



Ph.D. Entrance Test - 2019-20 (Phase-II)

Part – A: Research Methodology

Syllabus:

What is Research; Objectives, Motivation, Types of Research. Literature Review and Technical Reading, Attributions and Citations, Building Intellectual Property Rights: Codes and Standards, Ethics in Engineering Research, Technical Writing and Publishing, Communicating Research Work: Presentation Skills, Assessing Research Quality.

Reference Books:

1. Dipankar Deb, Rajeeb Dey, Valentina E. Balas, Engineering Research Methodology, A Practical Insight for Researchers, Springer Publications, 2019
2. C. R. Kothari, Research Methodology – Methods and Techniques, New Age International Publishers, 2004.
3. David V. Thiel, Research Methods for Engineers, Cambridge University Press, 2014.

Part B: BIOTECHNOLOGY

Syllabus:

Section 1: General Biotechnology

Biomolecules: structure and function of glucose fructose peptides and nucleotides.
Enzymes: kinetics and mechanism of action; Basic concepts of metabolism glycolysis
Krebs cycle electron transport chain

Microbiology Microbial growth and nutrition; Aerobic and anaerobic respiration;
Nitrogen fixation;

Cell Biology: Prokaryotic and eukaryotic cell structure; Cell cycle

Molecular Biology and Genetics: Molecular structure of genes and chromosomes;
Mutations and

mutagenesis; Nucleic acid replication, transcription, translation prokaryotes and eukaryotes; Mendelian inheritance; Gene interaction; Complementation; Linkage, recombination and chromosome mapping; RNA interference; Molecular basis of genetic diseases

Analytical Techniques: Principles of microscopy, spectroscopy and chromatography
Electrophoresis; Microarray

Immunology: Antibody structure and function; Molecular basis of antibody diversity; B and T cells and macrophages; Immune tolerance; Hypersensitivity; Autoimmunity;

Bioinformatics: Major bioinformatic resources and search tools; Sequence and structure databases; Sequence analysis (biomolecular sequence file formats, scoring matrices, sequence alignment, phylogeny);

Recombinant DNA Technology: Gene isolation, cloning and expression; DNA sequencing; Polymerase chain reactions; DNA fingerprinting; Southern and northern blotting; In-situ hybridization; Gene therapy

Section 2: Applied Biotechnology

Plant and Animal Biotechnology: Production of secondary metabolites by plant suspension cultures; Hairy root culture; transgenic plants; Plant products of industrial importance. Animal cell culture; Animal cell and tissue preservation; Anchorage and non-anchorage dependent cell culture; Hybridoma technology; Stem cell technology; Animal cloning; Transgenic animals

Bioprocess Engineering and Process Biotechnology: Principle of reactor design, Rheology of fermentation fluids, Aeration and agitation; Kinetics of microbial growth, Unit operations in solid-liquid separation and liquid-liquid extraction; Process scale-up Biofuels, Bioplastics, industrial enzymes, antibiotics; Large scale production and purification of recombinant proteins; Bioremediation-Aerobic and anaerobic processes for stabilization of solid / liquid wastes.

Reference Books

1. Molecular biology of the Gene: James Watson
2. Kuby Immunology: Barbara A. Osborne and Janis Kuby
3. Bioprocess Engineering Principles: Pauline M. Doran
4. Principles of Gene Manipulation and Genomics: Primrose
5. Microbiology: Michael J. Pelczar
6. Lehninger Principles of Biochemistry: Michael M. Cox

Ph.D. Entrance Test - 2019-20 (Phase-II)

Model-Question paper

Duration: 2hours

Max Marks 70

Part – A: Research Methodology

Section - A contains : 25 questions × 1 mark = 25 Marks
Section- B contains : 15 questions × 2 marks = 30 Marks
Section-C contains : 5 questions × 3 marks = 15 Marks

Section-A

Answer the following each question carries 1 Mark
25 questions × 1 mark = 25 Marks

