



UNIVERSITY  
OF  
JOHANNESBURG

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|--------------------------|-------------------------------------|
| <b><u>FACULTY</u></b>    | : Science                           |
| <b><u>DEPARTMENT</u></b> | : Biotechnology and Food Technology |
| <b><u>CAMPUS</u></b>     | : DFC                               |
| <b><u>MODULE</u></b>     | : MCB1XA2/MCB1AE2<br>Microbiology   |
| <b><u>SEMESTER</u></b>   | : First                             |
| <b><u>EXAM</u></b>       | : <b>June 2018</b>                  |

|                           |                                                       |                       |               |
|---------------------------|-------------------------------------------------------|-----------------------|---------------|
| <b><u>DATE</u></b>        | : 07 June 2018<br>DR MH Serepa-<br>Dlamini and Prof E | <b><u>SESSION</u></b> | : 12:30-15:30 |
| <b><u>ASSESSOR(S)</u></b> | : Green                                               |                       |               |
| <b><u>MODERATOR</u></b>   | : DR BC Dlamini                                       |                       |               |
| <b><u>DURATION</u></b>    | : 3 Hours                                             | <b><u>MARKS</u></b>   | : 120         |

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NUMBER OF PAGES: 9 PAGES

INSTRUCTIONS:

1. Answer ALL THE QUESTIONS.
  2. Number your answers clearly.
  3. Answer SECTION A on the MCQ card.
  4. Answer SECTION B and SECTION C in SEPARATE booklets
  5. Place the MCQ card in the answer booklet for SECTION B.
  6. It is in your best interest to write clearly and legibly.
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## **SECTION A**

### **Question 1**

- Answer the following questions on the allocated MCQ card.
  - The mark allocation is ONE mark per question.
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1. Which is not a component of any Taxonomy of living things?
    - a) The identification of organisms
    - b) The organization of similar organisms into groups
    - c) Labelling organisms and groups with names
    - d) The evolutionary pathway of related organisms
    - e) All of the above are components of any such taxonomy
  2. Of the microbial forms listed below, which exhibits the highest level of resistance to physical and chemical methods of growth control?
    - a) Protozoan cysts
    - b) Most vegetative bacterial cells
    - c) Bacterial endospores
    - d) Naked viruses
    - e) Yeasts
  3. Most antibiotics are isolated from
    - a) viruses
    - b) fungi
    - c) aquatic microorganisms
    - d) soil microorganisms
    - e) plants
  4. Both ionizing and nonionizing radiation tend to effect what?
    - a) DNA
    - b) RNA
    - c) Cell membrane
    - d) Cell wall
    - e) Proteins
  5. Viruses that cause lysis in host cells are called
    - a) temperate viruses

- b) phagocytic viruses
  - c) prions
  - d) virulent viruses
  - e) infectious viruses
6. Which of the following terms is defined as the destruction of vegetative pathogens but not bacterial endospores?
- a) Disinfection
  - b) Antisepsis
  - c) Sterilization
  - d) Degermination
  - e) Microbicidal
7. Which of the following is NOT a semisynthetic chemotherapeutic agent?
- a) Ampicillin
  - b) Carbenicillin
  - c) Methicillin
  - d) Penicillin
  - e) Sulfonamide
8. Modern classification is based on
- a) Physiology
  - b) Fossils
  - c) Phylogeny
  - d) Morphology
  - e) A and B
9. Choose the correct descending sequence of taxonomic categories.
- a) Phylum-class-order-family-genus
  - b) Class-order-phylum-family-species
  - c) Genus-class-division-family-order
  - d) Family-order-genus-order-class
  - e) A and C
10. Which of the following tests is used to determine the minimal lethal concentration?
- a) Broth dilution test
  - b) Agar dilution test
  - c) Kirby Bauer method

- d) All of the above
  - e) None of the above
11. The larger the \_\_\_\_, the better the chemotherapeutic agent
- a) Therapeutic index
  - b) Toxic dose
  - c) Therapeutic dose
  - d) Selective toxicity
  - e) Spectrum
12. The most selective antibiotics are those that interfere with the synthesis of
- a) Bacterial DNA.
  - b) Bacterial RNA.
  - c) Bacterial cell walls.
  - d) Bacterial plasma membrane.
  - e) Bacterial pili.
13. Quinolones are
- a) Antimetabolites.
  - b) Penicillin derivatives.
  - c) Bacteriostatic
  - d) Broad-spectrum.
  - e) Narrow-spectrum.
14. Typically, viruses form \_\_\_\_\_ around their nucleic acid.
- a) an envelope
  - b) a cell wall
  - c) a capsid
  - d) a cell membrane
  - e) a capsule
15. If an antimicrobial agent is bacteriostatic,
- a) Complete killing of bacteria occurs with its use.
  - b) Bacteria will resume growth upon removal of the agent.
  - c) No viable organisms remain after its use.
  - d) It will kill only spores.
  - e) It will kill bacteria and inhibit fungi.
16. Dry heat is used to sterilize:
- a) Loops in microbiology laboratories.

