

**SCHEME AND SYLLABUS FOR RECRUITMENT TO THE POST OF LECTURER IN
RADIOLOGICAL PHYSICS AND PHYSICIST IN A.P. MEDICAL EDUCATION SERVICE**

SCHEME

(P.G. standard)

PART – A: WRITTEN (Objective Type) EXAMINATION				
i)	General Studies and Mental ability (Degree standard)	150 Questions	150 Marks	150 Minutes
ii)	Subject (P.G. standard) Paper-I	150 Questions	150 Marks	150 Minutes
		Paper-II	150 Questions	150 Marks
PART – B: INTERVIEW (ORAL TEST)			50 Marks	

SYLLABUS

GENERAL STUDIES AND MENTAL ABILITY

1. General Science – Contemporary developments in Science and Technology and their implications including matters of every day observation and experience, as may be expected of a well-educated person who has not made a special study of any scientific discipline.
2. Current events of national and international importance.
3. History of India – emphasis will be on broad general understanding of the subject in its social, economic, cultural and political aspects with a focus on AP Indian National Movement.
4. World Geography and Geography of India with a focus on AP.
5. Indian polity and Economy – including the country's political system- rural development – Planning and economic reforms in India.
6. Mental ability – reasoning and inferences.

SUBJECT - PHYSICS

Paper-I

1. Complex variables – Cauchy reimann equaling – Evaluation of definite integrals – wave equation and its applications to vibrations of rectangular and circular membranes. Tensors – Kronecker delta – Covariance of Maxwell's equations.
2. Thermodynamic potentials – Bose-Einstein statistics (ideal gas equation and Bose Einstein condensation) – Fermi-Diarac statistics (Eermi gas – degenerary – magnetic susceptibility). Molecular, translational, rotational, vibrational partition functions – Equipartition of energy theorems – Sp. Heat of diatomic maulcules – ortho and para Hydrogen – Debey's theory of Sp. Heat.
3. Maxwell's equations – plane waves in non-conducting and conducting media – skin effect – Reflection and refraction of plane EM waves at interface between two dielectric media – Brewster angle – Reflection of EM waves from surface of a metal wave guides – power transfer – resonance conditions – Radiation by moving charges.
4. Fresnel Kirchoff's diffraction formula – Fraunhofer and Fresnel diffractions – Fraunhofaor diffraction due to circular and rectangular apertures – special frequently filtering and applications – Auto correlation – cross correlation – hologram.
5. Postulates of Quantum Mechanics – Schrodinager Wave equation – Linear harmonic oscillator – Hydrogen atom – Eigen values and Eigen vectors – degeneracy – Heisenberg uncertainty principle – perturabatin theory – Normal Zeeman effect – stark effect – perturbed linear harmonic oscillator – Relativistic quantum mechanics – Diaral particle in EM field – Magnetic moment and spin of election – spin orbit coupling – helicity of neutrino
6. Energy band structure of junction diode – RC coupled amplifier and its frequency response – feedback and its effect on gain and frequency – phase shift oscillator – wein bridge oscillator – Flip – flops using gates – Demorgan's laws – Half and full adders – Multivibrators – characterestics of Opamps – inverting and non inverting opamps – integrator and differentiator using opamps – Amplitude and frequency modulation – characteristics of photocell – optical fibres and their applications.
7. Time dependent perturbation theory – Fermi – Golden rule – radiation broadening – collision broadening – Resonsance Fluerescence in light scattering – Krame – Heisenberg formulae – Rayleigh and Raman scattering – Stimulated Raman effect.
8. Crystal symmetry – Miller indices – diffraction of X-rays – Von laue treatment of X-ray diffraction – Bragg's law – Brillouin zones – Laue and powder methods – Band theory of solids, Kroning – penney model – effective mass – energy bands in metals, semi conductors and insulators – Law of mass action – Hall effect – Quantum theory of para and dia magnetism – Ferremagnetism – Magnetic domains – Super conductivity – Thermal, magnetic, optical and electrical properties – Josephson effect – Livitation – Imperfections in crystals – colour centres – Dislocations – stress and strain fields of dislocations – grain boundaries – crystal growth techniques.