1. Essence of both basic and applied research lies in
 - a)Market orientation
 - b)scientific method
 - c) Performance monitoring research
 - d) costing methods
2. Which of the following is the first step in starting the research process?
 - a) Searching sources of information to locate problem.
 - b) Survey of related literature
 - c) Identification of problem
 - d) Searching for solutions to the problem
3. Research involves all the following except
 - a)Promotion
 - b)validation
 - c) Control
 - d) Testing
4. Statement of research problem is preceded by
 - a) Objectives
 - b) Introduction
 - c) Review of literature
 - d) Methodology
5. The following are the features of a good research study except
 - a)Should be replicable
 - b) Should be systematic and objective
 - c)Should be completed in 6 months
 - d)Should be ethical and unbiased
6. Applied research is directed towards
 - a) Problem solving
 - b)Action oriented research
 - b) Real time problems
 - d) All of the above
7. The primary objective of ----- is to provide insights into and an understanding of the problem confronting the researcher
 - a) Exploratory research
 - b) Conclusive research
 - c) Casual research
 - d) Descriptive research
8. Qualitative research is
 - a) is essentially same as the quantitative research
 - b) Employs rigorous mathematical analysis
 - c) is subjective in nature
 - d) is objective in nature

9. In compare to the primary data, secondary data can be collected

- a) Rapidly and easily
- b) At a relatively low cost
- c) In a short time with less effort
- d) All of the above

10. Which of the following gives the measure of the consistency of data?

- a) Mean
- b) Standard deviation
- c) Mode
- d) Median

11. Descriptive research is conducted for all the following reasons except

- a) To describe the characteristics of the relevant groups, such as consumers, company personnel, organizations or territories
- b) To determine the occurrence of study variables
- c) To understand which variables are the cause and which variables are the effect of a phenomenon
- d) To determine the perceptions of construction and their features

12. The practice of someone's work/idea/paper as one's without proper acknowledgement is termed as

- a) Citation
- b) plagiarism
- c) Referencing
- d) none of the above

13. In the process of conducting research 'Formulation of Hypothesis' is followed by

- a) Statement of Objectives
- b) Analysis of Data
- c) Selection of Research Tools
- d) Collection of Data

14. A research paper is a brief report of research work based on

- a) Primary Data only
- b) Secondary Data only
- c) Both Primary and Secondary Data
- d) None of the above

15. Conference proceedings are considered as.....documents.

- a) Conventional
- b) Primary
- c) Secondary
- d) Tertiary

16. Which of the following is not a "Graphic representation" ?

- a) Pie Chart
- b) Bar Chart
- c) Table
- d) Histogram

17. One of the following search engine is exclusively meant for scientific information

:

- a) Google
- b) Yahoo
- c) SCIRUS
- d) Altavista

18. What is full form of IPR

- a) Intellectual property rights
- b) Intelligent property right
- c) Intellectual property right
- d) Intelligent property rotation

19. Protocol means.....

- a) Interchange of data between two devices
- b) Interchange of data between two computers
- c) Linkage between two computers
- d) Linkage between two devices

30. The starting point for a literature search is

- a) tertiary data b) secondary data c) primary data d) some other data

31. Researchers need to be cautious of some material, particularly material found online. Why?

- a) It has been used before b) The quality is unknown
c) The authors name often does not appear d) It is too recent

32. What do you mean by citation

- a) A citation allows authors to provide the source of any quotations, ideas, and information on the copyrighted works of other authors
b) A citation allows authors to provide the source of any quotations, ideas, and information on the copyrighted works of own work
c) Citation is not typically related to copy right works
d) none of the above

33. When you discover that an author has, (1) cited another author (2) it is good practice to:

- a) not to use the work b) use the work and attribute it to author 1
c) use the work and attribute it to author 2 d) locate and read the original, then attribute it to author 2

34. What are the important things when giving a presentation

- a) Introduce yourself by name b) Slow down when you are speaking
c) Make eye contact with the audience d) Ask for questions from the audience at the conclusion of presentation
e) All of the above

35. The objective of the communication is

- a) Specific b) Measurable c) Attainable
d) Results – oriented and Time-limited e) All of the above

36. A side bar is used to

- a) Useful way of physically framing the text and giving shape to the document.
b) Highly necessary c) Used to provide extra information such as organization, or publication; copyright, contact information d) both a& b is correct e) both a&c is correct

