BIOTECHNOLOGY

SEMESTER – I

IMPORTANT QUESTIONS

unit I: Cell Structure and Functions

12 Mark Questions:

1. Describe the Fluid Mosaic Model of the plasma membrane. Explain the different mechanisms of transport across the membrane with suitable examples.
2. Describe the ultrastructure of a prokaryotic cell using well-labeled diagrams.
3. Describe the ultrastructure of a eukaryotic cell, using well-labeled diagrams.
4. Describe the structure and function of any three double-membrane bound cell organelles found in a plant cell.
5. Explain the detailed structure of a metaphase chromosome, highlighting the role of its various components like chromatids, centromere, telomere, and histones.
6. Explain the detailed structure of a specialised chromosomes

4 Mark Questions:

1. Differentiate between active and passive transport.
2. Write a short note on the cytoskeleton and its components.
3. What are plasmids? State their biological significance.
4. Describe the structure and function of the Golgi apparatus.
5. What are Polytene chromosomes? Where are they found?

Unit II: Cell Division and Cell Cycle

12 Mark Questions:

1. Describe the various stages of mitosis. Discuss its significance.
2. Explain the process of meiosis-I with suitable diagrams.
3. Describe the different phases of the eukaryotic cell cycle. Explain the role of key regulatory proteins at the checkpoints.
4. Describe the Apoptosis and Explain the significance of programmed cell death (Apoptosis).
5. Describe the senescence with suitable examples

4 Mark Questions:

1. What is the Synaptonemal complex? State its significance.

2. Differentiate between mitosis and meiosis.
3. Write a short note on bacterial cell division (binary fission).
4. What are cell cycle checkpoints? Name the key proteins involved.
5. Define Senescence. Give an example.
6. Write about necrosis

Unit III: Principles and Mechanism of Inheritance

12 Mark Questions:

1. Explain Mendel's law of independent assortment with a dihybrid cross. What is the expected phenotypic ratio?
2. Describe the deviations from Mendel's laws, explaining Incomplete Dominance and Co-dominance with examples.
3. Explain sex-linked inheritance in humans using the example of Hemophilia. Show a cross between a carrier female and a normal male.
4. What is linkage? Provide a cytological proof of crossing over. How does recombination frequency relate to the distance between genes?

4 Mark Questions:

1. State Mendel's Law of Segregation.
2. Differentiate between Penetrance and Expressivity with examples.
3. What are multiple alleles? Explain with the example of ABO blood groups in humans.
4. Write a short note on epistasis.
5. How is sex determined in *Drosophila melanogaster*?
6. What are holandric genes?

Unit IV: Biostatistics - Basic Concepts

12 Mark Questions:

1. Calculate the mean, median, and standard deviation for the given data set. Interpret your results.
2. What is a normal distribution? Explain its properties. How is it used in biological data analysis?
3. Explain the concept of hypothesis testing. Describe the steps involved in performing a Chi-square test with a suitable biological example.
4. Compare and contrast diagrammatic and graphical representation of data. Draw a well-labeled histogram and a frequency polygon for the given frequency distribution.

4 Mark Questions:

1. Differentiate between a bar diagram and a histogram.
2. Define standard error. What is its importance?
3. What are the probability rules? Explain the addition rule.
4. Write a short note on the Student's t-test.
5. Differentiate between random and non-random sampling methods.
6. What are null and alternative hypotheses?