Graduate Level Exam: Research Methodology and Biological Applications

Questions and Answers

Unit 1: Basic Concepts of Research

1 Mark Questions (Definitions)

1. Define Research.
    - Answer: Research is a systematic, controlled, empirical, and critical investigation of hypothetical propositions about the presumed relations among natural phenomena, aimed at discovering new facts or verifying existing knowledge.
2. What is Literature Review?
    - Answer: A literature review is a critical summary and evaluation of existing research and scholarly articles related to a specific topic, identifying gaps that a new study aims to fill.
3. Define Applied Research.
    - Answer: Applied research is a form of systematic inquiry involving the practical application of science to solve specific, immediate problems or develop new technologies/products.

3 Mark Questions (Knowledge-based)

1. Distinguish between Research Methods and Research Methodology.
    - Answer:
        - Research Methods are the specific techniques, tools, or procedures used to conduct research (e.g., surveys, experiments, interviews).
        - Research Methodology is the broader science or philosophy behind how research is conducted. It involves the study of the methods used and the logic behind selecting them to ensure valid results.
2. Explain the difference between Quantitative and Qualitative research.
    - Answer:
        - Quantitative Research focuses on numerical data, statistical analysis, and objective measurements to test hypotheses and generalize results (e.g., "What is the average height?").

        - Qualitative Research focuses on understanding human behavior, experiences, and social phenomena through non-numerical data like interviews or observations (e.g., "Why do people feel this way?").
3. What is the role of search engines in research consolidation?
    - Answer: Search engines (like Google Scholar, PubMed, or SciSpace) are vital for identifying relevant scholarly literature. They allow researchers to filter by date, author, or impact, enabling the efficient consolidation of diverse findings into a coherent theoretical framework.

8 Mark Questions (Application-based)

1. Discuss the various types of research based on purpose and approach. Provide examples for each.
    - Answer:
        - Basic vs. Applied: Basic (fundamental) research aims to expand knowledge for its own sake (e.g., studying the structure of an atom). Applied research seeks solutions to practical problems (e.g., developing a more efficient solar cell).
        - Descriptive vs. Analytical:Descriptive research describes the characteristics of a population or phenomenon (e.g., census data). Analytical research uses facts to make a critical evaluation of material (e.g., analyzing why a specific economic policy failed).
        - Quantitative vs. Qualitative: (As defined above).
        - Conceptual vs. Empirical:Conceptual research relates to abstract ideas or theories (e.g., developing a new philosophical framework). Empirical research relies on experience or observation alone, often without due regard for system and theory (e.g., testing the efficacy of a new drug).
        - Application: A researcher might use *Basic* research to identify a protein's structure, then *Applied* research to design a drug targeting it, using *Quantitative* methods to measure its effectiveness.

Unit 2: Research Design, Data Collection and Analysis

1 Mark Questions (Definitions)

1. What is a Research Model?
    - Answer: A research model is a theoretical framework or simplified representation of a complex system used to test hypotheses and predict outcomes.

2. Define Experimental Design.
    - Answer: Experimental design is the process of planning a study to meet specified objectives, ensuring that the data collected can be analyzed statistically to reach valid conclusions.
3. What is a Scale Bar in imaging?
    - Answer: A scale bar is a line or graphical device on a figure (like a micrograph) representing a known physical length, used to indicate the magnification or size of the objects shown.

3 Mark Questions (Knowledge-based)

1. Outline the steps in conceptualizing a research problem.
    - Answer:
        1. Identify a broad area of interest.
        2. Review existing literature to find gaps.
        3. Narrow down to a specific, researchable question.
        4. Formulate clear objectives and hypotheses.
2. Explain the importance of "Data Quality Check" before analysis.
    - Answer: A data quality check ensures that the collected data is accurate, complete, consistent, and free from outliers or errors. Analyzing "dirty" data leads to flawed conclusions (GIGO - Garbage In, Garbage Out), making validation essential for research integrity.
3. Differentiate between primary and secondary data collection methods.
    - Answer:
        - Primary Data: Collected firsthand by the researcher for a specific purpose (e.g., experiments, surveys).
        - Secondary Data: Data that has already been collected by others (e.g., government records, previous research papers, databases).

