

LUSAKA APEX
MEDICAL UNIVERSITY



FACULTY OF PRE-MEDICAL SCIENCES

UNIVERSITY EXAMINATIONS MAY 2022

BS 1001

CELLS AND BIOMOLECULES

SUNDAY 29TH MAY 2022

DURATION: Three Hours

TOTAL MARKS: 100

Examiner: Ms. K Malisa

INSTRUCTIONS FOR THE WHOLE PAPER

1. Write your Student Identity Number on all pages of the answer booklet(s).
2. Answer ALL the questions in this paper.
3. Present your work in a clear and logical manner.
4. All drawings should be in pencil.
5. Any disregard for examinations rules and regulations will result in you being disqualified from this examination.
6. Ensure that you sign in the examination attendance register before leaving the examination room

SECTION A: MULTIPLE CHOICE

Instruction: Mark the correct answer with the letter X in the answer booklet.

1. While viewing a sample under the microscope, you notice a round shaped cell without a true nucleus. What is the correct assumption that can be made regarding the cell so far?

- A. It is a eukaryote
- B. It is acellular
- C. It is a prokaryote
- D. It is dead

2. Bacteria come in many forms, but generally fall into 3 categories which are bacillus, coccus or spirals. What do you call rod shaped bacteria cells arranged in chains?

- A. Streptococci
- B. Streptobacilli
- C. Staphylococci
- D. Coccobacillus

3. Which of the following is not a characteristic of Archae?

- A. They are unicellular
- B. They live in extreme environments
- C. They have peptidoglycan in their cell wall
- D. They lack a true nucleus

4. Microbiology has several sub-disciplines. Which one is not a sub-discipline?

- A. Virology
- B. Immunology
- C. Botany
- D. Bacteriology

5. Microorganisms can be cellular or acellular. Which of the following is acellular?

- A. Protozoa
- B. Bacteria
- C. Yeasts
- D. Prions

6. What is a cell?

- A. A building block of plants
- B. A structure found in animals only
- C. A structure responsible for all processes of life
- D. A structure that makes up part of some organs

7. Which of the following scientists is the father of microscopy?

- A. Anton Van Leeuwenhoek
- B. Robert Hooke
- C. Theodor Schwann
- D. Matthias Schleiden

8. Which one of the following statements is part of the modern cell theories?

- A. All cells are produced by cell division of pre-existing cells
- B. The cell is the basic unit of life in all living things
- C. All cells have the same chemical composition and metabolic activities
- D. All organisms are composed of one or more cells

9. In a research laboratory, a scientist had sample A, which contained animal cells and sample B, which contained plant cells. After an extensive research he noticed a few similarities and differences between the two samples. Which statement most likely depicts his findings?

- A. Both sample A and Sample B had rigid cell walls
- B. Only sample A had nuclei while sample B had no nuclei
- C. Sample A and sample B both had membranes surrounding their mitochondria
- D. Sample A had Golgi apparatus which were surrounded by membranes while Sample B had Golgi apparatus which were not surrounded by membranes

10. Under a microscope, a scientist notices the breakdown of some compounds in a cell compartment. What cell compartment is the scientist likely observing?

- A. Smooth endoplasmic reticulum
- B. Lysosomes
- C. Rough endoplasmic reticulum
- D. Golgi apparatus

11. Which of the following statements correctly describe a eukaryotic cell?

- A. It can specialize
- B. It is simple and easy to grow
- C. It reproduces quickly
- D. All eukaryotic cells in an organism are exactly the same

12. Cristae are folds found in which cell structure?

- A. Mitochondria
- B. Nucleoid
- C. Cell membrane
- D. Capsule

13. How does a sex cell differ from a body cell?
- A. A sex cell does not contain chromosomes.
 - B. A sex cell contains homologous chromosomes.
 - C. A sex cell has the same number of chromosomes as a body cell.
 - D. A sex cell has half the amount of genetic material as a body cell.
14. How do the chromosomes at the end of meiosis I compare with the chromosomes at the end of meiosis II?
- A. Chromosomes have one chromatid at the end of both meiosis I and meiosis II.
 - B. Chromosomes have two chromatids at the end of both meiosis I and meiosis II.
 - C. Chromosomes have one chromatid at the end of meiosis I and two chromatids at the end of meiosis II.
 - D. Chromosomes have two chromatids at the end of meiosis I and one chromatid at the end of meiosis II.
15. How is meiosis related to sexual reproduction?
- A. Meiosis allows the offspring produced during sexual reproduction to grow and develop.
 - B. Meiosis joins together the sex cells during sexual reproduction to produce new offspring.
 - C. Meiosis produces the sex cells that join to form new offspring during sexual reproduction.
 - D. Meiosis produces the body cells that join to form new offspring during sexual reproduction.
16. How does meiosis I differ from meiosis II?
- A. The sister chromatids separate during meiosis I, but not during meiosis II.
 - B. The homologous chromosomes pair up during meiosis II, but not during meiosis I.
 - C. Two sex cells are produced as a result of meiosis II, but not as a result of meiosis I.
 - D. Chromosome number decreases by half as a result of meiosis I, but not as a result of meiosis II.

