LUSAKA APEX MEDICAL UNIVERSITY

FACULTY OF PRE-MEDICAL FOUNDATION

DEPARTMENT OF BIOLOGY

SECOND SEMESTER SUPPLEMENTARY/DEFFERED EXAMINATIONS: JANUARY 2016

BS1001
INTRODUCTORY BIOLOGY
(CELLS AND BIOMOLECULES**)**

TIME: Three (3) hours TOTAL MARKS: 100

Examiners: Mr.M.Mudenda, Mr.K. Chimfwembe and Miss C.Lulembo

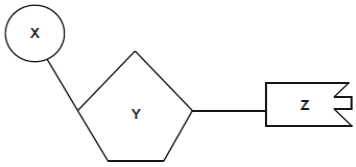
INSTRUCTIONS FOR THE WHOLE PAPER

1. Indicate clearly your computer number (Student ID) on the answer booklet.
2. Indicate the type of examination you are sitting for: Supplementary or Deferred
3. THERE ARE **THREE SECTIONS** IN THIS PAPER, A, B and C.ANSWER ALL SECTIONS.
4. Write all your answers in the booklets provided.
5. No communication of any kind with fellow students is allowed when examination is in progress

SECTION A: (Multiple Choice Questions: **50marks**)

1. A Prokaryotic cell has all the parts listed below **EXCEPT**
   a. Ribosomes
   b. Cell membrane
   c. Nucleus
   d. Genetic material
   e. Cell wall

2. The following diagram represents a nucleotide with subunits X,Y and Z



This nucleotide could be identified as a monomer of DNA but not RNA if
   a. X is ribose.
   b. Z is thymine.
   c. Y is phosphate.
   d. Z is paired with cytosine.

3. If a plant cell was missing chloroplasts, what will it be unable to do?
   a. Move from predators
   b. Reproduce
   c. Produce sugars from sunlight
   d. Absorb water from its roots

4. In cells, which of the following can catalyse reactions involving hydrogen peroxide, provide cellular energy, and make proteins, in that order?
   a. Peroxisomes, mitochondria, and ribosomes
   b. Peroxisomes, mitochondria, and lysosomes
   c. Peroxisomes, mitochondria, and Golgi apparatus
   d. Lysosomes, chloroplasts, and ribosomes
   e. Smooth endoplasmic reticulum, mitochondria, and ribosomes

5. A student using a light microscope correctly observes a cell and concludes that is a plant cell because
   a. Ribosomes are visible
   b. An endoplasmic reticulum has been seen
   c. A cell membrane is present
   d. It has a large central vacuole

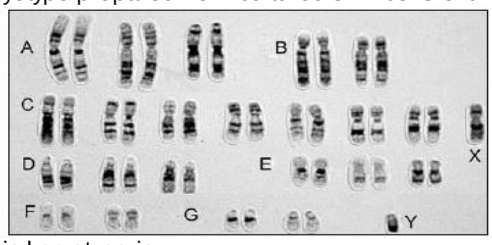
6. Membranes are components of the following **EXCEPT**
   a. Microtubule
   b. Nucleus
   c. Golgi apparatus
   d. Mitochondrion
   e. Lysosome

7. Which of the following groups contain prokaryotic organisms capable of surviving the greatest extreme in temperature?
   a. Protista
   b. Archaebacteria
   c. Eubacteria
   d. Fungi

8. All of the following are typical components of the plasma membrane of the eukaryotic cell **EXCEPT**
   a. Glycoproteins
   b. Cytochromes
   c. Cholesterol
   d. Phospholipids
   e. sphingolipids

9. Duplicated chromosomes are called
   a. Chromomeres
   b. Chromatin
   c. Chromatid
   d. Centromere

10. The following image is of a karyotype prepared from cultured skin cells of the fetus.



The number of autosomes in this karyotype is
a. 22
b. 23
c. 44
d. 46

11. The longest phase of the cell cycle is
a. Interphase
b. Mphase
c. Prophase
d. G1phase

12. The longest phase of Mitosis is
a. Interphase
b. Mphase
c. Prophase
d. G1phase

13. Division of the nucleus in mitosis is also known as
a. Cell division
b. Cytokinesis
c. Karyokinesis
d. Kinetochoresis