8 Mark Questions (Application-based)

1. Design a research plan for validating a new biological model. Include aspects of experimental design, data acquisition, and presentation.
    - Answer:
        - Model Conceptualization: Define the biological system (e.g., a cell culture model for drug toxicity).
        - Experimental Design: Use a Randomized Block Design. Set up Control groups (no drug) and Experimental groups (varying drug concentrations). Define independent (drug dose) and dependent (cell viability) variables.
        - Data Acquisition: Use automated assays (e.g., MTT assay) for observation. Ensure reproducibility by repeating experiments in triplicate.

- Data Quality Check: Use statistical software to identify and remove outliers and check for normal distribution.
- Analysis & Presentation: Perform ANOVA to determine significance. Present data using bar graphs with error bars (Standard Deviation). Include high-resolution tissue images with appropriate scale barsto show morphological changes.
- Interpretation: Conclude whether the model effectively predicts toxicity based on the validation metrics.

Unit 3: Overview of Biological Problems and Ethical Issues

1 Mark Questions (Definitions)

1. Define Plagiarism.
    - Answer: Plagiarism is the practice of taking someone else's work or ideas and passing them off as one's own without proper acknowledgment.
2. What are Intellectual Property Rights (IPRs)?
    - Answer: IPRs are legal rights granted to individuals over the creations of their minds, giving them exclusive rights to the use of their creation for a certain period (e.g., patents, copyrights).
3. Define Reproducibility.
    - Answer: Reproducibility is the ability of an independent researcher to achieve the same results as a previous study using the same methodology and data.

3 Mark Questions (Knowledge-based)

1. Why are model organisms (like Drosophila or Yeast) used in biological research?
    - Answer: Model organisms are used because they are easy to maintain, have short generation times, and share many genetic and biochemical pathways with humans. They allow researchers to study complex biological processes (like genetics or molecular biology) in a simpler, controlled environment.
2. Briefly explain the concept of Royalty in research commercialization.
    - Answer: Royalty is a payment made by one party (the licensee) to another (the licensor/owner) for the right to use an asset, such as a patent or copyrighted work. In research, it is often a percentage of sales generated from a product developed using the researcher's IPR.
3. What is the ethical significance of a "Transcriptional Regulatory Network"?
    - Answer: While primarily a biological concept, understanding these networks is crucial for ethical considerations in genomics and proteomics, such as gene

editing (CRISPR), where altering one gene can have cascading, unforeseen effects on the entire network.

8 Mark Questions (Application-based)

1. Analyze the ethical challenges in biological research, focusing on IPRs, Copyright, and Plagiarism. How do these impact the commercialization of science?
    - Answer:
        - IPRs and Patents: While they encourage innovation by offering financial rewards, they can also limit access to life-saving technologies (e.g., expensive patented drugs).
        - Copyright: Protects the expression of ideas (e.g., research papers). If copyright is too restrictive, it hinders the "Open Access" movement, slowing down global scientific progress.
        - Plagiarism & Scientific Misconduct: Destroys the trust upon which science is built. It can lead to the retraction of papers and damage to institutional reputations.
        - Impact on Commercialization: Effective IPR management allows universities and researchers to earn royalties, funding further research. However, unethical practices like data fabrication or plagiarism can lead to lawsuits and loss of commercial credibility.
        - Synthesis: Balancing the "Right to Knowledge" with "Property Rights" is the central ethical dilemma in modern biological research commercialization.

