussel, Pearl culture - economic importance, adaptive radiation in Cephalopods.

**Echinodermata:** General characters and classification up to orders with examples – Type study : Starfish, Echinoderm Larvae and their significance, water vascular system in Echinoderms.

### Unit II: Life and Diversity of Animals

**Chordata:** General characters and classification of Chordata with examples

**Prochordata :** Hemichordata: Eg. *Balanoglossus*, Cephalochordata: Eg. *Amphioxus*  
Urochordata: Eg. Ascidian.

**Agnatha:** General characters and classification Eg. *Petromyzon*

**Pisces:** General characters and classification – Type study: *Scoliodon* and *Mugil*  
Migration - Economic importance, Adaptive radiation, Accessory respiratory organs.

**Amphibia:** General characters and classification - Type study: *Rana hexadactyla* :  
Parental care in Amphibia

**Reptilia:** General characters and classification – Type study: *Calotes versicolor* –  
Poisonous and Nonpoisonous snakes – Types of skull in Reptilia

**Aves:** General characters and classifications Type study: *Columba livia*  
Flight adaptations, - Bird migration - Flightless birds, palate in birds.

**Mammalia:** General Characters and classification - Type study : Rabbit - Adaptive radiation in mammals, Aquatic mammals, Dentition in Mammals, Evolution of man.

### **Unit III: Cell Biology**

**General organization of Cell:** Cell structure - Physical, Chemical and biological properties of cytoplasm.

Prokaryotic and eukaryotic cells – ultra structure and organization

**Plasma membrane** – ultra structure – chemical composition and functions – modifications of plasma membrane.

**Endoplasmic reticulum;** Morphology, ultra structure, Chemical composition and functions.

**Golgi Complex** Ultra structure, chemical composition and functions

**Lysosomes:** Ultra Structure and Polymorphism– Chemical composition and functions : peroxisomes and glyoxysomes

**Mitochondria:** Ultra Structure - Chemical composition-enzyme systems - functions - Oxidation - Respiratory chain (ETP) – Kreb’s cycle, ATP production and Biogenesis.

**Ribosomes:** Ultra structure, - types - chemical composition - protein synthesis - functions.

**Nucleus and Nucleolus:** Ultra structure of inter-phase Nucleus and Nucleolus

**Nucleic Acids:** DNA – Ultra structure – replication – transcription, RNA – types-Genetic code.

**Chromosomes** – Ultra structure of chromosomes and Giant Chromosomes

**Cell divisions :** Mitosis, Meiosis and Cell cycle.

**Cancer biology:** Types of cancer, Oncogenes, Chemotherapy

**Cell Biology techniques:** Cell fractionation - Isolation of sub cellular components - Fixation - sectioning principles - Biochemical techniques - Chromatography - Electrophoresis and their application. Tissue culture.

### **Unit IV: Genetics And Biotechnology**

**Mendelian inheritance:** Monohybrid cross, Dihybrid Cross.

**Interaction of Genes:** complementary factors - supplementary factors – Epistasis  
Incomplete dominance, Multiple alleles Blood groups and their inheritance – Rh factor – cumulative factor inheritance

**Gene regulation:** Operon concept – lac operon positive and negative regulations

**Mutation:** Gene mutation – Chromosomal aberrations

**Animal breeding:** inbreeding and out breeding, hybrid vigour – population genetics(Hardy Weinberg law).

**Human Genetics:** Genetic counseling – Eugenics and Euthenics

**Genetic Engineering:** Protoplast fusion – Tissue culture – Gene technology – restriction enzymes as a tool for Gene technology. Gene cloning vectors – plasmids

**Recombinant DNA technology:** Applications in medicine, agriculture, veterinary and Food industry.

Genomic library – DNA finger printing.

### **Unit V: Developmental Biology and Immunology**

**The Germ Cell:** Out lines of origin - spermatogenesis and oogenesis in Frog, Bird and Mammal.

**Fertilization:** Mechanics - Physiology - Theories of Fertilization

**Cleavage:** Patterns of cleavage – radial, spiral and bilateral; Types – meroblastic, holoblastic and superficial; Factors affecting cleavage ; chemodifferentiation.

**Gastrulation** – Morphogenetic movements – Epiboly and emboly

Comparative study in Amphioxus, Frog, Chick and Man.

**Organogenesis:** Development of Brain, Eye, Ear and Heart-Parthenogenesis - Natural and Artificial - Regeneration in Invertebrates.