14. A couple had marital problems on account that their son had features and behaviour which were totally different from the father and the man suspected that the wife had a son with a different man.This can be explained due to
a. Genetics
b. Mitosis
c. Meiosis
d. Crossing over

15. Which molecules have properties that are dependent on hydrogen bonds?
a. Cellulose
b. Glycogen
c. Haemoglobin
d. Water

16. Why may fish living in ponds survive temperatures below 0 °c in winter?
a. Fish body tissues produce an enzyme which prevents blood from freezing.
b. The ice on the pond surface insulates the water in the pond.
c. The plants in the pond help to keep the water temperature above 0 °c.
d. The rocks in the pond warm up during the day and heat the water

17. Which feature of water is least likely to affect the life of an animal in a tropical rain forest?
a. Adhesion with other molecules
b. Cohesion between water molecules
c. Low viscosity
d. Maximum density at 4 °c

18. All the compounds below are polar **EXCEPT**
a. CH_3CH_2OH
b. HCO
c. $CH_3CH_2NH_2$
d. $CH_3CH_2NH_2(H^+N_2)_2$

19. The following properties of water are related to transpiration **EXCEPT**
    a. Surface Tension
    b. Adhesion and Cohesion
    c. High specific heat
    d. High heat of fusion

20. One naturally occurring polysaccharide is an unbranched chain of the molecule acetylglucosamine linked by β-1, 4 glycosidic bonds. There are –CH2OH groups that alternate on each side of the polysaccharide chain many hydrogen bonds form between these unbranched chains . Which polysaccharide has a structure similar to that described?
a. Amylose
b. Amylopectin
c. Cellulose
d. Glycogen

21. Which molecules contain a carboxyl group?
    1. Amino acid
    2. Glycerol
    3. Saturated fatty acid
    4. Unsaturated fatty acid
a. 1 and 2 only
b. 3 and 4 only
c. 1, 3 and 4 only
d. 2, 3 and 4 only.

22. DNA and RNA are polynucleotides composed of mononucleotides joined by
a. Catabolic reactions
b. Condensation reactions
c. Hydrolysis reactions
d. Redox reactions

23. The mononucleotides of RNA consist of a phosphate joined to the sugar
a. Deoxyribose
b. Dextrose
c. Ribose
d. Ribulose

24. The bases in RNA are
a. Adenine, cytosine, guanine and thymine
b. Adenine, cytosine, guanine and uracil
c. Adenine, guanine, thymine and uracil
d. Cytosine, guanine, thymine and uracil

25. When investigating the rate of reaction of the enzyme lipase on the hydrolysis of triglycerides, the pH must be maintained at an optimum to prevent the lipase denaturing. What is the reason for this?
a. The addition of water molecules produced by hydrolysis increases pH.
b. The products of hydrolysis decrease the pH.
c. The products of hydrolysis increase the pH.
d. The removal of water molecules used in hydrolysis decreases ph.10

26. How does increasing substrate concentration affect the rate of an enzyme-catalysed reaction in the presence of a competitive inhibitor?
a. The rate of the reaction decreases.
b. The rate of the reaction decreases initially and then recovers.
c. The rate of the reaction increases.
d. The rate of the reaction is not affected.