Unit 4: Scientific Report Writing

1 Mark Questions (Definitions)

1. What is a Bibliography?
    - Answer: A bibliography is a list of all the books, articles, and sources used or consulted by an author in the preparation of a scientific work, usually found at the end.
2. Define a Review Paper.
    - Answer: A review paper is an article that summarizes the current state of understanding on a topic, synthesizing findings from many primary research papers without reporting new original experimental results.
3. What is an Acknowledgement in a dissertation?

- Answer: It is a section where the author recognizes and thanks individuals or organizations (like funding bodies or supervisors) who provided assistance, support, or resources during the research.

3 Mark Questions (Knowledge-based)

1. Explain the importance of Citations in scientific writing.
   - Answer: Citations give credit to original authors, provide evidence for claims, allow readers to verify the source material, and help the author avoid plagiarism by clearly distinguishing their own ideas from those of others.
2. What are the key differences between a PowerPoint presentation and a Poster presentation?
   - Answer:
     - PowerPoint: Linear, time-bound, uses slides to support a spoken narrative; better for detailed storytelling.
     - Poster: Static, non-linear, allows for one-on-one discussion; better for highlighting key results visually at conferences.
3. List three essential components of a Research Grant proposal.
   - Answer:
     1. Abstract/Summary of the project.
     2. Detailed methodology and budget.
     3. Expected outcomes and impact of the research.

8 Mark Questions (Application-based)

1. Draft a guide for a graduate student on writing a Technical Research Report (Dissertation). Cover everything from nomenclature to bibliography.
   - Answer:
     - Structure: Title, Abstract, Introduction, Methodology, Results, Discussion, and Conclusion.
     - Nomenclature and Units: Use standard SI units (e.g., meters, liters). Define all abbreviations on first use. Use consistent nomenclature for genes (italicized) and proteins (standard case).
     - Citations: Use a consistent style (e.g., APA, Vancouver). Ensure every factual statement that isn't common knowledge is cited.
     - Data Presentation: Use clear tables and figures. Captions should be self-explanatory.
     - Bibliography: Ensure all cited works appear in the bibliography. Use reference management software (like Zotero or Mendeley) for accuracy.
     - Acknowledgements: Include funding sources and grants/fellowships that supported the work.
     - Review and Formatting: Check for flow, grammar, and adherence to the specific formatting guidelines of the university or journal.

Unit 1: Basic Concepts of Research

1 Mark Questions (Very Short Answer)

1. What is 'Fundamental Research' often called in Indian academia?
    - Answer: It is commonly referred to as 'Pure' or 'Basic' Research, focusing on the addition to the existing body of scientific knowledge.
2. Define 'Ex-post Facto' research.
    - Answer: It is a category of research in which the investigator attempts to trace an effect which has already occurred back to its probable causes.
3. What is the significance of 'Consolidation' in literature review?
    - Answer: Consolidation refers to the integration of fragmented information from various studies to form a unified, comprehensive understanding of the research gap.

3 Mark Questions (Short Answer / Short Notes)

1. Differentiate between 'Research Method' and 'Research Methodology' with an example from Biology.
    - Answer:
        - Research Method: The actual tool used, e.g., using a Spectrophotometer to measure protein concentration.
        - Research Methodology: The systematic plan and logic, e.g., the rationale for choosing the Bradford assay over the Lowry assay based on the protein type and buffer compatibility.
2. State the criteria of 'Good Research' as per standard Indian university curriculum.
    - Answer:
        1. Purpose: Clearly defined and common terms used.
        2. Procedural Design: Detailed enough for another researcher to repeat (Replicability).
        3. Objectivity: Logical analysis and freedom from researcher bias.
        4. Ethics: Adherence to moral professional codes.
3. Briefly explain the role of 'Analytical Research' in Biological Sciences.
    - Answer: Unlike descriptive research, analytical research uses existing facts to make a critical evaluation. In biology, this involves analyzing biochemical pathways or genetic sequences to establish cause-and-effect relationships rather than just describing a species' morphology.

