



## TAMIL NADU PUBLIC SERVICE COMMISSION

**NOTIFICATION NO: 11/2016**  
**ADVERTISEMENT NO.: 441**

**DATED: 29.07.2016**

Applications are invited only through online mode upto 28.08.2016 for Direct Recruitment to the vacancies in the following post:-

Candidates have to Register their basic particulars through One - Time Registration which is mandatory on payment of Rs.50/- towards registration fee.

Name of the Post and Code No.	Name of the Service and Code No.	Number of vacancies	Scale of pay
<b>Junior Scientific Officer</b> (2013-2015) (Post Code. 1767)	Tamil Nadu Forensic Sciences Subordinate Service (Code No.033)	29+1*[carried forward vacancy]	Rs.9,300 - 34800/- (PB1) + Grade Pay 4,800/-

**The Group wise details of the vacancies are as follows:**

Biology	06
Chemistry	22
Physics	02 (including one BC (OBCM) carried forward vacancy)
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<b>Total</b>	<b>30</b>
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**2. DISTRIBUTION OF VACANCIES:-**

Name of the post	GT(G)	GT(W)	GT(G)(PSTM)	BC(G)	BC(W)	BC(G)(PSTM)	BC(W)(PSTM)	MBC/DC(G)	MBC/DC(W)	MBC/DC(G)(PSTM)	MBC/DC(W)(PSTM)	SC(G)	SC(W)	SC(A)(G)	ST(G)(PSTM)	Total
	<b>Junior Scientific Officer</b>	5	3	1	4+1*	2	2	1	2	1	1	1	3	1	1	

**\*1CarriedForward Vacancy**

**Abbreviation:-**

GT- General Turn, BC(OBCM) - Backward Class, MBC/DC - Most Backward Class/ Denotified Community, SC - Scheduled Caste, SC(A) - Scheduled Caste (Arunthathiyars), ST - Scheduled Tribe, W - Women, DW - Destitute Widow, PSTM - Persons Studied in Tamil Medium, G-General.

**3. FEES:-**

<b>One - Time Registration fee</b>	<b>Examination fee</b>
<b>Rs.50/-</b>	<b>Rs.100/-</b>

Candidates who have already registered in one time Registration System it is enough to pay the Examination Fee.

**EXAMINATION FEE CONCESSION:-**

<b>Category</b>	<b>Concession</b>	<b>Condition</b>
Scheduled castes / Scheduled Caste (Arunthathiyars)	Full Exemption	--
Scheduled Tribes	Full Exemption	--
Most Backward Class / Denotified Communities	Three free Chances	For Degree Holders
Backward Classes(Other than Muslim) / Backward Classes (Muslim)	Three free Chances	For Degree Holders
Ex-Servicemen	Two free Chances	Minimum General Educational Qualification
Differently Abled Persons	Full Exemption	--
Destitute Widow	Full Exemption	--

- The three / two free chances allowed are not for **EACH POST** but for **ANY THREE /TWO APPLICATIONS ONLY**. The claim for exemption from payment of fee made in any application which is rejected / admitted or withdrawn will be counted as a free chance. (Further details regarding Fee Concession is mentioned are at para 12 of "Instructions to the Candidates")

**4. IMPORTANT DATES:-**

A	Date of Notification	29.07.2016	
B	Last date for submission of applications	28.08.2016	
C	Last date for payment of Fee	30.08.2016	
<b>Date and Time of Written Examination</b>			
D	Paper - I (Subject of Examination)	16.10.2016 FN	10.00 A.M. to 01.00 P.M.
	Paper - II (General Studies)	16.10.2016 AN	02.30 P.M. to 04.30 P.M.

## 5. QUALIFICATIONS:-

### (A) AGE (as on 01.07.2016)

Sl. No.	Category of Candidates	Minimum Age (Should have completed)	Maximum Age
1	SCs, SC(A)s, STs, MBCs/DCs, BCs (OBCM)s, BCMs and DWs of all castes	18 Years	No Maximum Age Limit
2	“Others” [i.e. Candidates not belonging to SCs, SC(A)s, STs, MBCs/DCs, BCs and BCMs]	18 Years	30 Years (Should not have completed)

### Note:-

- (i) “Others” [i.e. Candidates not belonging to SCs, SC(A)s, STs, MBCs/DCs, BCs and BCMs] who have put in 5 years and more of service in the State / Central Government are not eligible even if they are within the age limit.

### (B) EDUCATIONAL QUALIFICATION: (as on 29.07.2016): -

Candidates should possess the following or an equivalent qualification granted by any of the Universities or Institutions recognized by the University Grants Commission for the purpose of its grant.

M.Sc., (Forensic Science) Degree and a degree in the subject, for the group as shown in the explanation below to which he is appointed.

**or**

M.Sc., Degree in the subject for the group as shown in the explanation below to which he is appointed.

Other things being equal, preference shall be given to person who holds a degree in M.Sc., (Forensic Science)

**Note:**

Candidates claiming equivalent qualification to the prescribed qualification should furnish the particulars regarding equivalence of qualification at the time of submission of application itself failing which their application will be summarily rejected.

**Explanation:** The group, division and subjects are specified below-

Sl. No. (1)	Group (2)	Division (3)	Subject (4)
1	Biology	(i) Anthropology (ii) Biology (iii) Serology	Zoology or Anthropology (Physical)/ Bio- Chemistry Micro Biology, Botany
2	Chemistry	(i) Chemistry (ii) Documents (iii) Toxicology (iv) Photography (v) Prohibition (vi) Excise (vii) Explosives (viii) Narcotics	Chemistry (General or Organic or Inorganic or Analytical or Physical)
3	Physics	(i) Ballistics (ii) Documents (iii) Photography (iv) Physics	Physics or Physical Chemistry

**Note**

- (i) A person with Bio-Chemistry as his subject in the degree is eligible for appointment only in the Biology and Serology divisions in the Biology Group and in the Toxicology division in chemistry group.
- (ii) A person appointed in the documents and photography division will take his seniority either in the chemistry or physics group according to his subject in the degree.
- (iii) The services rendered in the Research and Development and Reception divisions and Mobile Forensic Science Laboratories will be counted for experience in the respective group according to their subject in the degree.
- (iv) A Person with Botany as his subject in the degree is eligible for appointment only in the Biology division in the Biology group.