27. Which of the following is **NOT TRUE** about the active site in enzymes catalysed reactions?
    a. It fits the shape of the substrate
    b. Contains an R group of the amino acid
    c. Releases products when the reaction is complete
    d. It is rigid

28. Which of the characteristic below is **FALSE** about a non-competitive inhibitor?
    a. Has a structure similar to the substrate
    b. Distorts the shape of the enzyme
    c. Prevents the binding of the substrate
    d. Cannot have its effect reversed by adding more substrate

29. Which of the following is **NOT TRUE** about induced-fit model of enzyme action?
    a. The active site is not flexible, but rigid
    b. The shape of the active site, enzyme and substrate adjust
    c. There is improved catalysis
    d. There is a greater range of substrate specificity

30. Which process allows the movement of molecules that are too large to enter through a cell surface membrane?
    a. Active transport
    b. Endocytosis
    c. Exocytosis
    d. Facilitated diffusion

31. The following are components of the phospholipids **EXCEPT**
    a. Fatty acid
    b. Cholesterol
    c. Phosphate
    d. Alcohol

32. The following moves freely across the cell membrane **EXCEPT**
    a. Carbon dioxide
    b. Oxygen
    c. Ammonia
    d. Amino acids

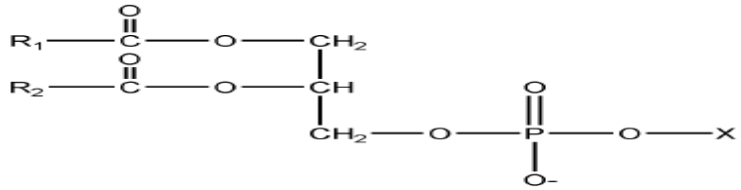
33. Which of the following is **NOT** an example of bulk transport?
    a. Phagocytosis
    b. Pinocytosis
    c. Exocytosis
    d. Symbiosis

34. Which biomolecules are classified differently from the others
    a. Lipids
    b. Carbohydrates
    c. Proteins
    d. Nucleic Acids

35. Which of the following is not a disaccharide?
    a. Sucrose
    b. Maltose
    c. Lactose
    d. All of the above
    e. None of the above

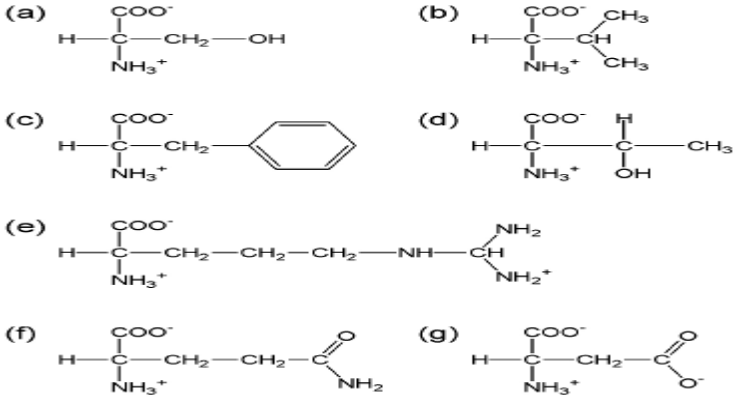
36. Which of the following is best observed by using a compound light microscope?
    a. A eukaryotic cell
    b. A virus
    c. A DNA sequence'
    d. The inner structure of a mitochondrion

37. The structure of the biomolecule is shown below. The structure is a



    a. Nucleic acid
    b. Protein
    c. Phospholipid
    d. Sphingolipid

Below are examples of seven amino acids, labelled (a) to (g), which have different functional groups. Carefully look at the amino acids and answer questions 37 to 43.



38. What type of side group is contained in the amino acid labelled (a)?
    a. Polar
    b. Non-polar
    c. Acidic
    d. Basic

39. What type of side group is contained in the amino acid labelled (b)?
    a. Polar
    b. Non-polar
    c. Acidic
    d. Basic

40. What type of side group is contained in the amino acid labelled (c)?
    a. Polar
    b. Non-polar
    c. Acidic
    d. Basic

41. What type of side group is contained in the amino acid labelled (d)?
    a. Polar
    b. Non-polar
    c. Acidic
    d. Basic