8 Mark Questions (Long Answer)

1. "Research is a multi-step process." Elaborate on the sequential steps involved in a typical biological research project, from identifying the problem to literature consolidation.
    - Answer:
        - Step 1: Identifying the Research Problem: Observing a biological phenomenon that lacks explanation (e.g., why a specific plant thrives in high salinity).
        - Step 2: Extensive Literature Survey: Using search engines (PubMed, SciSpace) to find what is already known.
        - Step 3: Hypothesis Formulation: Creating a testable statement (e.g., "Protein X confers salt tolerance").
        - Step 4: Preparing Research Design: Deciding the experimental setup.
        - Step 5: Data Collection & Analysis: Running experiments and applying statistics.
        - Step 6: Hypothesis Testing: Using results to accept or reject the hypothesis.
        - Step 7: Generalization and Interpretation: Drawing broader biological conclusions.
        - Step 8: Report Writing/Consolidation: Summarizing the journey for the scientific community.

Unit 2: Research Design, Data Collection and Analysis

1 Mark Questions (Very Short Answer)

1. Define 'Confounded Relationship'.
    - Answer: When the dependent variable is influenced by an extraneous variable, the relationship between the independent and dependent variables is said to be confounded.
2. What is 'Data Acquisition'?
    - Answer: It is the process of sampling signals that measure real-world physical conditions and converting the resulting samples into digital numeric values.
3. Mention one 'Data Quality Check' parameter.
    - Answer: Accuracy or Completeness—ensuring the data reflects the true value and that no critical data points are missing.

3 Mark Questions (Short Answer / Short Notes)

1. Explain 'Randomized Block Design (RBD)' in agricultural biological research.

- Answer: RBD is used when the experimental material is not homogeneous. The area is divided into 'blocks' (e.g., different soil types), and treatments are randomly assigned within each block to minimize the effect of soil variability on the results.

2. Discuss the importance of 'Data Presentation' using Tables and Figures.
   - Answer: Tables provide precise numerical values for reference, while Figures (Graphs/Images) allow for quick visual identification of trends, correlations, or morphological changes. Both are essential for making complex biological data accessible.
3. What is 'Validation' of a research model? Why is it mandatory?
   - Answer: Validation is the process of ensuring the model behaves like the real biological system. It is mandatory because an unvalidated model might provide "results" that are artifacts of the model's design rather than biological truths.

8 Mark Questions (Long Answer)

1. Explain the various 'Methods of Data Collection' in Life Sciences. Differentiate between Observation and Experimental methods.
   - Answer:
     - Observation Method: Data is collected without asking the subject; the researcher records what they see (e.g., animal behavior in the wild). It is objective but limited to surface behaviors.
     - Experimental Method: The researcher manipulates one variable (Independent) to see the effect on another (Dependent) in a controlled environment (e.g., growth of bacteria at different temperatures).
     - Acquisition: Using sensors, microscopes, or DNA sequencers.
     - Comparison: Observation is naturalistic and less invasive but lacks control. Experimental methods provide high control and allow for "Cause-and-Effect" determination, which is the gold standard in biological research.

Unit 3: Overview of Biological Problems and Ethical Issues

1 Mark Questions (Very Short Answer)

1. What is 'Royalty' in Indian IPR laws?

    - Answer: A payment made to the owner of a patent or copyright for the use of their intellectual property, usually a percentage of the revenue generated from its commercial use.
2. Define 'Model Organism'.
    - Answer: A non-human species that is extensively studied to understand particular biological phenomena, with the expectation that discoveries will provide insight into the workings of other organisms.
3. What is the full form of 'TRIPS' in the context of IPR?
    - Answer: Trade-Related Aspects of Intellectual Property Rights.