- b) Plastic pipettes.
  - c) Agar media.
  - d) All of the above.
  - e) A and b.
17. An experiment began with 4 cells and ended with 128 cells. How many generations did the cells go through?
- a) 64
  - b) 32
  - c) 6
  - d) 5
  - e) 4
18. Starvation proteins are produced by a culture during which of the following parts of the growth curve?
- a) Lag phase
  - b) Exponential phase
  - c) Stationary phase
  - d) Balanced growth phase
  - e) Death phase
19. A microbiology student noticed that a culture broth tube was very turbid at the surface but clear throughout the rest of the tube. She can conclude that the
- a) organism are aerobes.
  - b) organism should be grown in an anaerobic chamber.
  - c) organism cannot produce superoxide dismutase and/or catalase.
  - d) organism cannot tolerate oxygen.
  - e) broth is sterile
20. A microorganism which grows best above 45°C are called
- a) Psychrophilic
  - b) Mesophilic
  - c) Thermophilic
  - d) A and B
  - e) any of these
21. A microbiology student noticed that a culture broth tube was very turbid at the bottom of the tube but clear at the top of the tube. She can conclude that the
- a) broth is sterile.

- b) organism can tolerate oxygen.
  - c) organism cannot produce superoxide dismutase and/or catalase.
  - d) organism should be grown in an anaerobic chamber.
  - e) organism are aerobes.
22. A microbe, which grows at temperatures above 95° C is most likely to be
- a) an Archaeon
  - b) a fungus
  - c) a protozoan
  - d) A and B
  - e) none of these
23. Which of the following procedures can be used to isolate a pure culture of a bacterium from a mixture?
- a) streak plating
  - b) dilution plating
  - c) enrichment culture
  - d) All the above can be used to isolate a pure culture of a bacterium from a mixture.
  - e) None of the above can be used to isolate a pure culture of a bacterium from a mixture.

For questions 24 - 25, compare the following entities (I and II).

24. I. Average size of cells during the **exponential phase of growth**  
 II. Average size of cells during the **lag phase of growth**
- a) I is greater than II
  - b) I is less than II
  - c) I is exactly or approximately equal to II
  - d) I may stand in more than one of the above relations to II
  - e) It is difficult to tell
25. I. Number of cells detected in a culture using **Petroff-Hausser counting slide chamber**  
 II. Number of viable cells detected in the same culture using a **dilution and spread plating procedures**
- a) I is greater than II
  - b) I is less than II

- c) I is exactly or approximately equal to II
  - d) I may stand in more than one of the above relations to II
  - e) It is difficult to tell
26. Asexual reproduction occurs in \_\_\_\_\_ by sporangia.
- a) yeasts
  - b) basidiomycetes
  - c) ascomycetes
  - d) imperfect fungi
  - e) zygomycetes
27. Cell walls of fungi are composed primarily of
- a) lignin
  - b) cellulose
  - c) chitin
  - d) pectin
  - e) glycoprotein
28. In which phylum of fungi does the fusion of hyphae lead directly to the formation of a zygote?
- a) Ascomycota
  - b) Imperfect fungi
  - c) Basidiomycota
  - d) Zygomycota
  - e) all of the above
29. When a bacteriophage is integrated into a cellular genome it is called a
- a) virulent virus
  - b) lytic virus
  - c) prophage
  - d) transducing virus
  - e) microphage
30. Most ectomycorrhizae are
- a) ascomycetes
  - b) deuteromycetes
  - c) zygomycetes
  - d) basidiomycetes
  - e) None of the above

## **SECTION B**

### **Question 1**

1.1. Write essays on **TWO** of the following: 15 marks each

1. Define sterilization. Discuss TWO methods of sterilization with suitable examples.
2. Discuss TWO physical methods that can be used to control bacteria.
3. Discuss various classes of antibiotic's mode of action and give examples.
4. Fungal spores.
5. Discuss factors influencing the antimicrobial agent effectivity.

**(30)**

### **Question 2**

2.1. Compare and contrast batch cultures and continuous cultures. **(15)**

2.2. Draw a diagram of a three step  $10^{-1}$  serial dilution with  $10^{-1}$  at each step, using a final volume of 25ml at each step. **(3)**

- a) Indicate what volume of the unknown "original sample" you will need at the first step. **(2)**
- b) What is the total dilution factor? **(2)**
- c) What is the total dilution factor of the last tube diluted, which is "the tube with the highest dilution factor"? **(1)**
- d) You plate 0.1ml of the  $10^{-3}$  dilution and from that you determine that the number of cells in the original sample was  $5 \times 10^4$ . If the cells double every 20 minutes. How many bacterial cells will you have after 30 hours? **(4)**
- e) You have plated 0.1ml of the  $10^{-2}$  dilution tube, and 294 colonies grew, what is the CFU/ml? **(3)**

**(30)**



## **SECTION C**

**Answer this section on a separate answer booklet.**

### **Question 1**

- 1.1. Define the following words as they are used in Microbiology. (2)
- a. Virion (2)
  - b. Virology (2)
  - c. Virologists (2)
- 1.2. Give 4 characteristics of a capsid (4)
- 1.3. Name the steps involved in viral multiplication. (6)
- 1.4. Suppose, you inoculated a plate with 0.1 mL of a  $10^{-5}$  phage dilution mixed with a few mL *Escherichia coli* broth culture, then culture on a plate. If you subsequently counted 58 plaques on the plate, what will be the phage titer in 1 mL? Show all the steps in your calculations. (6)
- 1.5. If a virus contain a dsRNA as a nucleic acid, using the Baltimore system, show how replication and protein synthesis will occur. (8)
- (30)
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