**Human Reproduction:** Puberty - Menstrual cycle-Menopause - Pregnancy - Lactation - Family Welfare-Reproduction technology-monitoring of estrus cycle-Amniocentesis - Artificial insemination - Test tube babies.

#### **Immunology:**

**Natural barriers against infection:** Innate Immunity - Preventive measures - Counter attack by humeral factors. Acquired immunity - methods – Antigen - Antibody reaction -

**Lymphoid organs:** Primary and secondary lymphoid organs - Immunoglobulin classes - Acquired deficiency - HIV - AIDS.

**Viral and Bacterial infections:** synthesis of humeral antibodies – separation of T and B lymphocytes, immunization schedule for children - Prevention of new born diseases like Tetanus, Diphtheria, Whooping cough, Typhoid Fever, Cholera, Plague - Measles - Immunisation time Schedule.

### **Unit VI: Animal Physiology**

**Nutrition:** Food requirements - Carbohydrates, Proteins, fats, mineral salts, water, vitamins and enzymes and micronutrients.

**Enzymes:** General properties - Classification - Mechanism of enzyme action, factors - affecting enzyme action coenzymes - Digestive enzymes - intracellular and extra cellular - digestion.

**Respiration:** Organs of respiration - Respiratory pigments and their functions, Mechanism of respiration and regulation in Vertebrates

**Circulation:** Major types of body fluids – Composition of blood - theories of blood clotting, heart - types – origin and conduction of heart beat, working mechanism of heart, pacemaker, ECG - factors contributing to heart problems.

**Excretion:** Types of nitrogenous wastes, structure of mammalian kidney and urine formation, Regulatory function of kidney.

**Muscles:** Types of muscles, physiology of muscle contraction – muscle fatigue

**Nervous system:** Neurons - types of neurons - nerve impulse - mammalian eye structure - image formation - Visual pigments – Mammalian ear Structure – Physiology of hearing – equilibrium - chemoreceptor.

### **Unit VII: Environmental Biology**

**Ecology:** Branches of ecology - Autecology - synecology - Micro and macro environment. Biosphere - hydrosphere - Lithosphere - Stratosphere and atmosphere.

**Abiotic factors:** Water, Air, Soil, temperature, Light, Gravity and gases.

**Biotic factors:** Specific association-aggregation-social organization-competition-parasitism predation-antibiosis-commensalism-mutualism - neutralism.

**Ecosystem:** Classification - components ecological niche - Energy flow in ecosystem - Ecotypes - Homeostasis of ecosystem.

**Aquatic Ecology:** Fresh water - Marine and estuarine characters - Mangrove ecosystem - Mangroves in India.

**Population Ecology:** Population: definition, Characteristics, Density measurements - population fluctuations - population equilibrium - population regulation - population growth.

**Applied ecology:** Pollution, Origin and types-water pollution - Land pollution – Air pollution -Noise pollution

**Wild life management:** Preservation - Sanctuaries - National parks-Natural resources.

**Environmental issues:** Environmental degradation-deforestation, urbanization, population explosion and other environmental hazards-Bhopal Tragedy - Gulf War - Oil pollution-Green house effect – Global warming – Bio accumulation and Bio magnification – Biological control

### **Unit VIII: Aquaculture, Sericulture, Apiculture, Pisciculture, and Land and Water as Biological Media**

**Aquaculture:** Culture fisheries - cultivable aquatic organisms - Prerequisites of cultivable organisms. Basic considerations in Aquaculture, culture practices Management of ponds - Fertilization deeds - Hatchery - Spawning and Breeding-seaweed and shell - fish culture. Fish disease management – water quality maintenance – Importance and composition of fish feed-Prawn seed collection, Hatchery technology pearl culture.

**Sericulture:** Types of silk worm - Life cycle of silk worm –

Mulberry cultivation – Mulberry varieties in Tamil Nadu – Methods of propagation – methods of cultivation – Diseases and pests of mulberry.

Silk worm rearing – Diseases and pests of silk worm – prevention and control measures.

**Apiculture:** Bee Colony - Types of beehives, breeding of stocks, winter broods. Honey extraction and seasonal maintenance, swarming – Diseases of honey bees and their control methods – Bee wax and its uses.

### **Unit IX: Endocrinology**

**Ultra structure and functions of endocrine glands:** Hypothalamus-Pituitary – Thyroid-Parathyroid-Adrenal-Islets of Langerhans-Thymus-Ovary and Testis.

**Hormones:** Types and Chemistry of hormones

**Hormonal regulations:** Positive and Negative feed back

**Human Endocrine disorders.**

Applied endocrinology: Hormonal Contraceptives, Hormones in aquaculture (Prawn and Fish) uses of hormones in assisted reproduction. Ethics in the use of hormones as drugs and assisted reproduction.

