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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)