**Note:-**

The prescribed PG Degree qualification should have been obtained in the order of S.S.L.C., H.Sc. / Diploma or its equivalent and U.G. Degree respectively.

**C) KNOWLEDGE OF TAMIL:-**

Candidates should possess adequate knowledge of Tamil on the date of this Notification viz 29.07.2016.

(Further details are at para 11 of the 'Instructions to the candidates')

**6. SCHEME OF EXAMINATION (OBJECTIVE TYPE) AND ORAL TEST:-**

Subject	Duration	Maximum Marks	Minimum Qualifying Marks for selection	
			SCs, SC(A)s, STs, MBCs/DCs, BCs and BCMs	Others
<b>Paper - I any one of the following subjects:</b> (200 questions) (P.G Degree Standard) Forensic Science(226) Biology(227) Chemistry(228) Physics(229)	3 hours	300	171	228
<b>Paper - II</b> <b>General Studies</b> (Degree Standard)	2 hours	200		
<b>Interview and Records</b>		70		
<b>Total</b>		<b>570</b>		

**Note:**

- (i) The Candidates who have obtained PG degree in Forensic science should appear for the subject Forensic Science
- (ii) The Candidates who have obtained their PG degree in the subject as shown in column (4) of the Explanation under Note 5(B) of the notification should appear only in subject under which it is grouped as shown in column (2) except P.G. Degree in Physical Chemistry who should appear only in subject Chemistry.
- (iii) The Question papers in the subjects Physics and Chemistry in Paper-I will be set both in English and Tamil. The question paper in the subjects Forensic Science and Biology under Paper-I will be set in English only. The Question paper in Paper – II will be set in English and Tamil.
- (iv) The syllabi for Paper - I & Paper-II have been furnished in Annexure-I A and I -B to this Notification.

**Note:-**

1. To use either blue or black ink Ball Point pen only.
2. Answer sheet will be invalidated if shaded in pencil.
3. The answer sheet will be invalidated if the box provided for booklet series mentioned in the Question Paper is not shaded / incorrectly shaded.
4. Answer sheet answered in a subject other than the subject opted by the candidates in his application / specified in the Hall Ticket will be invalidated.
5. One mark will be deducted for incorrect or absence of shading Register Number.

**7. CENTRE FOR EXAMINATION:-**

Examination will be held at following Three Centres.

Sl. No.	Name of the Centre	Centre Code
1.	Chennai	0100
2	Coimbatore	0200
3	Madurai	1000

**Note:-**

Candidates will be required to appear for the Examination/ Certificate verification and Counselling at their own expenses.

The Commission reserves the right to increase / decrease the number of Examination Centres and to re-allot the candidates.

**8. CERTIFICATE OF PHYSICAL FITNESS:-**

Candidates selected for appointment to the post will be required to produce a certificate of Physical Fitness in the form prescribed below:

Form of Certificate of Physical Fitness	Standard of Vision Prescribed
Form prescribed for other than Executive and Ministerial posts	Standard - I Colour Blindness will be a disqualification.

Candidates with defective vision should produce Eye Fitness Certificate from a qualified Eye Specialist.

**9. MODE OF PAYMENT OF EXAMINATION FEE:-**

- Examination fee Rs.100/- (Rupees Hundred only)
- Candidates have to register their basic particulars through One-Time Registration which is mandatory on payment of Rs.50/- towards registration fee. The registration shall be valid for a period of five years from the date of one-time registration.

- Candidates should also to pay the service charges applicable to the Bank. **(State Bank of India and Indian Bank)**
- Candidates can avail exemption from paying Examination Fees as per eligibility criteria.
- **Offline mode of payment in the form of DD/Postal Order etc., will not be accepted and the applications forwarded with such modes of payment will be summarily rejected.**
- Those who have already registered in the **one time** registration system and paid the registration fee of Rs.50/- and received the registration ID **need not pay** the application fee i.e. Rs.50/- and it is enough to pay the Examination Fee of Rs.100/- alone.
- Candidates who have made **one Time Registration must apply for this post also.** **One Time Registration** is only to avail exemption for application fee for a period of 5 years from the date of registration.

#### **10. PROCEDURE OF SELECTION:-**

Selection will be made in two successive stages i.e., (i) Written Examination and (ii) Oral Test in the form of an interview. Final selection will be made on the basis of total marks obtained by the candidates at the Written Examination and Oral Test taken together and subject to the rule of reservation of appointments and Group wise vacancies by way of counselling. Appearance in both the papers of the Written Examination and Oral Test is compulsory. A candidate who has not appeared in any one of the papers in Written Examination or Oral Test will not be considered for selection, even if he/she secures qualifying marks in the Written Examination or Oral Test.

(Further details are at paragraph 23(b) of the 'Instructions to the candidates').

#### **11. NO OBJECTION CERTIFICATE:-**

Details are at para 15 (g) of the Commission's 'Instructions to the candidates'. Any violation of the instructions will be liable for or end in rejection of his / her candidature.

#### **12. CONCESSIONS:-**

Concessions in the matter of age and / or fees allowed to SCs, SC(A)s, STs, MBCs/DCs, BCs, BCMs, Destitute Widows, Ex-servicemen and Differently Abled persons, other categories of persons etc. are given in paragraphs 12 to 14 of the 'Instructions to the candidates'.

