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University Examinations 2024/2025

FIRST YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF MEDICAL MICROBIOLOGY

HMM 3113: CELL BIOLOGY

DATE: JANUARY 2025

TIME: 3 HOURS

INSTRUCTIONS:

Answer *All* questions

Ensure that all your answers are properly numbered

Part I multiple Choice Questions (MCQ): Write the correct answer on the space provided in the answer booklet. Each MCQ is one mark

Part II: Short Answer Questions – Answer questions following each other on the answer booklet

Part III: Long Answer Questions – Answer each question on the answer booklet

SECTION A: MULTIPLE CHOICE QUESTIONS (20 marks)

1. Who of the following contributed to the development of the cell theory
 - a) Anton van Leeuwenhoek
 - b) Robert Hooke
 - c) Theodor Schwann
 - d) Matthias Schleiden
2. The following scientist advanced the cell theory with a conclusion that cells could only come from other cells
 - a) Anton van Leeuwenhoek
 - b) Rudolph Virchow

- c) Theodor Schwann
 - d) Robert Hooke
3. Unlike eukaryotes, prokaryotes do not have
- a) DNA
 - b) Cytoplasm
 - c) cell walls
 - d) A membrane bound nucleus
4. Which technology was essential for the development of the cell theory?
- a) Telescopes
 - b) Antiseptics
 - c) Microwaves
 - d) Microscopes
5. What part of the cell serves as the intracellular highway?
- a) Endoplasmic reticulum
 - b) Golgi apparatus
 - c) Cell membrane
 - d) Mitochondria
6. Which of the following would you NOT find in a bacterial cell?
- a) DNA
 - b) Cell membrane
 - c) Golgi apparatus
 - d) Ribosomes
7. How many cell divisions occur in mitosis?
- a) None
 - b) 1
 - c) 2
 - d) 3
8. What is the name of the first stage of mitosis?
- a) Prophase
 - b) Metaphase

- c) Anaphase
 - d) Telophase
9. Which of the following statements is true about the metaphase?
- a) A chromosome is the thickest during the metaphase
 - b) A chromosome is the shortest during the metaphase
 - c) A chromosome is the longest during the metaphase
 - d) Both (a) and (b)
10. A fully expressed allele is referred to as
- a) Dominant
 - b) Recessive
 - c) Homologous
 - d) Heterozygous
11. How many autosomes are present in a human being?
- a) 20 pairs
 - b) 22 pairs
 - c) 23 pairs
 - d) 44 pairs
12. Which statement about DNA is correct?
- a) Adenine (A) pairs with cytosine (C)
 - b) Thymine (T) pairs with adenine (A)
 - c) Cytosine (C) pairs with thymine (T)
 - d) None of the above
13. What is a mutation?
- a) A change in the DNA of an organism
 - b) A change in the way an organism looks
 - c) A change in the way an organism behaves
 - d) Ailment to the cell until the genetic makeup take another form.
14. Variation in genes is known as?
- a) Alleles
 - b) Genotypes

- c) Phenotypes
 - d) Recessive traits
15. Which of these is a disadvantage of gene therapy?
- a) It is not a long-term solution
 - b) It does not work
 - c) It has serious side effects
 - d) None of the above
16. What results after insertion of an extra nucleotide into a DNA sequence?
- a) Missense mutation
 - b) Frame shift mutation that is likely to result in a non-functional protein
 - c) Frame shift mutation that is likely to result in a functional protein
 - d) None of the above
17. Which of these diseases could be treated by gene therapy?
- a) Influenza
 - b) Tuberculosis
 - c) Diabetes
 - d) None of the above
18. Factors that act to change allele frequencies. EXCEPT
- a) Natural Selection
 - b) Genetic drift
 - c) Mutations
 - d) Protein synthesis
19. When is genetic counselling typically offered.
- a) After a child is born
 - b) Before or alongside genetic testing
 - c) Only when a genetic condition is diagnosed
 - d) After genetic conditions have been treated
20. Which microscopy technique would provide the best resolution for observing the structure of ribosomes within a cell?
- a) Light microscopy

- b) Fluorescence microscopy
- c) Scanning electron microscopy
- d) Transmission electron microscopy

SECTION B: SHORT ANSWER ALL QUESTIONS (40 MARKS)

- a) Describe the composition of the plasma membrane (7 marks)
- b) Describe the components of the cytoskeleton (6 marks)
- c) List the steps in immunofluorescence (4 marks)
- d) Describe the role of cyclins in regulating the cell cycle (5 marks)
- e) Describe characteristics of prokaryotic cells (7 marks)
- f) Explain the key characteristics of stem cells (6 marks)
- g) Describe light microscopy as laboratory technique in cell biology (5 marks)

SECTION C: LONG ANSWER TWO QUESTIONS (40 MARKS)

QUESTION ONE

- a) Discuss the mechanisms of membrane transport (13 marks)
- b) Describe the composition of the plasma membrane (7 marks)

QUESTION TWO

- a) Discuss the phases in cell cycle and division (10 marks)
- b) Outline the phases in Meiosis I (4 marks)

QUESTION THREE

- Discuss the categories of cell signaling pathways (20 marks)