37. Which is the major disadvantage of using peer-reviewed journals in literature reviews?

- a) The information is too recent b) Humans control the quality
c) Subscription fees are high d) Information could be as old as four years

38 Which of these will NOT help you to decide whether a publication is reputable?

- a) Advertising inside b) Citation rate
c) Audience d) Importance to peers

39. When you cite Internet resources, you do not need to find

- a) date created b) date of birth of the author
c) date last updated d) date of access

40. Which of these is the most efficient way to locate relevant journals?
a) Searching using tertiary sources b) Browsing the shelves in the library
c) Browsing in a newsagents d) Following up references in articles

Section- C

**Answer the following each question carries 3 Marks
5 questions × 3 marks= 15 Marks**

41. What do you think might happen if you started a research project, but hadn't written any clear research objectives?
a) Confusion about the limits of study b) Collection of data is unlimited c) identify barriers and concerns d) only a is correct e) both a & b is correct
42. Surveying the literature involves
a) Narrow the problem itself b) identify the gaps c) limited information about the existing theories d) b is correct e) both a& b is correct
43. The purpose of attribution is
a) similar to citation b) not similar to citation c) Used to quote (or paraphrase **all or a portion** of an openly licensed work d) both a & c e) none of the above
44. Who is responsible for plagiarism?
a) Lecturers and supervisors b) The participant c) Institution d) The researcher e) All of the above
45. How do you prepare for presentation?
a) Writing main argument or conclusion b) Writing the main points as headings c) Timing the presentation & discuss the main issue by clear opening and closing line remarks d) all of the above e) only a& b

Part B: Biotechnology

Section - A contains : 25 questions × 1 mark = 25 Marks
Section- B contains : 15 questions × 2 marks = 30 Marks
Section-C contains : 5 questions × 3 marks = 15 Marks

Section-A

**Answer the following each question carries 1 Mark
25 questions × 1 mark = 25 Marks**

1. Production of secondary metabolites requires the use of

- A. Protoplast B. Meristem C. Cell suspension D. Callus

2. Cybrids are produced by

- A. Fusion of two different nuclei from two different species
B. Fusion of two nuclei from same species
C. Nuclei of one species and cytoplasm of both the parent species

14. Expression vectors differs from cloning vectors in having

- A. Origin of replication C. Unique restriction sites
B. Suitable marker genes D. Control elements

15. One of the most useful methods for identifying a specific gene is

- A. thin layer chromatography B. the Western blot
C. the Southern blot D. magnetic resonance imaging

16. How many crossover events are needed to integrate an entire plasmid into a circular bacterial chromosome?

- A. 1 B. 2 C. 3 D. 4

17. Enzyme used in formation of cDNA from mRNA is

- A. Helicase B. polymerase C. reverse transcriptase D. gyrase

18. The insertion of a cloning vector into a cloning host typically involves what process?

- A. Transduction B. Transformation C. Hybridization D. Conjugation

19. Vectors used for sequencing genomes A

- A. YACB. Plasmid C. CMV D. M13

20. Which method is suitable for finding out conserved patterns in DNA or protein sequences is D

- A. Multiple sequence alignment B. pairwise alignment
C. Global alignment D. Local alignment

21. Amino acids are mostly synthesised from

- (a) mineral salts (b) fatty acids (c) volatile acids (d) α -ketoglutaric acid

22. Which is distributed more widely in a cell?

- (a) DNA (b) RNA (c) chloroplasts (d) sphaerosomes

23. ATP is a

- (a) Nucleotide (b) nucleoside (c) nucleic acid (d) vitamin

24. Which of the following reactions generate ATP?

- a) Glucose to Glucose-6-phosphate b) Pyruvate to Lactate
c) Glucose -6 phosphate to fructose-6 phosphate d) Phosphoenol pyruvate to Pyruvate