3 Mark Questions (Short Answer / Short Notes)

1. Describe the ethical issues related to 'Plagiarism' in Indian Universities.
    - Answer: Indian universities (under UGC guidelines) take plagiarism seriously. It involves using others' text, data, or ideas without credit. Levels of plagiarism (Similarity Index) are checked using software like Urkund/Ouriginal. High similarity can lead to the cancellation of registration or withdrawal of the degree.
2. Why is 'Reproducibility' considered the cornerstone of biological research?
    - Answer: Biological systems are complex and variable. If an experiment cannot be reproduced by another lab, the "finding" is likely an error or a specific fluke. Reproducibility ensures that the biological principles discovered are robust and universal.
3. Briefly explain 'Transcriptional Regulatory Networks'.
    - Answer: These are sets of molecular regulators (like transcription factors) that interact with each other and with other substances in the cell to govern the gene expression levels of mRNA. Understanding them is key to modern Genomics and systems biology.

8 Mark Questions (Long Answer)

1. Discuss the significance of Intellectual Property Rights (IPR) in Biological Research. Cover Patents, Copyrights, and the concept of 'Commercialization'.
    - Answer:
        - Patents: Protect biological inventions (e.g., a new vaccine or a genetically modified seed). In India, naturally occurring substances cannot be patented.
        - Copyrights: Protect the expression (e.g., a biology textbook or a research software's code).
        - Commercialization: This is the path from "Lab to Market." IPR provides the legal framework that allows biotech companies to invest in research, knowing they can recoup costs through exclusive rights.
        - Ethics: The challenge lies in balancing commercial profit (via IPR) with public health (e.g., access to affordable medicines). This is a

critical discussion in the Indian context regarding "Generic Medicines."

Unit 4: Scientific Report Writing

1 Mark Questions (Very Short Answer)

1. What is a 'Bibliography'?
    - Answer: A list of all sources consulted during research, even those not directly cited in the text.
2. Mention one 'Citation Style' commonly used in Biology.
    - Answer: Vancouver Style (numeric) or APA Style (author-date).
3. What are 'Acknowledgements' in a research report?
    - Answer: A section where the author thanks individuals or funding agencies (like CSIR, DBT, or ICMR) for their support.

3 Mark Questions (Short Answer / Short Notes)

1. Explain the importance of 'Nomenclature' and 'Abbreviations' in technical writing.
    - Answer:
        - Nomenclature: Ensures everyone globally knows exactly which species or gene is being discussed (e.g., *Homo sapiens*).
        - Abbreviations: Save space and improve readability, but they must be standardized and defined upon first use to avoid confusion.
2. Compare the utility of 'Poster' vs. 'PowerPoint' presentations in academic conferences.
    - Answer: Posters are better for networking and detailed one-on-one technical discussions. PowerPoints are better for presenting a cohesive narrative to a large audience within a fixed time frame (usually 10-15 minutes).
3. What is the difference between 'Citations' and 'References'?
    - Answer: Citations appear *within* the text (e.g., Smith, 2023) to credit a specific statement. References are the *full details* listed at the end of the report for all cited works.

8 Mark Questions (Long Answer)

1. Draft a comprehensive outline for a 'Dissertation' for a Master's degree in Biotechnology, adhering to standard scientific writing norms.
    - Answer:

- Front Matter: Title Page, Certificate, Declaration, Acknowledgements, Table of Contents, List of Abbreviations.
- Chapter 1: Introduction: Background and "Need for Study."
- Chapter 2: Review of Literature: Historical and recent developments.
- Chapter 3: Objectives: Specific aims (bullet points).
- Chapter 4: Materials and Methods: Detailed enough for replication.
- Chapter 5: Results: Data presented via tables/figures; no interpretation here.
- Chapter 6: Discussion: Comparing results with previous literature; justifying findings.
- Chapter 7: Summary & Conclusion: Final take-away and "Future Prospects."
- End Matter: References/Bibliography and Appendices (if any).

1 Mark Questions

1. What is the primary objective of Research?
    - Answer: The primary objective is to find answers to questions through the application of scientific procedures, aimed at discovering truth which is hidden and hasn't been discovered as yet.
2. Define Descriptive Research.
    - Answer: Descriptive research includes surveys and fact-finding enquiries of different kinds; its main purpose is description of the state of affairs as it exists at present.
3. What is Field Research?
    - Answer: Field research is a qualitative method of data collection that aims to observe, interact with, and understand people while they are in a natural environment.