#### **13. HOW TO APPLY:**

Click here [www.tnpscexams.net](http://www.tnpscexams.net) / [www.tnpscexams.in](http://www.tnpscexams.in)

#### 14. GENERAL INFORMATION:-

- A. The rule of reservation of appointments applies to the post of Junior Scientific officer
- B. In G.O. Ms. No. 145, Personnel and Administrative Reforms (S) Department, dated 30.09.2010, the Government have issued orders to fill up 20% of all vacancies to be filled in by direct recruitment shall be set apart on **preferential basis** to persons studied the above prescribed qualification in Tamil Medium. The 20% reservation of vacancies on preferential allotment to **Persons Studied in Tamil Medium (PSTM)** will apply for this post of **Junior Scientific officer**. The turns for PSTM has been ordered in G.O. Ms. No. 40, Personnel and Administrative Reforms (S) Department, dated 30.04.2014. (Candidates claiming this reservation should have studied the above prescribed qualification for the post in Tamil Medium and should have the certificate for the same. Having written the examinations in Tamil language alone will not qualify for claiming this reservation). If the candidates with PSTM are not available for selection for appointment against reserved turn such turn shall be filled up by Non-PSTM candidates but belonging to the respective communal category. (Further details are at (xix) of para 29 of the 'Instructions to candidates')
- C. The number of vacancies advertised is only approximate and is liable for modification including reduction with reference to the vacancy position at any time before finalisation of selection.
- D. If no qualified and suitable women candidates are available for selection against the vacancies reserved for them, those vacancies will be filled by male candidates belonging to the respective communal categories.
- E. In G.O. (Ms.) No.13, Welfare of Differently Abled Person (DAP3.2) Department, dated 02.03.2016, orders were issued by Government approving a list of 263 posts identified under Group A & B categories as the suitable posts for the persons with disabilities and also directed that 3% of vacancies in direct recruitment for the posts identified under A & B categories shall be reserved for Differently Abled Persons. As far as the post of '**Junior Scientific Officer**' in Tamil Nadu Forensic Science Subordinate Service is concerned, it has not been identified as suitable for Differently Abled person in the above said G.O. Hence reservation to differently Abled person will not apply for this post. However, they can apply and should send the documents referred to in **para 14 (f)** of the Commission's 'Instructions to the Candidates' when called for.
- F. **Reservation to "Destitute Widows" and "Ex-service Men" will not apply to this post.**



- G. Even after filling up of the post reserved for SC Arunthathiyars on preferential basis, if more number of qualified Arunthathiyars are available, they shall be entitled to compete with the Scheduled Castes other than Arunthathiyars in the inter-se merit among them and if any posts reserved for Arunthathiyars remain unfilled for want of adequate number of qualified candidates, it shall be filled up by Scheduled Castes other than Arunthathiyars.
- H. Any claim relating to the selection (not related to candidature or / and claims made in the application) should be sent when called for documents / uploading document is made. Any claim received thereafter will not be entertained.
- I. Correct and true information regarding arrest, convictions/debarment/disqualification by any recruiting agency, criminal or any disciplinary proceedings initiated or finalised, participation in agitation or any Political Organization, candidature in election for Parliament/State Legislature/Local Bodies etc., if any, should be furnished to the Commission at the time of application i.e. the details thereof, originals of the Judgement of Acquittals, order/ or G.O. dropping further action in Departmental proceedings or any document that may prove the suitability of such candidates for a Government appointment in such cases must be produced at the stage/ time of Certificate Verification without fail.
- J. The selection for appointment to the above said post is purely provisional subject to final Orders on pending Writ Petitions, if any, filed in Madras High Court and Madurai Bench of Madras High court.
- K. **Applications containing wrong claims relating to other basic qualifications / category of reservation / eligibility criteria / age / educational qualification will be liable for rejection.**

**15. OTHER IMPORTANT INSTRUCTIONS:-**

**a. Candidates should ensure their eligibility for examination:**

The candidates applying for the examination should ensure that they fulfil all eligibility conditions for admission to examination. **Their admission to all stages of the examination will be purely provisional subject to satisfying of the eligibility conditions.** Mere issue of memo of admission to the candidate will not imply that his/her candidature has been fully cleared by the Commission.

b. The Hall Tickets for eligible candidates will be made available in the Commission's website [www.tnpsc.gov.in](http://www.tnpsc.gov.in) or [www.tnpscexams.net](http://www.tnpscexams.net) for downloading by candidates. No Hall Tickets will be sent by post. So the candidates / applicants should watch Tamil Nadu Public Service Commission website since ahead/ before the scheduled date of examinations.

**c. Facilitation Counter for guidance of candidates:**

In case of any guidance/ information / clarification of their applications, candidature, etc. candidates can contact Tamil Nadu Public Service Commission's Office in person or over Telephone No.044-25332833/ 25332855 or the Commission's Office Toll-Free No.1800 425 1002 on all working days between 10.00 a.m. and 05.45 p.m.

**d. Mobile phones and other articles banned:-**

i. Candidates are not allowed to bring to the venue of the Examination Cellular phone, Calculator, memory notes and books etc. or any other Electronic device or Recording device either as separate piece or part of something used by the candidate such as Watch or Ring.

ii. If they are found to be in possession of any such thing or instrument they will not be allowed to attend the examination further, besides invalidation of answer paper and / or debarment. If it is considered necessary they will be subjected to thorough physical search including frisking on the spot.

iii. Do not bring into the Examination Hall any article such as books, notes, loose sheets, mathematical and drawing instruments, Log Tables, stencils of maps, slide rules, Text Books, rough sheets etc. except the permitted writing material i.e. pen. No colour pen or pencil must be used.

e. Candidates are not required to submit along with their application any certificates in support of their claims regarding age, educational qualifications, community certificates and certificates regarding their physical disability, etc., They should be submitted when called for by the Tamil Nadu Public Service Commission. The candidates applying for the examination should ensure that they fulfil all the eligibility conditions for admission to the examination. Their admission at all the stages of examination for which they are admitted by the Commission viz. Written Examination will be purely provisional, subject to their satisfying the prescribed eligibility conditions. If on verification at any time before or after the Written Examination and Certificate Verification, it is found that they do not fulfil any of the eligibility conditions, their candidature for the examination will be cancelled by the Commission.