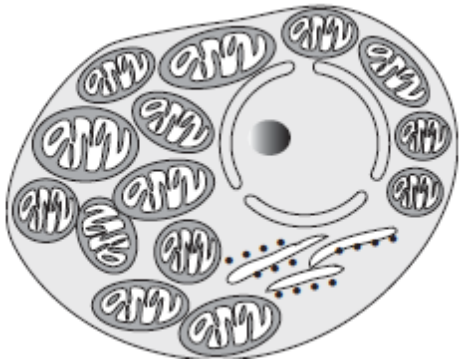
42. What type of side group is contained in the amino acid labelled (e)?
    a. Polar
    b. Non-polar
    c. Acidic
    d. Basic

43. What type of side group is contained in the amino acid labelled (f) i?
    a. Polar
    b. Non-polar
    c. Acidic
    d. Basic

44. What type of the side group is contained in the amino acid labelled (g)?
    a. Polar
    b. Non-polar
    c. Acidic
    d. Basic

45. Nuclear division in which the chromosome number is reduced from 2n to n is part of the life cycle of all the following organisms **EXCEPT**?
    a. Moulds
    b. Ferns
    c. Insects
    d. bacteria

46. Examine the following cell



Based on the internal structure, the cell is likely to
a. Be a cheek epithelial cell
b. Be a mature red blood cell
c. Require high levels of oxygen
d. Produce high levels of sugars

47. The following are all fat-soluble vitamins **EXCEPT**
a. A
b. D
c. E
d. C

48. VitaminB1 is also known as
a. Thiamin
b. Niacin
c. Riboflavin
d. Folate

49. How does glycogen differ from starch?
a. It contains 1-4 glycosidic bonds
b. It contains 1-6 glycosidic bonds
c. It is a linear molecule
d. It is highly branched

50. Which process would allow the movement of large protein molecules out of the cell?
a. Active transport
b. Exocytosis
c. Facilitated diffusion
d. Phagocytosis

SECTION B: (**25marks**)

1. For the following questions, write either True (T) or False (F) (5marks)

i. The insoluble part of the cytoplasm is also known as cytosol
ii. The enzymes found within the lysosomes are synthesised by rough endoplasmic reticulum
iii. Plasmid is the other name for chloroplast
iv. Homologous chromosomes have the same length and same genes
v. Mitosis results in genetic stability but poor survival rates
vi. G0 is part of interphase'
vii. Autosomes are derived from the somatic cells
viii. Karyokinesis occurs in all somatic cells
ix. Asters are short fibers radiating from the centrioles.
x. After meiosis I, the chromosome number reduces to half but the sister chromatids do not separate

2. Fill in the following blanks (10marks)

Biomolecules are also called (1)……since they are made up of molecule units called(2)…….. .The molecule units combine by the process of (3) ……with the release of (4)…… The bond formed when the molecule units join can be broken down with the addition of (5)……in the process called (6)……

In some cases however, the biomolecules can combine to form special compounds. Carbohydrates can either combine with protein or lipids to form (7)……..or (8)…….and proteins can combine with lipids to form (9)……..Lipids can also combine with phosphates to form (10)……

3. Complete the table below for the following Biomolecules (6marks)

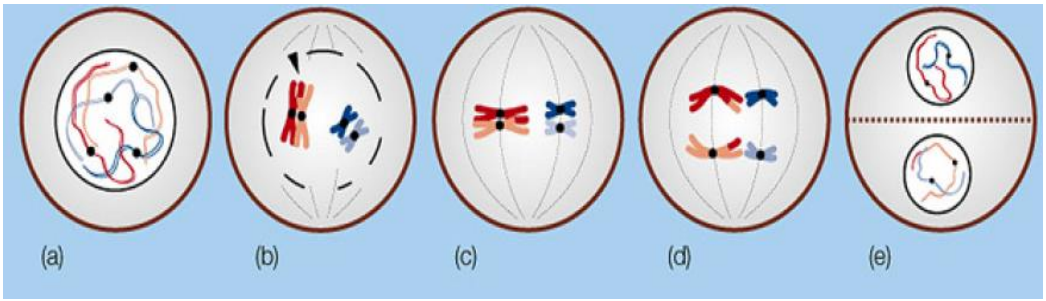
Biomolecule	Monomer	Bond formed	Polymer
Proteins			
Carbohydrates			
Lipids			
Nucleic Acids			