**Unit X: Microbiology**

**History and scope of Microbiology:**

General structure of microbes – bacteria, viruses, algae, fungi and protozoa

**Microbial identification:** Morphological, physiological and Biochemical properties –

**Culture technique:** Media preparation, preservation of cultures, aerobic and anaerobic culture – staining methods, sterilization methods.

**Agricultural Microbiology:** Nitrogen cycle - Nitrogen fixation - Biogas.

**Medical Microbiology:** Diseases caused by Viruses bacteria, fungi and protozoan  
Antibiotic sensitivity-Microbiology of drinking water - water borne diseases- Sewage and biological purification methods.

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## HISTORY

### **Main Currents in Indian History from Early times to A.D.1984**

#### **Unit I:**

Background and Sources – Indus Culture – Vedic Age – Buddhism and Jainism – Mauryans – Administration – Kushanas – Guptas – Cultural Renaissance - Harshavardhana – Chalukyas – Rajput Age.

#### **Unit II:**

Sultanate of Delhi – Vijayanagar Empire – Bhakthi Movement – Mughals - Golden Age of the Mughals – Marathas and Sikhs – Coming of the Europeans (Portugese, Dutch, French and English) – The Carnatic Wars.

#### **Unit III:**

Expansion of Company's Rule till 1857 – India under the Crown – Socio-Religious Reform Movements in India in the 19<sup>th</sup> century – Western Education – National Movement – Pre-Gandhian Era and Gandhian Era – Constitutional Developments – Act of 1909, Act of 1919, Government of India Act of 1935 and Indian Independence Act of 1947 – Salient features of Republican Constitution (1950) – Integration of Indian States.

#### **Unit IV:**

Nehru Era - Social, Economic, Cultural and Political Development of India between 1950 and 1984 – Women's Movement - Uplift of women – Social Legislations – Phule, B.R. Ambedkar, E.V.Ramasamy, Muthulakshmi – Abolition of Untouchability Act – Hindu Succession Act, Protection of Civil Rights Act.

#### **Unit V:**

Foreign Policy of India till A.D.1984 – Relations with Pakistan – Kashmir Issue – Sino-Indian Relations – Indo-US Relations – Indo-Soviet Relations.

### **An Outline History of Tamil Nadu up to A.D. 1987**

#### **Unit VI:**

Sangam Age – Pallavas – Art and Architecture – Bhakthi Movement – Imperial Cholas – Local Self-Government – Art and Architecture – Imperial Pandyas (II Pandyan Dynasty) – Tamil Nadu under Vijayanagar Rule – Nayaks of Madurai – Services of Christian Missionaries – Rise of Poligars – Pulithevan – Kattabomman and Marudu Brothers – Vellore Mutiny of 1806.

#### **Unit VII:**

Foundation of British Rule in Madras Presidency – Role of Tamil Nadu in the Freedom Struggle.

**Unit VIII:**

Social Reform Movements in Tamil Nadu – Justice Party – Congress Rule – DMK in Power – Emergence of AIADMK – Midday Meals Scheme in Tamil Nadu.

**History of Europe from A.D. 1453 to 1990**

**Unit IX:**

Renaissance – Geographical Discoveries – Industrial and Agrarian Revolutions in England – Reformation and Counter Reformation – Benevolent Despots – Louis-XIV of France, Peter, the Great of Russia, Frederick, the Great of Prussia and Joseph II of Austria – French Revolution – Napoleon Bonaparte – Congress of Vienna – Methernich – Unification of Italy and Germany – Eastern Question.

**Unit X:**

I World War – Russian Revolution – The League of Nations – Rise of Dictatorship (Nazism and Fascism) – II World War – U.N.O – Cold War – Disintegration of Soviet Union – Reunification of Germany.

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Syllabus for Competitive Examination for Recruitment of

PROJECT CO-ORDINATORS AND BLOCK RESOURCE TEACHER EDUCATORS UNDER SSA SCHEME

GEOGRAPHY

**Unit I: Geomorphology**

Earth: Distribution of land and water; continental drift and plate tectonic theories; Earth's interior; Earth movements: Orogenic and epirogenic; Earthquake and volcanism; Folds and faults; Types of rocks: igneous, sedimentary and metamorphic – Rock cycle; Soil Profile; Weathering and Mass wasting; Agents of erosion: running water, wind, glacier and wave; Karst and coastal topography.

