श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौद्योगिकी संस्थान, त्रिवेंद्रम, तिरुवनन्तपुरम - 695 011, केरल, भारत
SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY, TRIVANDRUM
THIRUVANANTHAPURAM - 695 011, KERALA, INDIA
(एक राष्ट्रीय महत्व का संस्थान, विज्ञान और प्रौद्योगिकी विभाग, भारत सरकार)
(An Institution of National Importance, Department of Science and Technology, Government of India)
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Syllabus for written test for selection to the post of Scientific Assistant (Instruments)- MFCP

1. General Biomedical Science and Lab Practices:

Biomedical devices, Classification based on risk, ISO 10993 Standard. Quality concepts and Quality Management System, Features of ISO 17025, Calibration, Quality assurance, Interlaboratory comparison, Proficiency testing, Audit, Safety practices, Documentation,

2. Essentials of Biomaterials Science:

Materials and classification: polymers, ceramics, metals/alloys and composites. Structure and properties of materials, Structure of Crystals- Ideas on lattice, Miller indices, Basics of crystallography.

Mechanical Properties of materials- Stress-Strain behavior. Determination of mechanical properties by Universal Testing Machine.

Definition and classification of Biomaterials. Evaluation of Biomaterials.

3. Basics of Ceramics Processing

Chemical composition and phase compositions; Particle size and shapes; Density, pore structure and specific surface area; Rheological behavior of slurries and pasters.

Comminution; Batching and mixing; Granulation. Ceramic forming processes: Dry pressing; Pastic forming; Slip Casting; Drying; Shaping and surface finishing. Sintering: Furnaces, temperature measurements, pre-sintering processes and sintering steps.

Processing of bioceramic materials, Chemical synthesis of inorganic biocompatible materials, spray drying, making green bodies and optimizing sintering steps.

Characterization of ceramics: Phase analysis using XRD and FTIR; Analysis of microstructure using Optical and electron Microscopy. Mechanical Tests-Tensile test, Compression test, Indentation test, Impact test, Fatigue test.

4. Instrumental Methods of Analysis:

Infrared Spectroscopy: Principles and instrumentation of IR spectrometer, sample handling. Fourier Transform Infrared Spectroscopy (FTIR), Interpretation of Infrared (IR) spectra.

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Atomic Spectroscopy: Atomic transitions, Atomic absorption and emission. Principles and instrumentation of Atomic absorption Spectroscopy (AAS) and Atomic emission spectroscopy (AES), analysis methods and their biomedical applications.

Energy Dispersive X-Ray Analysis: Principles of EDX, Sample preparation for EDX.

5. Morphological and Structural Analysis:

(i)Electron Microscopy: Basics of Electron Microscopy. Scanning electron microscope (SEM), Transmission electron microscope (TEM), Sample Preparation for Electron Microscopy- Biological sampling handling, Non-Biological sample handling, Fixatives, Dehydration; Sample Coating in electron microscopy. Imaging process.
(ii) X-Ray diffraction (XRD) analysis: Principles of X-ray diffraction. Bragg's law. Instrumentation and data interpretation of XRD. Biomedical applications of XRD.

References:

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WF Smith, Principles of Materials Science and Engineering, 2nd Ed, Mc GrawHill, 1995.
WD Kingery, Introduction to Ceramics, 2nd Ed, Wiley, 2016.
M Barsoum, Fundamentals of Ceramics, McGraw-Hill, 1997.
MN Rahaman, Ceramic Processing, 2nd Ed, CRC Press, 2017
DA Skoog, F James Holler, SR Crouch, Principles of Instrumental Analysis, 7th Ed, Cengage 2020
HH Willard, Instrumental Methods of Analysis, 7th edition, CBS Publishers, 1988
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Reimer, L. Scanning electron microscopy: physics of image formation and microanalysis, Springer Series, 2010
Cullity B.D, Elements of X-Ray Diffraction, 3 Ed, Pearson Education 2001

Administrative Officer Gr.I(I/C)
18/9/23