Paper-II

NUCLEAR PHYSICS (Nuclear Physics, Radiation and Health Physics)

1. Properties of nucleus – size, electric and magnetic moments, charge radius of nucleus – Mass defect – Binding energy and its variation with mass number – stability of nucleus.
2. Nuclear decay – Gamow's theory of alpha decay – Fermi theory of beta decay and selection rules – Gamma decay and selection rules.
3. Interaction of radiation with matter – Energy loss – Bohr's formula for specific ionization – interaction of electrons with matter (Bremsstrahlung and Cerenkov radiations) – Interaction of gamma rays (photoelectric effect, Compton scattering, pair production) – Linear attenuation coefficient – Mass attenuation coefficient.
4. Nuclear models – Liquid drop model – semi empirical mass formula – shell model.
5. Nuclear reactions – Q-value – conservation laws – reaction cross section – Fission and Fusion processes.
6. Classification of Reactors – moderating and controlling materials – slowing down of neutrons – Energy loss – Four factor formula – criticality of a reactor – shielding in reactors – particle accelerators
7. Classification of fundamental particles – interaction of particles – conservation laws – CPT theorem – parity violation – Quark model – symmetries

Radiological Physics:

1. The production and properties of X-rays and quality of X-rays; The X-ray tube, the anode and the cathode – The simplified X-ray circuit, self rectified X-ray circuit, Voltage rectification, Physics of X-ray production, Rating of diagnostic tubes, the angular distribution of X-rays, Half value layer, Filters, effective energy, mean energy.
2. High energy machines: Superficial therapy – deep X-ray therapy, Mega Voltage therapy, Medical linear accelerators, Betatron & Cyclotron, Cobalt – 60 units, source housing, beam collimation and penumbra, particles for Radiotherapy.
3. Measurement of Radiation Dosimetry: Quantities to describe a Radiation beam, Energy transfer a two stage process Kerma & Absorbed dose, Electronic equilibrium, the Bragg – Gray cavity, free air chamber, Thimble chamber, Farmer dosimeters, Determination of absorbed dose in phantoms – measurement of dose at energies above 3 MeV, Relation between energy fluence and exposure, Calorimetry, Chemical dosimetry, Thermoluminescence dosimetry, film dosimetry.
4. Treatment planning – single beams and combination of beams: Phantoms, depth dose distribution, initial dose build up, effect of field size or shape, dependence of source surface distance, Tissue Air Ratios, effect of distance, Back Scatter factor, Relation between TAR & PDD, Calculation of dose in rotation therapy, Scatter air ratio, Dose calculation in irregular fields. Measurement of isodose curves, wedge filters, combination of Radiation fields, SSD & SAD techniques, specification of target dose, optimization of treatment planning correction for contour irregularities, tissue compensation, quality assurance checks of treatment machines.
5. Brachy therapy: Intracavitary and interstitial sources, calibration of brachy therapy sources, specific gamma ray constant, Systems of implant dosimetry, the Paterson Parker, Quimby, the Paris systems, dose specification and dose computation.
6. Physics of Nuclear Medicine: Ionisation chamber – G.M. Tubes, Scintillation detectors, Resolving time and loss of counts, principle of working of Gamma camera & PET scan principle of TC 99 generators.
7. Radiation Protection: Dose equivalent, Background radiation, low level radiation, maximum permissible dose, structural shielding design, protection against radiation from brachy therapy sources, Radiation protection surveys and monitoring instruments.
8. Radiobiology: Radiobiological equivalence, immediate Radiochemical effects, cell cycle and Radio sensitivity, target theory, concepts of N.S.D., T.D.F., Linear quadratic models and Alpha & Beta constants.

**Sd- Secretary,
01/07/2008**