

Instructions to candidates

Duration: Two (02) hours

Number of questions: Eight (08) Structured Essay

Mark allocation: 100

Answer all questions

Index No:

1.

a. Fill in the blanks

i. Two sugars that differ in configuration at only one chiral center are called

.....

ii. Two sugars that are mirror images of each other are called .....

iii. Pair of isomers that have opposite configuration at one or more chiral centers but not mirror images is called .....

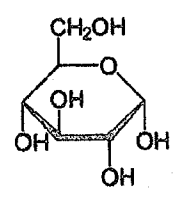
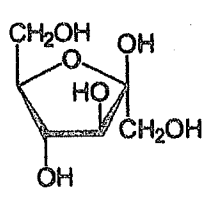
(3 mark)

b. Name three (03) common disaccharides and the type of bond in each one, connecting the monomers.

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 .....  
 .....

(8 mark)

c. Select the  $\alpha$ -pyranose and the  $\beta$ -furanose sugar molecules from the following



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(2 mark)

d. Write two similarities and a difference between a glycogen molecule and an amylose molecule.

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(4 mark)

e.

i. List the major macromolecule which serves as an important structural component in plant cells.

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(0.5 mark)

ii. Name it's monomer and the type of bond between the monomers.

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(1.5 mark)

f. Which two polysaccharides are the energy storage forms of animals and plants?

Animals: .....

Plants: .....

(1 mark)



2.

a. Differentiate unsaturated fatty acids and saturated fatty acids.

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(2 mark)

b. Explain how a triacylglycerol is formed.

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(5 mark)

c. List the main function of each of the following

i. Phospholipids: .....

ii. Triacylglycerols: .....

iii. Wax: .....

(3 mark)



d. Name two steroidal lipids found in humans.

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(2 mark)

e. Differentiate active and passive transport using three (03) features.

Active Transport	Passive Transport
i. .... .....	..... .....
ii. .... .....	..... .....
iii. .... .....	..... .....

(3 mark)

3.

a. Water takes a longer time to increase its temperature while the land heats up comparatively quickly. Explain.

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(5 mark)



b. Which property of water is exhibited in transportation of water through a plant?

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(1 mark)

c. What is the building block of proteins ?

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(1 mark)

d. A decapeptide undergoes partial hydrolysis. Fragments formed are listed below. Edman gives PTH-Gly. What's the sequence of the decapeptide?

- |                   |                        |
|-------------------|------------------------|
| 1.) Ala, Trp      | 5.) Trp, Ala, Arg      |
| 2.) Val, Pro, Asp | 6.) Arg, Gly           |
| 3.) Pro, Val      | 7.) Glu, Ala, Leu      |
| 4.) Ala, Glu      | 8.) Met, Pro, Leu, Glu |



(2 mark)

- e. To determine the amino acid sequence of a peptide you performed following steps using enzyme cleavage of your peptide combined with the subsequent sequencing.
- Step 1. Treatment with trypsin has yielded three fragments with the following sequences:  
Tyr-Leu-Asp-Arg, Gly-Ser-Ala-Lys, Trp-Gly-Ser-Met
- Step 2. Treatment with pepsin has given the same three peptide fragments:  
Tyr-Leu-Asp-Arg, Gly-Ser-Ala-Lys, Trp-Gly-Ser-Met
- i. From the above data, determine and write the correct sequence of your peptide.

(2 mark)

- ii. Assume that your lab ran out of pepsin supply thus cannot perform step 2. What alternative cleavage agent from the following you can use to determine the sequence of the peptide.

Cyanogen bromide, Carboxy peptidase, Chymotrypsin

(1 mark)



f. List three types of column chromatography methods that can be used to separate proteins.

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(3 mark)

4.

a. What are the conditions required for photosynthesis?

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(2 mark)

b. Name the pigment which is responsible for absorption of light in plants?

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(1 mark)

c. Name the metal present in chlorophyll 'a' and 'b'?

