

ADIKAVI NANNAYA UNIVERSITY, RAJAHMUNDRY
SCHOOL OF LIFE AND HEALTH SCIENCES
Pre Ph.D Examination Syllabus- 2024

Paper - I: Recent Advances in Life Science & Research Methodology

UNIT-I:

Basic and applied research, Literature survey and collection, Identification of the problem, Setting up of objectives, Experimental design, standardization of protocols, Annual report preparation, Thesis writing, Research paper and Review article writing, Project writing. Research ethics, Plagiarism.

UNIT-II:

Biochemical techniques: Extraction, isolation, purification, Identification and characterization of Proteins, Quantification of carbohydrates, Extraction of lipids, Enzyme kinetics – Enzymes assay, activity, turn over, yield. Measurement of pH: Use of indicators, Sterilization techniques, Media Preparation. Centrifugation techniques - Principle and applications of Centrifugation.

UNIT-III:

Microscopy – Principle, types, and applications of Microscopy,
Chromatography - Principle, types, and applications of Chromatography
Electrophoresis – Principle, types and applications of electrophoretic techniques
Isotopes – Scintillation counter, Gamma ray counter, Radioactive decay, Measurement and Units of radioactivity, safety measurements, Disposal of radioactive wastes.

UNIT-IV:

Spectrophotometry – Principles and applications of Visible, UV spectrophotometry, IR, NMR, AAS
* Biostatistics – Sampling methods, Sample collection, Mean, Median, Mode, Tabulation of data, Graphical representation of data, correlation, regression, Chi-square test, Student t-test, Test of significance, ANOVA Software used in Biostatistics.

UNIT-V:

Computational Biology-Microsoft office-word, excel and power point presentation, Graphical representation of data using EXCEL and sigma plot.
Bioinformatics –BLAST, Protein data base.
Intellectual property rights (IPR), property rights (IPP) and Patenting.

Texts and References:

1. Research methodology of biological science – by N. Gurumani
2. Fundamentals of Biostatistics – by Khan & Khanum
3. Biophysical chemistry: principles and techniques– by Upadhyay
4. An Introduction to Practical Biochemistry by Keith Wilson and John Walker
5. Molecular Cloning: A laboratory Manual by Joseph Sambrook and David W. Russell
Published by Cold Spring Harbor Laboratories Press

B. Nageshwari
23/2/24

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Model papers:

ADIKAVI NANNAYA UNIVERSITY, RAJAHMUNDRY

School of Life and Health Sciences

Pre-PhD Examinations w.e.f. 2024

Model paper for Paper- I: Recent Advances in Life Science & Research Methodology

Duration: 3 hour

Max Marks: 100M

ALL Questions carry equal marks

5X20=100M

Answer all the questions

UNIT-I

- 1) Write about experimental design and standardization of protocols for research work. Add a note on identification of research problem?
(or)
- 2) Write briefly about the thesis writing and Project writing?

UNIT-II

- 3) Differentiate disinfection and sterilization. Write about the role of various instruments used to create sterile condition for cell and tissue culture. Add a note on Media preparation?
(or)
- 4) Write in detailed about Enzyme assay, activity, turnover yield. Add a note on Enzyme kinetics?

UNIT-III

- 5) Write in detail about radioactive decay. Measurement of radioactivity, safety measurements and disposal of radioactive wastes?
(or)
- 6) Define Chromatography? Write about Principle, types, and applications of Chromatography?

UNIT-IV

- 7) Write about graphical representation of data. Add a note correlation and regression?
(or)
- 8) Describe about tabulation and graphical representation of data. Add a note on ANOVA?

UNIT-V

- 9) Write about the various applications of Bioinformatics in Biology?
(or)
- 10) Write in detail about IPR & IPP?

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Paper II: Carbon dots and metal nanocomposites for biological applications

UNIT-I: Nanoscience

Introduction to Nanoscience and Nanotechnology: Definition, History and classification; **Properties of Nanomaterials:** Quantum confinement, size effects; **Various synthesis methods of nanomaterials:** Top down and Bottom-Up approaches, Physical, chemical and biological methods of synthesis.

UNIT-II: Metals and Metal oxide nanoparticles

Metal Nanoparticles: Monometallic vs Bimetallic; Physiochemical properties of monometallic and bimetallic nanoparticles: Surface Plasmon Resonance, Optical properties, Surface to volume ratio, metal and metal oxide alloys.

UNIT-III: Carbon dots

Carbon dots: Carbon quantum dots; physiochemical, electrical and photoluminescence properties; Synthesis methods and sources of carbon dots; Applications of carbon dots in various scientific fields; Quantum yield; Applications in biomedical field: biosensing, biocatalysis, bioimaging and drug delivery.

UNIT-IV: Green synthesis

Euphorbia heterophylla: Taxonomy, Characteristics, medicinal properties; Bioactive compounds; **Green reducing agents:** Various methods for extraction of reducing agents from plants and other biomass; Advantages, and Disadvantages; Effect of Nanoparticles properties on green reducing agents.

UNIT-V: Material characterization

Principal and applications of techniques; Optical and Fluorescence properties: UV-Vis spectroscopy, FTIR, and Fluorescence spectroscopy; **Phase analysis:** X-ray diffraction; **Morphology:** Scanning Electron and Transmission Electron Microscopy; Elemental analysis: Energy dispersive X-ray spectroscopy

References:

- 1) Handbook of Green and Sustainable Nanotechnology: Fundamentals, Developments and Applications-Shanker et al.
- 2) An introduction to green nanotechnology-Nasrollahzadeh, Mahmoud, et al.
- 3) Applications of Nanotechnology for Green Synthesis.-Asiri et al.

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Model papers:

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School of Life and Health Sciences

Pre-PhD Examinations w.e.f. 2024

Model paper for Paper- II: Carbon dots and metal nanocomposites for biological applications

Duration: 3 hour

Max Marks: 100M

ALL Questions carry equal marks

5X20=100M

Answer all the questions

UNIT-I

- 1) Define nanoscience and nanotechnology, and provide a brief history of their development. Discuss how nanomaterials are classified based on their dimensions?
(or)
- 2) Describe the top-down and bottom-up approaches to synthesizing nanomaterials, and discuss the advantages and disadvantages of each method?

UNIT-II

- 3) What's the difference between monometallic and bimetallic nanoparticles? How do their properties like color and size differ?
(or)
- 4) How are metal and metal oxide alloys different from pure metal nanoparticles? Can you give an example to explain?

UNIT-III

- 5) What are carbon dots, and how are they made? Describe their properties and how they can be used in science?
(or)
- 6) How do carbon dots help in biosensing, biocatalysis, bioimaging, and drug delivery?

UNIT-IV

- 7) What are bioactive compounds, and how are green reducing agents extracted from plants and other biomass?
(or)
- 8) What are some advantages and disadvantages of using green reducing agents compared to traditional chemical reducing agents for nanoparticle synthesis?

UNIT-V

- 9) Explain the principle of UV-Vis spectroscopy and its applications in analyzing nanoparticles?
(or)
- 10) Describe the technique of X-ray diffraction for phase analysis of nanoparticles. How does it provide information about the crystalline structure of nanomaterials?

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Paper - III: Presentation on the Research topic:

Course structure:				
S.No	Paper title	Test Mode	Marks	Credits
1	Paper I: Recent Advances in Life Science & Research Methodology	Written	100	4
2	Paper II: Carbon dots and metal nanocomposites for biological applications	Written	100	4
3	Paper III: A study on Euphorbia heterophylla derived carbon dots and Fe/Zn nanocomposites for in vitro biological applications	Presentation	50	2

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