4. Complete the table below (4marks)

Structure protein	Example of Protein	Function of Protein
Primary Structure		
Secondary structure		
Tertiary Structure		
Quaternary structure		

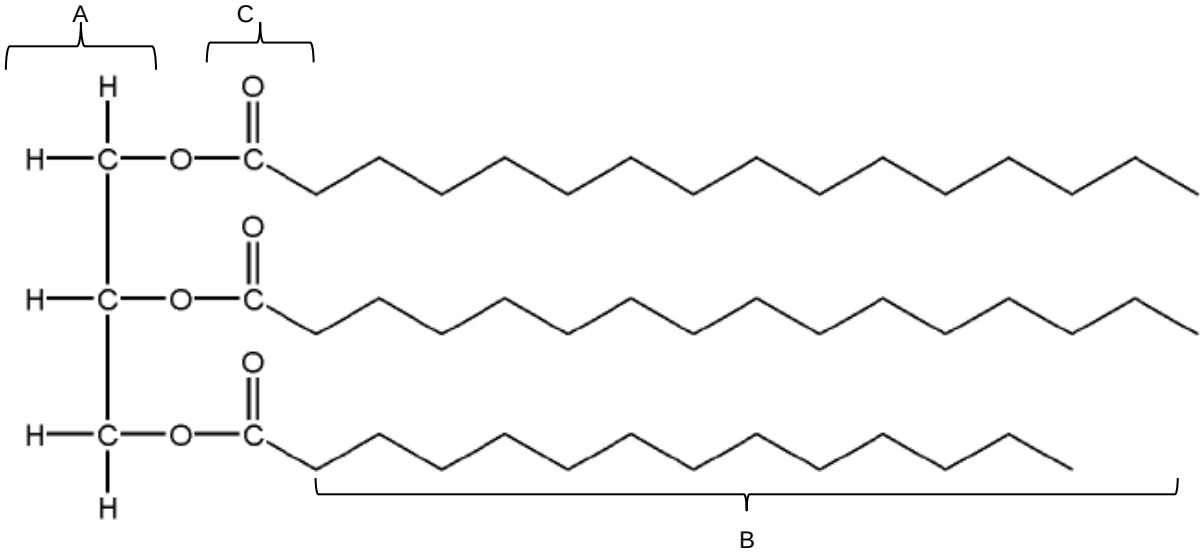
SECTION C :**(25marks)**

5. The diagrams below shows stages of one phase the cell cycle



a. What is the phase of the cell cycle show above?(1)
b. Explain answer in (a) above(1)
c. Name the stages a,b,c and e above(2)
d. In which type of cell(s) does the process depicted above take place?(1)
e. What is the significance of the process shown above?(1)

6. The structure below is a biomolecule



a) What type of a biomolecule is shown above?(1)
b) What is the name of the biomolecule shown above?(1)
c) Indicate components labelled A,B and C.(3)
d) What is the link between the melting point of the biomolecule above and component labelled B above (2)
e) Explain the health/nutrition implications of the biomolecule shown above (2)

7. With the aid of a well labeled diagram show how the hydrogen bonds form between five different water molecules, showing clearly the interaction of the charges (5).

8. You have been provided with two suspensions, A and B which are suspected to be from the stomach of an **Herbivore** and a **Carnivore.** You will need to use cells from the suspensions. The suspensions are partially digested.

a) What assumption(s) would you make to use the suspension(s)? (1)
b) Using your knowledge of biology, describe the steps you would take to analyse the specimens under the microscope (2)
c) With **illustrations**, explain what you are likely to find in the two suspensions mentioned above (2).