25. What phase of cellular respiration has the highest ATP yield?

- a) Glycolysis b) Oxidative phosphorylation
c) Kerbs cycle d) Glucogenesis

Section-B

**Answer the following each question carries 2 Marks
15 questions × 2 marks= 30 Marks**

1. What is -40 °F in °C and °K

- A. -25 °C, 233°K B. -35 °C, 233°K
C. -15 °C, 233°K D. -40 °C, 233°K

2. The average molecular weight of air is

- A. 22 B. 41 C. 56 D. 29

3. Convert 1000 RPM to s⁻¹

- A. 166.7 B.16.67 C. 600 D. 60,000

4. Calculate respiratory quotient assuming 2 mols of CO₂ is released per 3mols of O₂ consumed.

- A. 0.67 B. 1.5 C. 6 D. 1

5. Give the Expression for impeller Reynolds Number

- A. $\mu N_i D_i^2 / \rho$ B. $\rho N_i D_i^2 / \mu$ C. $\rho N_i^2 D_i / \mu$ D. $\rho N_i D_i / \mu$

6. What are the stages involved in the prophase I of Meiosis

- A. Anaphase-I B. Telophase-II C. Prophase-II D. Metaphase-II

7. What are the methods used for the air sterilization

- A. Radiation B. Filter C. Heat D. Chemical

8. Name the cell organelle which contains DNA

- A. Nucleus, Mitochondria and Chloroplast
B. ER, Cytosol, peroxisomes
C. Golgi apparatus, plasmalemma, ribosome
D. All

9. What is totipotency
- A. Dedifferentiation of plant cells
 - B. Redifferentiation of plant cells
 - C. Dedifferentiation and redifferentiation of plant cells
 - D. None
10. If a specific growth rate of an organism is 0.67 per day, what is its doubling time?
- A. 35.8 hour
 - B. 30 hour
 - C. 26 hour
 - D. 24.8 hour
11. What is DNA REPLICATION?
- A. DNA duplicated
 - B. DNA cut into two halves
 - C. DNA becomes 3-times
 - D. DNA becomes 4-times
12. What is meant by oxidative phosphorylation?
- A. phosphorylation ADP
 - B. phosphorylation ATP
 - C. phosphorylation ADP in Presence of proton pump
 - D. Both A and C
13. List any two biological databases
- A. NCBI, PDB
 - B. SWISSPROT, KEGG
 - C. UNIPROT, PUBMED
 - D. All
14. Expand BLAST
- A. Basic Logical Allotment Screening Tool
 - B. Basic Local Alignment Search Tool
 - C. Branching Logarithmic Amplification Simplified Tool
 - D. None
15. What is the aspect ratio of an airlift bioreactor?
- A. 2:1
 - B. 1:1
 - C. 3:1
 - D. 10:1

Section- C
Answer the following each question carries 3 Marks
5 questions × 3 marks= 15 Marks

1. Mention the steps that are involved in the PCR amplification of DNA

- A. Initial Denaturation, Melting, Annealing, regulation
- B. Denaturation. Degradation, Extension, ligation
- C. Initial Denaturation, Denaturation, Annealing, Extension, Final Extension
- D. Denaturation, Degradation, Melting, Extension

2. Calculate the kinetic energy of 100 kg of liquid flowing through a pipe at a speed of 15ms^{-1}

- A. 75000 kg ms^{-2}
- B. $11,250\text{ kg ms}^{-2}$
- C. $37,500\text{ kg ms}^{-2}$
- D. 5625 kg ms^{-2}

3. A solution contains 40 wt% water 35wt% ethanol 15wt% glycerol and 10 wt% acetic acid. What is the mole fraction of each component? (MW: 18, 46, 92 and 60 respectively.)

- A. 0.67, 0.23, 0.05 & 0.05
- B. 0.8, 0.1, 0.05 & 0.05
- C. 0.7, 0.2, 0.04 & 0.06
- D. 0.85, 0.1, 0.02 & 0.03

4. Briefly describe the phases of a cell cycle

- A. G1, G2, G3
- B. S1, G1, S2
- C. S1, S2, G1
- D. G1, S, G2

5. Calculate the mean and standard deviation of lysine concentration measured 5 times, whose values are 45g l^{-1} , 48 g l^{-1} , 44g l^{-1} , 46g l^{-1} and 47 gl^{-1}

- A. 46, 1.58
- B. 53, 1.08
- C. 44, 1.2
- D. 46, 1.11