- f. If any of their claims is found to be incorrect, or false it will lead to rejection / debarment
- g. **Unfair means strictly prohibited:** No candidate shall copy from any other candidate nor permit to be copied nor give nor attempt to give nor obtain nor attempt to obtain irregular assistance of any description.
- h. **Conduct in examination hall:** No candidate should misbehave in any manner or create a disorderly scene in the examination hall or harass the staff employed by the Commission for the conduct of the examination. Any such misconduct will be severely viewed and penalized.

**The on-line application can be submitted upto 28.08.2016 till 11.59 p.m., after which the link will be disabled.**

*(For detailed information the candidates may refer Commission's "Instructions to the candidates" at the Commission's website [www.tnpsc.gov.in](http://www.tnpsc.gov.in) )*

**Secretary**

**ANNEXURE - IA****FORENSIC SCIENCE (PG DEGREE STANDARD) Code No.226**  
**FOR THE POST OF JUNIOR SCIENTIFIC OFFICER****UNIT I**

Forensic Science - Definition - Development of Forensic science in India - Organization and functions of Forensic laboratory

**UNIT II**

Physical evidences - their classification and significance - Locard's Principle of exchange- class and individual characteristics.

Crime Scene examinations - documentation of crime scene- recognition, collection, preservation and transportation of physical evidence for laboratory examinations.

Fundamentals of photography - crime scene photography

**UNIT -III**

Foot and tyre impressions - Walking pattern - Recording and examination of foot prints and tyre prints.

Finger prints - Fundamental principles - Finger print patterns - classification of finger prints - methods of developments of latent finger prints.

**UNIT IV**

Tool marks - identification - restoration of filed off/erased marks - Detection of counterfeit coins and currency.

Fire arms, Bullet and cartridge case identification - pellets and wads - Range of firing.

**UNIT V**

Fire and arson - Natural fires - Arson - Accelerants - Combustible properties of flammable substances.

Explosives - Classification of explosive substances - Combustion, detonation and explosion - Effects of explosion - Military and industrial explosives - Improvised explosive devices - Explosive residues - Residues examination.

**UNIT VI**

Questioned documents, identification of hand writing, type writer and forged signatures - Erasures and alterations on documents and their detection.

**UNIT VII**

Broken glass - glass fractures - direction of force - backward fragmentation - comparison of glass fragments.

Forensic examination of soil and paints,

Theory and practice of polygraph and voice identification.

**UNIT VIII**

Toxicology - classification and mode of action of poisons - narcotic drugs - alcoholic beverages - isolation and identification of poisons, drugs and alcohol.

**UNIT IX**

Examination of biological fluids - blood, seminal and saliva stains - forensic characterization of the above stains - stain patterns of the blood, Examination of fibres, hair, bones, teeth and skull - Fundamental of DNA typing.

**UNIT X**

Instrumental methods of organic analysis - principles of chromatography, spectrophotometry, and mass spectrometry.

Instrumental methods of inorganic analysis - Principles of emission and atomic absorption spectra - X-ray diffraction - Neutron activation analysis.

**BIOLOGY (PG DEGREE STANDARD)**                      **Code No.227**  
**FOR THE POST OF JUNIOR SCIENTIFIC OFFICER**

**UNIT-I**

General classification and salient features of Invertebrata and vertebrata – Metamorphosis and regeneration in lower forms of animal – Economic importance of oyster, honey bee, Silkworm – Agricultural pests and their control – Larval forms of crustacean and Echinodermata - Classification and identification of poisonous and nonpoisonous snakes and types of snake venom. Evolution: Theories, types and factors influencing evolution Evidences of human evolution – Human genetics: Pedigree analysis, lod score for linkage testing, Karyotyping, Significance of human genome project.

**UNIT-II**

Structural organization and importance of animal cells - Muscle cells – Cardiac, Striated and non-striated muscle cells– HepatocytesNeurons, Nephrons, Karatocytes, immune and endocrine cells. Functions of hormones and their receptors – Impact of sex hormones in human behavior. Chronobiology: importance of circadian rhythm and human biological clock – DNA analysis in paternity testing – Cell counting of WBC and RBC.Functions and disorders of Digestive, Respiratory, Cardiovascular Nervous, Muscular, Excretory, Reproductive and Integumentary systems. Developmental biology: production of sperm and egg, Fertilization – Zygote, Cleavage. Blastulation, gastrulation and formation of germ layers in animals and organogenesis – determination of sex by Amniocentesis. Entomology: Insect classification – Beneficial and harmful insects – Role of insects in decomposition of decayed materials – Exploiting insect olfaction in forensic studies – Importance of ants, blowflies and beetles in forensic investigation.

**UNIT – III****Fundamentals of Anthropology**

Meaning – Scope and branches of Anthropology – Basic concepts / principles of Physical or Biological Anthropology – Anthropology and its relation with other Social, Biological and Medical Sciences – Analysis of kinship – Health and Ethno medicine – Population dynamicswith special reference to Tamil Nadu – Applied and developmental Anthropology – Tribal, Rural and Urban Communities  
Research Methodology- Anthropological research – Fieldwork Tradition, Methods and Techniques, Qualitative and Quantitative research Methods, Observation, Case study, Ethnography, Life histories and Personal documents, Visual Anthropology, Genealogical Methods.

**UNIT – IV****Physical / Biological Anthropology**

Position of human being in the animal kingdom – Human Evolution - Theories of human evaluation, Human growth and development – Factors affecting for growth, Demographic growth variation, Sex and Gender – Bio-cultural dimensions, Race and Ethnicity - Major racial groups of India, Ethnicity and contemporary relevance – Applied physical anthropology - Anthropometry and its uses, DNA Technology, genetic diseases, Forensic Anthropology and criminal investigations.

**UNIT-V****Chemistry of Biomolecules**

**Carbohydrates** – Structure and functions [Mono, Di & Polysaccharides] – Disorders of Carbohydrate Metabolism and its laboratory diagnosis.