3 Mark Questions

1. Explain the importance of "Literature Consolidation" in a research project.
    - Answer: Literature consolidation involves synthesizing findings from various sources into a coherent narrative. It helps in establishing the theoretical framework, avoiding duplication of work, and identifying specific variables that have or haven't been tested.
2. Contrast Analytical Research with Descriptive Research.
    - Answer: In descriptive research, the researcher has no control over variables; they can only report what has happened. In analytical research, the researcher uses facts or information already available and analyzes these to make a critical evaluation of the material.
3. How do search engines facilitate the initial stages of research?
    - Answer: Search engines provide immediate access to vast databases (like PubMed or arXiv). They allow for keyword-based discovery, tracking citation

counts to gauge paper impact, and setting up alerts for new publications in a specific niche.

8 Mark Questions

1. Compare and contrast "Research Methods" and "Research Methodology" in the context of a biological study. Why is the latter considered a 'science'?
    - Answer:
        - Methods: The techniques used (e.g., PCR, Gel Electrophoresis, Statistically sampling 100 plants).
        - Methodology: The logic behind choosing PCR over other methods, the rationale for the sample size, and the philosophical approach (e.g., Positivism).
        - Why a Science: It is a science because it involves a systematic study of the methods themselves—evaluating their reliability, validity, and limitations. It ensures that the research process is logical, repeatable, and capable of being scrutinized by the scientific community.

Unit 2: Research Design, Data Collection and Analysis

1 Mark Questions

1. What is "Observation" in data acquisition?
    - Answer: Observation is a method of data collection where information is sought by way of investigator's own direct observation without asking from the respondents.
2. Define "Data Presentation."
    - Answer: It is the process of organizing and showcasing data in a visual or tabular format (e.g., Graphs, Charts, Tables) to make it easily understandable and interpretable.
3. What is a "Research Model Validation"?
    - Answer: It is the process of confirming that a research model accurately represents the real-world system it is intended to simulate or explain.

3 Mark Questions

1. What are the standard procedures for validating a proposed biological model?
    - Answer:
        1. Internal Validation: Checking if the model's logic is sound.

2. External Validation: Comparing model predictions against independent real-world datasets.
3. Sensitivity Analysis: Testing how changes in input variables affect the outcome.

2. Discuss the "Imaging of tissue specimens" and the critical role of scale bars.
    - Answer: Imaging involves capturing the microscopic or macroscopic features of biological tissues. Scale bars are critical because magnification levels can change during printing or digital display; the scale bar provides an absolute reference for size that remains accurate regardless of image scaling.
3. Explain the "Processing and Analysis Strategies" for raw biological data.
    - Answer: This involves cleaning (removing noise), transforming (e.g., log-transformation for normalization), and applying statistical tests (e.g., t-tests or ANOVA) to determine if observed differences are statistically significant.

8 Mark Questions

1. Detail the methods of data collection in biological research. Distinguish between quantitative and qualitative data acquisition techniques.
    - Answer:
        - Quantitative: High-throughput sequencing, spectrophotometry, cell counting. These produce discrete numbers and allow for rigorous statistical testing.
        - Qualitative: Behavioral observations of animals, morphological descriptions of new species, or histological grading of tissues. These focus on qualities and characteristics.
        - Analysis: Quantitative data uses descriptive and inferential statistics. Qualitative data uses thematic analysis or descriptive categorization.
        - Application: In a drug trial, quantitative data might be "Blood pressure readings," while qualitative data might be "Patient-reported descriptions of side effects." Both are essential for a complete biological picture.