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(1 mark)

d. Name the structural unit of photosynthesis?

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(1 mark)



e. Light energy trapped by chlorophyll is used to split water. List three (03) products that result when water is split.

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(3 mark

5.

a. List the stages of cellular respiration and mention where those occur.

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(4 mark

b. Who discovered the tricarboxylic acid cycle?

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(2 mark

c. Which part of cellular respiration produces the most ATP?

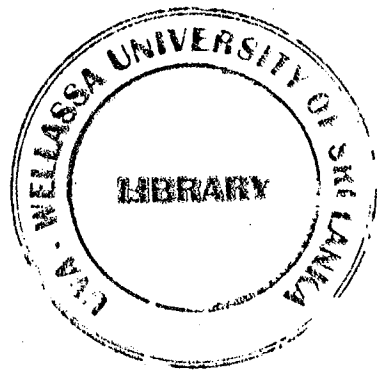
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(1 mar

d. What is the type of respiration shown by yeast?

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(1 mar



e. What is the major byproduct of yeast respiration.

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(1 mark)

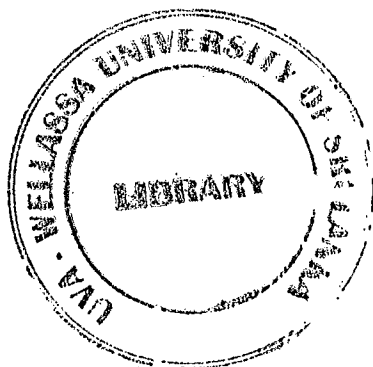
f. Give two (02) applications of the byproduct that mentioned in above 'e'.

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(2 mark)

g. How do lipids enter the respiration pathway?

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(1 mark)

6. a. Illustrate the lock and key model of enzyme mediated catalytic cycle.



(3 mark)



b. Differentiate coenzyme and cofactor. Give an example for each.

Coenzyme	Cofactor
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.....	.....
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.....	.....
Eg.....	Eg.....

(4 mark)

c. List three (03) factors that affect the reaction rate of an enzyme.

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(3 mark)

7.

a. Propose an experiment to determine the activity of Amylase under laboratory conditions.

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(1 mark)

b. Explain the procedure of experiment proposed in question 'a' by 6 or 7 steps.

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(5 mark)

c. Explain the relevant theory of the proposed experiment in above 'b'.

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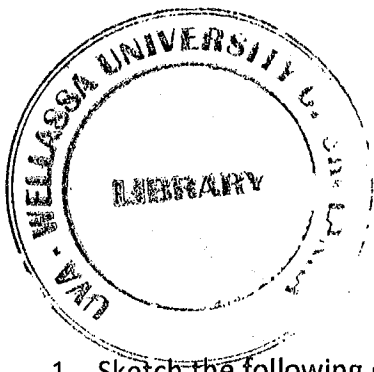
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(4 mark)

8. Explain the functions of Electron transport chain or Chemiosmosis in cellular respiration.

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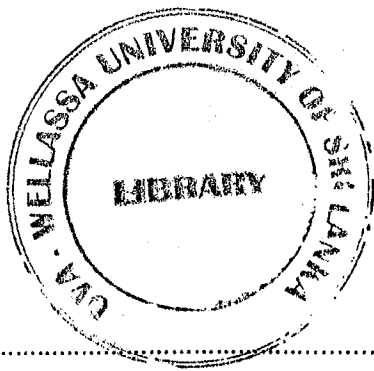


**Part B – Structured essay**  
**(Please provide the answer within the given space only)**

1. Sketch the following geological structures.

(20 m)

Mylonitic foliation	Gneissic foliation
Upright fold	Recumbent fold
Normal Fault	Strike Slip Fault
Graded bedding	Dyke



2. Define following terms.

(2.5 x 4 mark)

a. Geological Structure

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b. Deformation

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c. Pure shear

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d. Simple shear

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3. List three sedimentary structures that are used to identify the top and bottom of the formation.