**Proteins and Amino acids** – Types, structure and function.

**Lipids** – Types structure and functions. Sterols –Cholesterol. Disorders of lipid metabolism and its laboratory diagnosis.

**Nucleic acid** – DNA – Types, structure and functions

RNA – Types, structure and functions

**Enzymes** – Classification and properties of enzymes, Coenzymes, Marker enzymes

**Hormones**- Classes and functions of hormones

**UNIT-VI****Biochemical and Molecular Techniques**

Blood and its composition – WBC, RBC and Platelets. Blood clotting, Blood grouping, Cross matching and compatibility tests, Blood smear analysis, HLA typing.

Antigens and Immunoglobins – Classes and functions.

Collection and Preservation of Biological fluids [Blood, Urine, CSF, Amniotic fluid, Semen, Sputum and Saliva]. Normal and Abnormal constituents of Biological fluids.

Isolation of DNA from blood sample, Agarose gel Electrophoresis, PCR, DNA Sequencing, RAPD, RFLP, DNA Finger printing -STR Typing.

Isolation of Proteins from blood sample, SDS PAGE, RIA, ELISA, FISH.

Ames test, Comet Assay.

**UNIT- VII**

Origin of Microbiology, Contribution of Louis Pasteur, Alexander Flemming, Waksman, Robert Koch. Microscopy; Brightfield, Phase contrast, Fluorescent, Electron Microscopy and Confocal Microscopy. Staining techniques.

Cultivation of Microorganisms, Preparation of culture media, Sterilization techniques, Preservation techniques, Identification of Microorganisms; Conventional and Molecular techniques.

Host parasite interaction, Microbial diseases, Nosocomial infection, Zoonotic diseases, Food borne diseases, Microbial diseases of medical negligence. Bioterrorism and Biohazards.

**UNIT- VIII**

DNA profiling, Genetic code, Mutation and DNA polymorphism, Microbial nanotechnology, Infectomics.

Biodeterioration of fibres and leather, Bioremediation, Bioconversion - Biogas technology, Environmental microbiology - Microbiology of air, water and soil. Role of microbes in production of fermentation products.

Production of antibiotics, Enzymes, Pigments, Insulin, Interferon, Monoclonal antibodies and Growth Hormones. Recombinants DNA technology.

Microbial biofertilizers, Microbial biopesticides and Microbial degradation of synthetic pesticides.

**UNIT – IX**

Plant Diversity, Cell Biology – Taxonomy and Paleo botany, Plant Physiology Plant biochemistry, Plant pathology

**Plant Diversity** – Algae, Fungi, Bryophyte, pteridophytes, Gymnosperms, lichen.

**Cell Biology** – Cell structure and functions

**Taxonomy**– Principals of Taxonomy and phylogeny of angiosperms, Nomenclature of plants, Monocotyledons and dicotyledons

**Paleo botany** – Fossil plants

**Plant Physiology and Plant biochemistry** – Ezymes, Protein, Aminoacid and photo synthesis, respiration

**Plant pathology** – Bacterial, Fungal and Viral Diseases of Plants.

**UNIT- X**

Plant Anatomy, Embryology, Genetics, Economic Botany, Ethnobotany, Environmental Botany

**Plant Anatomy** – Cell cycle, Cell division, Tissue system and secondary growth, Fruit wall and seed coat.

**Embryology** – Embryogenesis, Polyembryony, Double fertilization, Somatic Embryogenesis and Pollen grains.

**Genetics** – Mendelism, Linkage, crossing-over, chromosome mapping, RAPD and RFLP Techniques.

**Economic Botany** – Wood and Wood products, Fatty Oils and Vegetable Oils. Tannins and Dyes.

**Ethnobotany** – Ethno Medicinal Plants, Narcotic Plants.

**Environmental Botany** – Plant adaptations, Hydrophytes, Xerophytes, Mesophytes, Epiphytes, Halophytes and Mangrove vegetation. Ecological Indicators, Forest and Forest Management.

**CHEMISTRY (PG DEGREE STANDARD)**      **Code No.228**  
**FOR THE POST OF JUNIOR SCIENTIFIC OFFICER**

**Unit – I : Quantum Chemistry :**

Quantum mechanical postulates – Eigen value and function – the Schrodinger wave equation – elementary applications of Schrodinger's equation – the particle in a box (one, two and three dimensional cases) – particle in a ring. The harmonic oscillator – the rigid rotor – the hydrogen atom – the Schrodinger equation for hydrogen atom – angular momentum – term symbols – Approximation methods – perturbation and variation method – application to hydrogen and helium atoms – R.S. coupling and term symbols for atoms in the ground state – Slater orbital and HF – SCF methods Born open – Heimer approximation – valence bond theory for hydrogen molecule – LACO – MO theory for di and polyatomic molecules – concept of hybridization – Huckel theory for conjugated molecules (ethylene butadiene and benzene) – semi empirical methods.

**Unit – II: Chemical Kinetics and Thermodynamics:**

Rate laws – rate constant for first, second, third and zero order reaction – Half life period Temperature dependence on rate – Arrhenius theory – collision theory – Absolute reaction rate theory – ionic reaction – salt effect – catalysis – Laws of photo chemistry, quantum efficiency - photo physical processes of electronic excited molecules.

Partial molar properties – Chemical Potential – Partial molar volume and molar heat content – significance and determination – Thermodynamics of real gases - gas mixture – fugacity definition – determination of fugacity variation of fugacity with temperature and pressure – concept of thermodynamic probability – distribution of distinguishable and non – distinguishable particles. Maxwell – Boltzmann, Fermi-Dirac and Bose Einstein statistics – modes of contribution to energy – partition function – translational, vibrational and rotational partition functions for mono, diatomic and polyatomic ideal gases.