**Unit II: Climatology**

Climate and weather; composition and structure of the atmosphere; Insulation: Horizontal and vertical distribution of temperature; Atmospheric pressure and winds: Vertical and Horizontal, Pressure and wind belts; Indian Monsoon and local winds;

Atmospheric Moisture: Forms of condensations, types of precipitation; Atmospheric disturbances: Temperate and tropical cyclones.

**Unit III: Oceanography**

Distribution of ocean and seas; Bottom relief of ocean floor; Relief feature of Pacific, Atlantic and Indian ocean; Distribution of temperature and salinity; Currents of oceans; Deposits of oceans; Distribution of coral reefs.

**Unit IV: Human Geography**

World Population; Growth since 1960, distribution and density; Regional variations; Problems of over population; Migration: causes and consequences, Push and pull factors for international migration.

Settlements: Classification and hierarchy; Urban and sub urban settlements; Metropolitan cities of India; Growth and associated problems:

**Unit V: Economic Geography**

Basic concepts in Agricultural practices; Types of Agriculture; Shifting, subsistence and commercial, mixed and gardening; Scientific and technological developments in agricultural sector.

Fisheries : Locational factors and fishing regions;

Minerals and power resources; Metallic and non metallic; distribution and production; Conventional and non-conventional powers; Conservation of mineral resources.

**Unit VI: Regional Geography of the World with Special Reference to India**

Distribution of Major land forms: Mountain, plateau, and plain; Major climatic regions; Natural vegetative regions; Forests and wild life sanctuaries;

India: Location and extent; Physiographic regions: Relief, geology and drainage climate vegetation and soil; Rivers and multipurpose projects; Agricultural, mineral and industrial regions;

Human resources: Population growth, distribution and density

Trade and transport: Growth and Development.

### **Unit VII: Cartography**

Types of maps and scales; Data collection and classification; Mapping techniques: Choropleth and Isopleth; Diagrammatic representation: Line, Bar and pie graphs;

Measures of central tendencies: Mean, Median and Mode centers.

### **Unit VIII: Remote Sensing and Geographical Information Systems**

Remote sensing: Components of remote sensing; Physics of remote sensing: Electro Magnetic Spectrum and spectral resolutions; Remote Sensing systems: Passive and Active; Indian Remote Sensing: Growth and Development; Indian Resource Satellites and products;

Geographic Information Systems: Hardware and Software Components of GIS; Collection of spatial data; Data structure: Vector and Raster; Types of GIS software

Global Positioning Systems: Types and applications.

### **Unit IX: Environmental Geography**

Human and Environment: Natural and Cultural, Eco systems: Functions and components, Earth and its components; Bio-geo-Chemical Cycles: Nitrogen, Carbon, Oxygen, and Water Cycle.

Environmental degradation: Land, water and Air pollutions, Global warming, Acid rain, Ozone depletion and Eutrophication; Legislation of environmental protection in India.

### **Unit X: Disaster Management**

Hazard and Disasters: Definition and Types of disasters; Natural: Earthquake, Volcano, landslide, Floods and Droughts, Tsunami (Indian Examples); Manmade: Chemical, Nuclear explosions, fire accidents, War and terrorism. Gas leaks (Indian Examples)

Disaster Management: Relief, Rehabilitation. Mitigation and Preparedness.

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**EDUCATION**

**Unit-I**

Pre-primary Education – Programme of Pre-primary Education. Universalisation of Primary Education – Equality of opportunity – Secondary and Higher Secondary Education – Language Policy – Medium of Instruction – Need for uniform pattern – Non-formal and Adult Education – Functional Literacy Programme – Programmes for workers in Industry – Programme for dropouts - Role of Universities and Voluntary Agencies in Non-formal Education – Open School/ Open University. Education Commissions after Independence. National Policy on Education (1986).

**Unit-II**

Quantity and Quality of Education-State and National level. Unemployment and underemployment- causes - Delinking Jobs from Degrees- Skill development- Vocational / Skill oriented education- Man Power Planning and Education – Brain drain. Special problems of rural and tribal pupils. Illiteracy and poverty- Eradication of poverty through Education.

**Unit-III**

National Integration – International understanding – Value Education in action – Nutrition and health – Sanitation – Safety and first aid – Women’s education – Education for the handicapped – Education for the gifted – Population Education– Environmental Education – Need for protecting the environment – Human Rights Education – Significance – Constitutional Provisions. Peace Education – Significance – Justice and Civic Responsibilities.

