

UNIVERSITY OF RUHUNA
BACHELOR OF SCIENCE (GENERAL) DEGREE LEVEL II - (SEMESTER I)
EXAMINATION – 2022 January

SUBJECT: BOTANY

COURSE UNIT: BOT 2112 (General Microbiology)

Time: Two hours

Answer all questions

Use the space provided for questions 1-3

(1)

(a) State **three** important characters of microorganisms.

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(b) What is the “Cell theory”?

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(c) What do you understand by “spontaneous generation”?

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(d) What are the techniques that prevent contamination by unwanted microorganisms known as?

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(e) State an important discovery associated with the following scientists.

Name of the scientist	<u>Discovery</u>
<i>Pasteur</i>	
<i>Petri</i>	
<i>Fleming</i>	
<i>Griffith</i>	
<i>Edward Jenner</i>	
<i>Woese</i>	

(f) What would be the advantage of using scanning electron microscope over transmission electron microscope in the examination of a bacterial cell?

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(g) Why do you need to perform staining in observing bacteria under the microscope?

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(h) What do you understand by the term “negative staining”?

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(i) What is a “glycocalyx”? State two advantages of possessing a glycocalyx for a bacterial cell.

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(j) Name five features of bacterial plasmids.

1.
 2.

- 3.
- 4.
- 5.

(k) What are “magnetosomes”? State an example of a bacterial species with magnetosomes in their cells.

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(l) State the main function of gas vacuoles in a bacterial cell.

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(m) What are the categories of bacteria based on the position of flagella?

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(n) Name two alternative metabolic pathways found in bacteria other than the Krebs cycle.

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(o) Name four end products of pyruvic acid after fermentation.

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(p) What is the difference between homolactic fermentation and heterolactic fermentation?

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(q) State one bacterial genus that belong to each group mentioned in (p) above.

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(100 Marks)

(2)

(a) State three main functions of the bacterial cell wall.

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(b) What is the main component of the bacterial cell wall?

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(c) State two constituents of the component that you mentioned in (b) above.

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(d) What are the major differences between the cell wall structure of Gram positive and Gram negative bacteria?

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(e) What is the main difference between the cell walls of bacteria and Archaea?

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(f) State three functions of lipopolysaccharides and lipoproteins found in Gram negative bacterial cell walls.

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(g) Name an antibiotic that interferes with bacterial cell wall formation.

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(h) What is the mechanism of the antibiotic mentioned in (g) above?

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(i) State the consequences of exposing a bacterial cell to the antibiotic mentioned in (g) above.

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(j) "Antibiotic resistance is a major issue in medical microbiology". Name the major categories of antibiotic resistance mechanisms found in bacteria.

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(k) State the main characteristics of the bacterial genome.

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(l) What are the gene transfer mechanisms found in bacteria?

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(m) Name three enzymes that are important for pathogenesis of a host by bacteria.

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(n) State three virulence factors of bacteria that promote colonization in a host.

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(o) State the main trait of pathogenic bacteria that is important for iron competition.

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(p) State three differences between endotoxins and exotoxins of bacteria.

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(q) What is the main function of “quorum sensing genes” of bacteria?

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(r) Name four non-specific defense mechanisms found in humans.

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(100 Marks)

(3).

(a) What are the objectives of “primary and secondary treatment” of wastewater?

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(b) Name two methods used in “secondary treatment” of wastewater.

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(c) How is each “secondary treatment” method mentioned in (b) above designed to obtain the maximum efficiency of the process?

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(g) What are the reasons for using indicator microorganisms to determine the quality of drinking water instead of direct assessment of pathogenic microorganisms?

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(h) What can be inferred if indicator microorganisms are present in large numbers in a tested water sample?

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(i) "Microorganisms play an important role in the cycling of carbon in the biosphere". Comment on the above statement.

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(100 Marks)

(4) Write notes on following:

(a) Categorization of bacteria based on **oxygen requirements**

(b) Mechanisms evolved in cyanobacteria and free-living heterotrophic bacteria to **protect the nitrogenase enzyme complex** from the deleterious effect of oxygen during nitrogen fixation.

(100 Marks)