**Unit – III : Nuclear Chemistry :**

Nuclear properties – nuclear spin and moments, origin of nuclear forces, salient features of liquid drop and shell models. Types of radioactive decay: Orbital electron capture, nuclear isomerism, internal conversion, detection and determination of activity by cloud chamber, nuclear emulsion, bubble chamber, G.M., Scintillation and Cherenkov counters; Accelerators – Linear and Cyclotron. Nuclear reaction: Types, reaction cross section, Q-value, threshold energy, compound nucleus theory: nuclear fission and fusion reactions as energy sources: photonuclear and thermo nuclear reactions. Components of nuclear reactor – the fast breeder reactor – nuclear reactors in India. Radioactive tracer – principles of tracer technique – application of tracers in the study of reaction mechanism and in analytical chemistry – neutron activation analysis, isotope dilution analysis – radio chemical determination of age of geological specimen. Tracers as applied to industry and agriculture – radioactive tracer in the diagnosis and treatment in the field of medicine.



**Unit- IV: Electrochemistry :**

Mean ionic activity and activity coefficient: concept of ionic strength, Debye-Huckel theory of strong electrolytes – activity coefficient of strong electrolytes-determination – Debye Huckel limiting law at appreciable concentration of electrolytes – Debye Huckel Bronsted equation – qualitative and quantitative verification.  $P_H$  &  $P_{K_a}$  of acids and bases – determents and buffer actions conductometric and potentiometric tirations Mechanism of electrode reaction – polarization and overpotential. Corrosion and passivation of metals: Pourbaix and Evans diagrams – fuel cells – electrodeposition – principle, applications and anticorrosion techniques.

**Unit – V : Spectroscopy**

Electromagnetic radiations and quantization of energy: Rotational spectra of diatomic molecules – isotopic substitution and rotational constants – vibrations spectra of linear symmetric, linear asymmetric and bent tri atomic molecules – electronic spectra – selection rules – nuclear magnetic resonance – chemical shifts – spin – spin coupling – election spin resonance and hyperfine splitting theoretical principles of mass spectroscopy. Application's of UV, IR, NMR, ESR and mass spectroscopy for structural elucidation of organic compounds, inorganic complexes and free radicals.

**Unit – VI : Organometallic compounds, Bio inorganic chemistry and Polymers:**

Metal carbonyls, Metal nitrosyls, metal alkyl, alkenes and arene compounds – organic metallic compounds in catalysis – Chemistry of prophyryns – chlorophyll hemoglobin, myoglobin, ferredoxin, rubredoxin and cytochromes.

Preperation and uses of polyethylene and uses of polyethylene, poly butylenes PVC, Nylon – Ziegler – Natta catalysts – Inorganic Polymers such as silicones, Borazines and phosphonitrilic compounds.

**Unit – VII : Organic reaction mechanism and Stereochemistry:**

General methods of reaction mechanisms (Kinetic and non kinetic)  $S_N1$ ,  $S_N2$  mechanisms – addition substitution, elimination and rearrangements – free radical mechanism – aromatic substitution – formation and stability of reactive intermediates – The arenium ion mechanism. Orientation and reactivity (ortho, meta and para directing groups). Typical reactions to be studied – nitration, halogenations, alkylation, acylation and diazonium coupling. Formylation – Gatterman, Gatterman-Koch, Vilsmeier-Hack & Reimer-Tiemann, Ziegler alkylation, Chichibabin, Aldol condensation – Claisen condensation – Perkin, Cannizzaro, Friedel Craft, Favorski, Stork enamine – Michael addition – Baeyer – Villiger – Chichibabin. Pericyclic reactions – classification and examples Woodward and Hoffmann rules – use of  $OsO_4$ , diborane,  $NaBH_4$ ,  $LiAlH_4$  in organic synthesis. Photo Chemistry of ketones, photo oxygenation, photo reduction, photocycloaddition, Paterno - Buchi reaction, Di-pi-methane rearrangement. Cis-trans isomerisation, Barton reaction and photo-Fries reaction.

Elements of symmetry – optical and geometric isomerism E.Z and R.S notation's – Conformational analysis simple cyclic and acyclic systems – Effects of conformation on reactivity in acyclic compounds and cyclohexanes. Relative stabilities of cis – trans isomers.

### **Unit – VIII: Natural Products and Drugs :**

Carbohydrates - Classification – configuration and general reactions of monosaccharide's – Chemistry of glucose, fructose, sucrose and maltose, important compounds in Chemistry – Dyes – azo triphenylmethane and phthalein groups – indigo – alizarin vitamins, hormones, proteins – structural determination –Terpenoids – classification, isolation, general properties of citral, – Terpeneol, menthol, champhor.

Alkaloids and Flavonoids – Nomenclature and classification general properties – colour reactions, structure for Nicotine, atropine, cocaine, quinine, morphine and Heroin.

Drugs: Pharmacological actions, therapeutic uses and screening tests of the following drugs – opium alkaloids – morphine, heroin, antibiotics – synthetic analgesics – pethidine, methadone – barbiturates – tranquilizers – phenothiazines, meprobamate, diazepam – stimulants – amphetamines, imipramines – hallucinogens – cannabinoids, LSD – hypnosis and sedatives – antipyretics, analgesic, antiseptics and disinfectants – Alcohol - manufacture of ethyl alcohol and liquors – constituents of liquors – estimation of alcohol contents in liquors – denaturation, denaturants, industrial alcohol and power alcohol.

### **Unit - IX : Poisons and Pesticides :**

Definition of poisons – Mode of action of poisons – Extraction and purification of poisons in toxicological analysis – Volatile poisons – metallic poisons – non-volatile organic poisons – water soluble compounds – protein precipitation methods. Estimation of the following poisons – Carbon monoxide, cyanide, formaldehyde, methanol, chloral, chloroform, phenols, cresols, phosphorus and amphetamines - Signs and symptoms of  $H_2SO_4$ ,  $HNO_3$ ,  $CO_2$ ,  $H_2S$  poisoning. Analytical methods for the estimation of ethyl alcohol. Metallic poison – signs, symptoms of arsenic, mercury, lead and copper – Reinch test - Marsch Berzelius and Gutzeit tests –volumetric, colorimetric and instrumental methods of analysis of the above metals. Pesticides & Insecticides – Definition – general properties poisonous nature – detection & isolation.