(10 mark)

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4. What are the differences between Brittle and Ductile structures

(10 mark)

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**Part B – (45 minutes)**

Provide concise answers only within the given space.

1. Briefly explain unpolarized light and polarized light.

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2. Briefly discuss pleochroism.

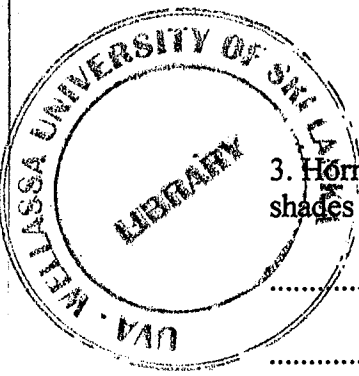
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3. Hornblende is generally black in hand specimen. In thin section, it is likely to appear in various shades of brown or green. Comment on it.

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4. How do you recognize isotropic minerals and anisotropic minerals under the optical microscope?

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5. Briefly mention the main steps of the Becke Line test.

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6. List three (03) unique crystal systems for the biaxial minerals./ What is the characteristic extinction of biaxial minerals?

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7. Briefly discuss "birefringence and interference color".

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8. Describe optical indicatrix.

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9. Briefly define "isolated system", "closed system", and "open system".

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10. Briefly explain mineral stability according to Bowen's reaction series.

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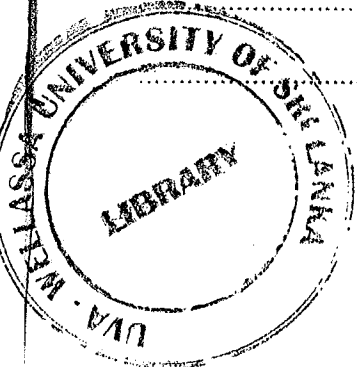
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(Total Marks 2 x 10 = 20)





**Part (B)**

**Number of Questions: Six (06)**

**Mark Allocation: 30**

1. List four (4) attributes that a System Analyst must have. (2 mark)

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2. What are the essential attributes of well-engineered software? (2 mark)

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3. What is meant by Inheritance? Give one (1) example. (2 marks)

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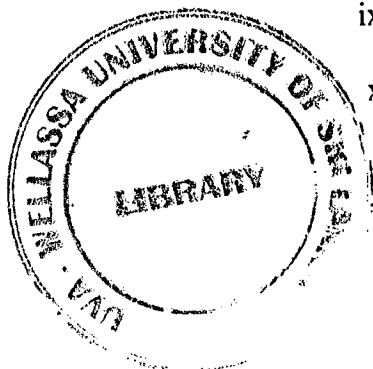
4. What are the phases in System Development Life Cycle? (2 marks)

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5. Categorize the following relationship into generalization, aggregation, composition and association. (10 marks)

**Relationship**

- i. Files contain records .....
- ii. A hand has fingers .....
- iii. Monitors and keyboards are input/output devices .....
- iv. A student learns from a professor .....
- v. A country has a capital city .....
- vi. A file is an ordinary file or a directory file .....
- vii. Every chess board consists of 64 squares .....
- viii. Husband married to a wife .....
- ix. Radiologist consults the lawyer .....
- x. Car has accelerator, break and wheels as parts .....



(2 mark)

6. Using UML, model the following description by visualizing the class, relationship type and multiplicity. (12 mark)

a. Personal computer consists of a CPU box, a keyboard, a mouse, a monitor and possibly some speakers. The CPU box holds a CD-ROM drive, one or more hard drives, a modem, RAM, a graphics card, and a sound card.

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b. A daisy is a kind of flower. A rose is a (different) kind of flower. Both red roses and yellow roses are kinds of roses. A petal is a part of both kinds of flowers. Ladybugs eat certain pests, which may be infesting certain kinds of flowers.