Unit 3: Overview of Biological Problems and Ethical Issues

1 Mark Questions

1. What is a "Copyright" in the context of scientific publishing?

- Answer: Copyright is a legal right that protects the original expression of an idea (like the text and figures in a paper), preventing others from reproducing it without permission.

2. Define "Scientific Misconduct."
   - Answer: Scientific misconduct is the violation of the standard codes of scholarly conduct and ethical behavior in the publication and professional scientific research.
3. What is "Commercialization" in research?
   - Answer: It is the process of bringing a research discovery or innovation to the market as a product or service.

3 Mark Questions

1. List the key biology research areas mentioned in the syllabus and their focus.
   - Answer: Genetics (heredity), Physiology (function), Biochemistry (chemical processes), Molecular Biology (molecular basis of activity), Cell Biology (cell structure), and Genomics/Proteomics (entire sets of genes/proteins).
2. Explain the ethical implications of "Plagiarism" on a researcher's career.
   - Answer: Plagiarism leads to loss of credibility, retraction of publications, termination of employment, and blacklisting by funding agencies. It permanently damages the researcher's professional reputation.
3. What is the difference between a Patent and a Copyright?
   - Answer: A Patent protects an invention (a new process or product), while a Copyright protects an original work of authorship (a book, article, or image).

8 Mark Questions

1. Trace the history of biological research and discuss the role of "Model Organisms" in advancing our understanding of Genomics and Proteomics.
   - Answer:
     - History: From Aristotle's observations to the discovery of DNA structure.
     - Model Organisms: Organisms like *E. coli*, *S. cerevisiae* (Yeast), *C. elegans*, and *M. musculus* (Mice) are essential.
     - Advantage: They have sequenced genomes, easy genetic manipulation, and conserved pathways.
     - Genomics/Proteomics: Because biological systems are largely conserved, studying the entire genome (Genomics) or protein set (Proteomics) in a model organism allows us to predict gene function and protein interactions in humans, significantly accelerating medical and agricultural research.

Unit 4: Scientific Report Writing

1 Mark Questions

1. What are "Keywords" in a research paper?
    - Answer: Keywords are specific terms used to index the paper in databases, making it searchable for other researchers.
2. Define "Nomenclature" in scientific writing.
    - Answer: Nomenclature is a system of names or terms, or the rules for forming these terms in a particular field of science (e.g., Binomial nomenclature for species).
3. What is a "Research Grant"?
    - Answer: A research grant is a sum of money awarded by an organization (government or private) to a researcher or institution to fund a specific research project.

3 Mark Questions

1. How should "Numbers and Units" be treated in a technical research report?
    - Answer: Numbers should be precise. Use numerals for measurements (e.g., 5 mL). Always use standard SI units. Ensure a space exists between the number and the unit, and be consistent throughout the document.
2. Explain the purpose of "Abbreviations" and how they should be introduced.
    - Answer: Abbreviations save space and make reading easier for experts. They must be defined at first mention (e.g., "Deoxyribonucleic acid (DNA)") and then used consistently thereafter. Avoid using too many in the abstract.
3. What are "Fellowships" and how do they differ from "Grants"?
    - Answer: Fellowships are usually awarded to individuals for their professional development or specific research training (like a salary), while Grants are typically awarded for a specific project's costs (equipment, reagents).

8 Mark Questions

1. Compare the requirements and presentation styles for a "Poster Presentation" versus a "PowerPoint Presentation" at a scientific conference.
    - Answer:
        - Poster: High visual-to-text ratio. Needs to be readable from 3-5 feet away. The researcher stands by the poster for interactive Q&A. Focuses on the 'big picture' and key data.
        - PowerPoint: Structured slides with a logical flow (Intro -> Methods -> Results -> Conclusion). Requires a spoken narrative. Limited time (e.g., 10-15 mins).
        - Design: Poster needs one large layout; PPT needs multiple cohesive slides.

- Application: A poster is better for networking and detailed peer-to-peer discussion; a PPT is better for reaching a large audience simultaneously and telling a compelling story of the research journey.