### **Unit – X : Analytical Chemistry and Instrumental methods:**

Significant figures – precision & accuracy – Errors - minimizing methods – estimation of errors – rejection of observation.

Absorption, partition chromatography – Gas Chromatography – HPLC – Solvent extraction and ion exchange methods – atomic absorption spectroscopy – Electron analytical techniques voltammetry, cyclic voltammetry, polarography, amperometry, Coulometry and conductometry, ion-Selective electrodes – TGA, DTA and DSC.

**FOR THE POST OF JUNIOR SCIENTIFIC OFFICER****1.UNIT-I MECHANICS – RELATIVITY AND SPACE PHYSICS:-**

Impulse – Impact – Laws of Impact – Direct impact and Oblique impact between two smooth Spheres – Loss of Kinetic theory – Motion of two interacting bodies – Reduced mass – Rigid body dynamics

**RELATIVITY:** Postulates of Special Theory of relativity – Lorentz transformation Equations and its Consequences – Relativity of Simultaneity - Mass Energy Equivalence

**SPACE PHYSICS:** Escape Velocity – Orbital Velocity – Geo Stationary Orbits and Satellite Communication – Remote Sensing.

**2.UNIT-II CLASSICAL MECHANICS:-**

Generalised Co-ordinates – D'Alembert's Principle - Lagrangian Equations and its applications – Hamilton's Equations from Variation Principle – Principle of Least Action – Canonical Transformations and its applications – Hamilton – Jacobi Theory – Action Angle Variable – Kepler's Problem – Theory of Small Oscillations – Eulerian Angles, Eulerian Theorem – Coriolis force – Euler Equations of motion.

**3.UNIT-III THERMODYNAMICS – STATISTICAL MECHANICS:-**

Laws of thermodynamics – Entropy – Thermodynamic potentials – Maxwell's equations and its applications Gibbs phase rule – Phase transition – Vanderwaal's equation of State.

**CLASSICAL STATISTICS:** Micro and Macro States – Liouville's theorem – Micro Canonical and grand Canonical ensembles – partition function Gibbs Paradox.

**QUANTUM STATISTICS:** Maxwell's distribution – BE Statistics – Black body radiation – Planck's Radiation Law – FD Statistics – Applications

**4.UNIT- IV OPTICS – ATOMIC AND MOLECULAR SPECTROSCOPY:-**

Basic ideas of Interference, Diffraction and Polarisation – Principle of LASER and its applications – Coupling Schemes – Zeeman effect – Paschen – Back effect – Spectra Structure of atomic molecules – Rotation, Vibration and Rotation – Vibration Spectra Frank – Condon principle – Microwave, IR, RAMAN, Mossbauer, NMR, NQR and ESR Spectroscopy – Principle, technique and applications.

**5.UNIT-V SOLID STATE AND NUCLEAR PHYSICS:-**

Crystal Classes and Systems – 2D, 3D Lattices – Lattice heat capacity X-rays – X-ray diffraction – Uses – Band theory of Solids – Fermi level – Superconductivity – Basic concepts – application of Super Conductors. Different types of magnetic materials.

Nucleus – Properties and Structure – Nuclear forces – Binding energy – Radioactive decays – Particle detectors and accelerators – Nuclear fission and fusion – Elementary particles – Cosmic Rays

**6. UNIT-VI QUANTUM MECHANICS:-**

Basic formalism – Schroedinger time dependent and time independent equations – Eigen values and Eigen functions – uncertainty principle – Hilbert space - Dirac notation – Schroedinger and Heisenberg interaction picture – WKB Quantisation rule – Time dependent perturbation theory – Fermi golden rule – Born and Sudden approximations – Dirac's relativistic equation – Dirac's equation for a central field – Spin angular momentum – negative energy states.

**7. UNIT-VII ELECTRO MAGNETIC THEORY:-**

Gauss Law – Laplace and Poisson equations – Biot and Savart Law – Ampere Law – Faraday's Laws of induction – Maxwell's Equations – Molecular Polarisability and electrical susceptibility – Lorentz force – Equation of Continuity – Propagation of EM Waves in non conducting and conducting medium – reflection and refraction at a plane interface between dielectrics – Radiation from a localised source – oscillating electric dipole.

**8. UNIT-VIII ELECTRONIC DEVICES AND APPLICATIONS:-**

Semi Conductor diode and Transistor – Optoelectronic devices – photo diode, photo transistor, LDR, LED, LCD, Special Semi conductor devices – JFET, MOSFET, UJT, SCR – Characteristics and applications – Operational amplifier Characteristics and applications – 555 timer – Block diagram and working.

Electrodes and transducers used in ECG and EEG techniques – ultrasound Scan – Basic ideas of CT and MRI Scan.

**9. UNIT-IX DIGITAL ELECTRONICS AND MICROPROCESSOR:-**

Logic gates – half and full adder and subtractors – Parallel binary adder – 8421 adder – karnaugh map –NAND – NOR networks – flipflops – counters and shift registers - Architecture of 8085 – Addressing models – Instruction set – Programming techniques – Semiconductor memory types – RAMS and ROMS – Interfacing of memory devices and I/o Ports.

**10. UNIT- X COMMUNICATION ELECTRONICS:-**

Directional high frequency antennas – Sky wave propagation – Ground wave propagation – Modulation and demodulation techniques – Principle of radio communication – AM and FM transmission – RADAR Principle and equation – Television transmission and reception – Fibre optics – Propagation of Light in an Optical fibre – Losses and dispersion – applications.