**Unit-IV**

Meaning of educational innovation – Principles involved in innovation – Emergence of School – in cultural, social and religious setting – Innovations that emerged from educational experiments – Tagore:- Santiniketan – Gandhiji:- Basic Education – A.S.Neill:- Progressive School - Sri Aurobindo:- Ashram Schools. Rousseau:- Children’s Education - Montessori:- Sense Experience – Bertrand Russell:- Education for Social Order- Froebel:- Kindergarten – Dewey:- Pragmatic life – J. Krishnamoorthy:- Freedom in learning situation – Swami Vivekananda:- Man Making Education. Influence of Psychological factors on innovation – principles underlying self learning devices. Piaget:- Experiments and discovery learning - Child-centred learning. Effects of cultural, religious and social factors on innovation – Conformity to common educational goals.

**Unit-V**

The Learner and learning process – Learning situation – Significance of Educational Psychology to the teacher. Concept of growth and maturity – Developmental characteristics – Developmental tasks and education – Development of mental abilities – Attention, Inattention, distraction and span of attention – sensation and perception – factors of perception – errors in perception – concept formation – Piaget’s stages of cognitive development – concept maps - Language, Imagination, thinking and reasoning – Psycho-linguistics. Attitude – measurement of Attitude, Aptitude – measurement of Aptitude – Interest – Interest

schedule. Motivation - Marlow's hierarchy of motives – Role of rewards and punishments – Levels of aspiration – Achievement motivation – Goal as a motivational factor – Implications for the teacher.

#### **Unit-VI**

Special characteristics of adolescents and their problems, attitudes, interest, group behaviour, discipline – Leadership – Nature and importance of learning – Individual differences in learning – Learning curves – Transfer of learning – Factors in learning – Learning Theories – Trial and Error – Conditioning – Classical and Operant – Learning by Insight – Imitation – Gagne's Conditions of learning – Remembering and forgetting – Learning Disabilities.

#### **Unit-VII**

Intelligence - Nature of Intelligence – Theories of Intelligence – Uni-factor, Two Factor, Multi Factor, Group Factor, Primary Mental Abilities – Guilford's S.I., Multiple Intelligence – Assessment of intelligence – Constancy of IQ. – Distribution of Intelligence – uses of intelligence tests. Creativity – Creativity and Intelligence – Identification and promotion of creativity. Personality – Meaning of personality – Factors influencing personality – Trait and Type Theories of Personality – Assessment of personality – Integrated personality – Concept of mental health and hygiene – conflict and frustration – Adjustment – Defence mechanisms – Mental illness – Guidance and counselling – distinction – Educational, Vocational and Personal Guidance. Counselling Techniques – Individual and Group – Therapeutic Counselling.

#### **Unit-VIII**

Curriculum – Foundations of curriculum – Principles of curriculum construction – selection and organisation of content – curriculum evaluation. Text Books – importance – evaluation of text book. Educational Technology – Programmed Learning – Instructional Aids – Teacher made and mechanical aids – CAI – Classroom Interaction Analysis – Micro-teaching – Teaching Skills.

#### **Unit-IX**

Planning Teaching – Year Plan, Unit Plans, Lesson Plans. Taxonomy of Educational Objectives – OBI – OBT. Test and Measurement – Teacher made Test, Prognostic and Diagnostic Tests. Construction of a Test – steps – item analysis – characteristics of a good test. Classification and Tabulation of Scores – Measures of Central Tendency – Measures of Variability, Rank Correlation – Graphical representation of scores.

#### **Unit-X**

National level Agencies/ Statutory Bodies of Education – MHRD, UGC, NCERT, NIEPA, NCTE, NAAC, AICTE and RCI – their role and functions. Management and Administration of Education in Tamil Nadu – Administrative structure at the State and District levels. School level administration – role of Headmaster as an administrator and head teacher. Types of Schools – Central Board, State Board and Matriculation. School Managements – Central Government, State Government, Local Bodies, Private Aided and Private Unaided. SSA and DPEP – their role and functions – special focus on DTERT, DIETs, BRCs and CRCs.

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**GENERAL KNOWLEDGE**

**Unit I:**

Milestones in Indian History

**Unit II:**

Major events in World History

**Unit III:**

Important events in History of Tamil Nadu

**Unit IV:**

Geography - Elementary aspects of Geography of the World, India & Tamil Nadu

**Unit V:**

Salient features of Indian Constitution

**Unit VI:**

Salient features of Indian Economy

**Unit VII:**

Personalities - Books & Authors, discoveries, men & women of stature

**Unit VIII:**

Sports & Games

**Unit IX:**

Everyday Science

**Unit X:**

Current Affairs

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