17. Zodwa knows that chromosomes behave differently in meiosis and mitosis. What do chromosomes do in meiosis but not in mitosis?

- A. Each chromosome makes a copy.
- B. The homologous chromosomes form pairs.
- C. Chromosomes line up in the middle of the cell.
- D. Chromosomes condense or shorten up before cell division begins.

18. If a sexually reproducing organism has 28 chromosomes in its body cells, how many chromosomes did it inherit from each parent?

- A. 7
- B. 14
- C. 16
- D. 28

19. What process does a multicellular organism use to replace its damaged body cells?

- A. mitosis
- B. meiosis
- C. replication
- D. transcription

20. Which of the following statements correctly describes the function of cell division in unicellular organisms?

- A. Cell division allows the organism to grow.
- B. Cell division allows the organism to reproduce.
- C. Cell division allows the organism to produce sex cells.
- D. Cell division allows the organism to repair damage to the cell.

21. Which of these lists presents the stages of the cell cycle in the correct order?
- A. interphase, mitosis, cytokinesis
 - B. cytokinesis, mitosis, interphase
 - C. mitosis, interphase, cytokinesis
 - D. interphase, cytokinesis, mitosis
22. During spermatogenesis, the first meiotic division begins with which cell?
- A. Spermatogonium
 - B. Secondary spermatocyte
 - C. Primary Spermatocyte
 - D. Spermatid
23. After a rough day of tough tests and quizzes, Lukwesa decides to go shopping to cook herself a healthy meal. Her shopping basket includes eggs, liver, cod liver oil and bream. Which vitamin are these foods likely to boost in her body once Lukwesa partakes of them?
- A. Vitamin A
 - B. Vitamin C
 - C. Vitamin D
 - D. Vitamin K
24. Which of the following is the most abundant mineral in your body?
- A. Calcium
 - B. Phosphorus
 - C. Iron
 - D. Sodium

25. A severe lack of vitamin C in the diet causes a disease which can result in bleeding gums, bruising easily and painful joints. This disease is commonly known as_____.

- A. Beri
- B. Kwashiorkor
- C. Scurvy
- D. Osteomalacia

26. If everyone in richer countries ate less of this mineral, it would result in a global drop in high blood pressure and cardiovascular disease. Which mineral is this?

- A. Calcium
- B. Sodium
- C. Phosphorus
- D. Iron

27. Which of the following is the scientific name for Vitamin K?

- A. Ascorbic acid
- B. Phytonadione
- C. Tocopherol
- D. Pantothenic Acid

28. Which of the following options, A – D, are the pyrimidine bases found in DNA?

- A. uracil and thymine
- B. thymine and cytosine
- C. adenine and thymine
- D. cytosine and uracil

29. Which base is not found in RNA?

- A. adenine
- B. cytosine
- C. thymine
- D. uracil

30. The research of Erwin Chargaff was essential in the discovery of the structure of DNA by Crick and Watson. Chargaff analyzed the base composition of DNA from a wide range of organisms. He reported his findings using the initial letter of each base to stand for the number of that base found in an organism's genome. Which of these relationships did he find within the genome of each organism he studied?

- A. $C=T$ $G=A$
- B. $C+G=A+T$
- C. $T+C=A+G$
- D. $G=T$ $A=C$

31. Adjacent nucleotides in a polynucleotide chain are joined together by _____.

- A. Phosphodiester bonds
- B. Peptide bonds
- C. Ionic bonds
- D. Hydrogen bonds

32. Essential Amino Acids _____.

- A. Are the only amino acids that are found in a protein
- B. Are produced by the body
- C. Are obtained from a diet
- D. Are not part of a primary protein structure