## ANNEXURE - IB

### ALL TECHNICAL POST MAIN EXAMINATION

#### General Studies

#### Degree / P.G Degree Standard

#### Topics for Objective Type

#### **Unit-I General science :**

**Physics** Universe-General Scientific laws-Scientific instruments-Inventions and discoveries-National scientific laboratories-Science glossary-Mechanics and properties of matter-Physical quantities, standards and units-Force, motion and energy-Electricity and Magnetism, Electronics and Communication -Heat, light and sound-Atomic and nuclear physics-Solid State Physics – Spectroscopy- Geophysics - Astronomy and space science

**Chemistry** Elements and Compounds-Acids, bases and salts-Oxidation and reduction-Chemistry of ores and metals-Carbon, nitrogen and their compounds-Fertilizers, pesticides, insecticides-Biochemistry and biotechnology-Electrochemistry-Polymers and plastics

**Botany**-Main Concepts of life science-The cell-basic unit of life-Classification of living organism-Nutrition and dietetics-Respiration-Excretion of metabolic waste-Bio-communication

**Zoology**-Blood and blood circulation-Endocrine system-Reproductive system-Genetics the science of heredity-Environment, ecology, health and hygiene, Bio- diversity and its conservation-Human diseases-Communicable diseases and non- communicable diseases- prevention and remedies- Alcoholism and drug abuse-Animals, plants and human life

#### **Unit- II. Current Events**

**History**--Latest diary of events – National--National symbols-Profile of States-Defence, national security and terrorism-World organizations-pacts and summits-Eminent persons & places in news-Sports & games-Books & authors -Awards & honours-Cultural panorama-Latest historical events-- India and its neighbours-- Latest terminology-Appointments-who is who?

**Political Science**-1. India's foreign policy-2. Latest court verdicts – public opinion-3. Problems in conduct of public elections-4. Political parties and political system in India-5. Public awareness & General administration-6. Role of Voluntary organizations & Govt.,-7. Welfare oriented govt. schemes, their utility

**Geography** Geographical landmarks-Policy on environment and ecology—

**Economics**--Current socio-economic problems-New economic policy & govt. sector

**Science**-Latest inventions on science & technology-Latest discoveries in Health Science-Mass media & communication

#### **Unit-III. Geography**

Earth and Universe-Solar system-Atmosphere hydrosphere, lithosphere-Monsoon, rainfall, weather and climate-Water resources --- rivers in India-Soil, minerals & natural resources-Natural vegetation-Forest & wildlife-Agricultural pattern, livestock & fisheries-Transport including Surface transport & communication-Social geography –

population-density and distribution-Natural calamities – disaster management-Climate change - impact and consequences - mitigation measures-Pollution Control

#### **Unit-IV. History and culture of India**

Pre-historic events--Indus valley civilization-Vedic, Aryan and Sangam age-Maurya dynasty-Buddhism and Jainism-Guptas, Delhi Sultans, Mughals and Marathas-Age of Vijayanagaram and the bahmanis-South Indian history-Culture and Heritage of Tamil people-Advent of European invasion-Expansion and consolidation of British rule-Effect of British rule on socio-economic factors-Social reforms and religious movements-India since independence-Characteristics of Indian culture-Unity in diversity –race, colour, language, custom-India-as secular state-Organizations for fine arts, dance, drama, music-Growth of rationalist, Dravidian movement in TN-Political parties and populist schemes-Prominent personalities in the various spheres – Arts, Science, literature and Philosophy – Mother Teresa, Swami Vivekananda, Pandit Ravishankar , M.S.Subbulakshmi, Rukmani Arundel and J.Krishnamoorthy etc.

#### **Unit-V INDIAN POLITY**

Constitution of India-. Preamble to the constitution- Salient features of constitution- Union, State and territory- Citizenship-rights amend duties- Fundamental rights-Fundamental duties- Human rights charter- Union legislature – Parliament- State executive- State Legislature – assembly- Status of Jammu & Kashmir- Local government – panchayat raj – Tamil Nadu- Judiciary in India – Rule of law/Due process of law-Indian federalism – center – state relations-. Emergency provisions- Civil services in India- Administrative challenges in a welfare state- Complexities of district administration- Elections - Election Commission Union and State. Official language and Schedule-VIII- Amendments to constitution- Schedules to constitution-. Administrative reforms & tribunals- Corruption in public life- Anti-corruption measures – Central Vigilance Commission, lok-adalats, Ombudsman, – Comptroller and Auditor General of India- Right to information - Central and State Commission- Empowerment of women- Voluntary organizations and public grievances Redressal- Consumer protection forms

#### **Unit- VI. Indian economy**

Nature of Indian economy-Need for economic planning-Five-year plan models-an assessment-Land reforms & agriculture-Application of science in agriculture-Industrial growth-Capital formation and investment-Role of public sector & disinvestment-Development of infrastructure- National income- Public finance & fiscal policy- Price policy & public distribution- Banking, money & monetary policy- Role of Foreign Direct Investment (FDI)- WTO-globalization & privatization- Rural welfare oriented programmes- Social sector problems – population, education, health, employment, poverty-HRD – sustainable economic growth- Economic trends in Tamil Nadu -Energy Different sources and development- Finance Commission -Planning Commission-National Development Council

#### **Unit-VI. Indian national movement**

National renaissance-Early uprising against British rule-1857 Revolt- Indian National Congress-Emergence of national leaders-Gandhi, Nehru, Tagore, Nethaji -Growth of militant movements -Different modes of agitations-Era of different Acts & Pacts-World war & final phase struggle-Communalism led to partition-Role of Tamil Nadu in freedom struggle - Rajaji, VOC, Periyar, Bharathiar & Others-Birth of political parties /political system in India since independence-

## Unit-VII. APTITUDE & MENTAL ABILITY TESTS

Conversion of information to data-Collection, compilation and presentation of data - Tables, graphs, diagrams-Parametric representation of data-Analytical interpretation of data -Simplification-Percentage-Highest Common Factor (HCF)-Lowest Common Multiple (LCM)-Ratio and Proportion-Simple interest-Compound interest-Area-Volume-Time and Work-Behavioral ability -Basic terms, Communications in information technology-Application of Information and Communication Technology (ICT)- Decision making and problem solving-Logical Reasoning-Puzzles-Dice-Visual Reasoning-Alpha numeric Reasoning-Number Series-Logical Number/Alphabetical/Diagrammatic Sequences-

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