33. What is the name of the bond between the two atoms as shown $-C-N-$?

- A. Peptide bond
- B. Glycosidic bond
- C. Ester bond
- D. Hydrogen bond

34. The function of myoglobin is to _____
- A. Transport oxygen throughout the body
 - B. Provides muscles with oxygen
 - C. Proliferates muscle fibers
 - D. Engages the lungs and makes them strong
35. Chitin is a polysaccharide that has an atom that is not normally found in other polysaccharides. What is the name of this atom?
- A. Hydrogen
 - B. Phosphorus
 - C. Nitrogen
 - D. Sodium
36. In competitive inhibition, inhibitors bear a close structural similarity with the _____.
- A. Co-enzyme
 - B. Co-factor
 - C. Prosthetic group
 - D. Substrate
37. Enzymes act best at a particular temperature called?
- A. Catalytic temperature
 - B. Normal Body temperature
 - C. Optimum temperature
 - D. Maximum temperature
38. Feed-back inhibition means _____.
- A. Initial product inhibition
 - B. End Product inhibition
 - C. Enzymatic induction
 - D. Competitive inhibition

39. Uncatalyzed reactions show _____ activation energy.
- A. Lower
 - B. Higher
 - C. Moderate
 - D. Optimum
40. An enzyme without a co-factor is known as an_____.
- A. Apoenzyme
 - B. Holoenzyme
 - C. Coenzyme
 - D. Ribozyme
41. According to the induced fit model proposed by Daniel E. Koshland in 1959_____.
- A. The enzyme active site is rigid
 - B. The substrate is the key
 - C. Each type of enzyme will only act on one type of substrate molecule
 - D. The enzyme has a wider range of substrate specificity
42. Mitosis is the process by which_____.
- A. cells grow in size.
 - B. a cell's nucleus divides.
 - C. cytokinesis occurs.
 - D. DNA is replicated
43. A cell with chromosomes lined up in the middle is most likely in which stage of Mitosis?
- A. Prophase
 - B. Anaphase
 - C. Telophase
 - D. Metaphase

44. During mitosis, how many times does a cell divide?
- A. Once
 - B. Twice
 - C. Three times
 - D. Four time
45. Uncontrolled cell division is commonly referred to as _____.
- A. Apoptosis
 - B. Lysis
 - C. Cancer
 - D. Karyotyping
46. At G₀ _____.
- A. The cell is dead
 - B. The cell is paused to check the and correct the errors in the DNA
 - C. The cell undergoes apoptosis
 - D. The cell is resting
47. Based on your knowledge of the phases in mitosis, when do you think karyotypes are made?
- A. At anaphase
 - B. At prophase
 - C. At metaphase
 - D. At telophase
48. The most abundant biomolecules on earth are the _____.
- A. Proteins
 - B. Lipids
 - C. Carbohydrates
 - D. Triglycerides

49. Phenylalanine and Tryptophan differ from other amino acids in that_____.
- A. They are essential amino acids
 - B. They are non-essential amino acids
 - C. They are semi essential amino acids
 - D. They are aromatic amino acids
50. Which scientist in 1665 concluded that a thin slice of cork consisted of many tiny boxes?
- A. Anton Von Leuwenhoek
 - B. Robert Hooke
 - C. Matthias Schleiden
 - D. Theodor Schwann

SECTION B: STRUCTURED QUESTIONS

Instruction: Write down your answers in the answer booklet. Ensure you clearly label all the questions.

- B1. (a) What do you understand by the term polarity? [1 Mark]
- (b) Briefly explain why water is a polar molecule? [2 Marks]
- (c) Illustrate how water's polarity can bring about hydrogen bonding. [2 Marks]
- (d) Explain what role hydrogen bonds play in water having a high specific heat capacity.
- [2 Marks]
- (e) What is the biological importance of water having a high specific heat capacity?
- [2 Marks]
- (f) Write down the numerical value of the specific heat capacity of water in the appropriate scientific units. [1 Mark]

B2. Complete the following table on carbohydrates in your answer booklet. [10 Marks]

TYPE OF CARBOHYDRATE	MOLECULAR FOMULAR	EXAMPLE
<i>Triose</i>		
<i>Tetrose</i>		
<i>Pentose</i>		
<i>Hexose</i>		
<i>Heptose</i>		

B3. Triglycerides are the most abundant types of dietary lipids found in nature. Demonstrate the formation of a triglyceride via condensation reactions. [10 Marks]

B4. (a) Enzymes are globular proteins that speed up chemical reactions by lowering the energy of activation. What types of bonding/interactions bring about the globular structure of a protein? [5 Marks]

(b) Using an illustration explain how changing substrate concentration affects enzyme activity given that enzyme concentration is constant. [5 Marks]

B5. (a) What two factors determine protein function? [2 Marks]

(b) Demonstrate the formation of a dipeptide. [3 Marks]

(c) Briefly explain how the secondary structure of a protein comes about. [2 Marks]

(d) What is protein denaturation? Give two examples of factors that may cause it.

[2 Marks]

The End

