

## Part (A)

## I. Compare and contrast the following: (12%)

1. Confocal Microscopy and Scanned-Probe Microscopy
2. Active Transport and Group Translocation
3. Aerobic Respiration, Anaerobic Respiration and Fermentation

## II. Describe the following microorganisms: (12%)

1. *Saccharomyces cerevisiae*
2. *Lactobacillus plantarum*
3. *Clostridium perfringens*
4. *Haemophilus influenzae*
5. *Mycoplasma pneumoniae*
6. *Rickettsia*

## III. What is the generation time? Please design an experiment to calculate the generation time of bacteria. If a single bacterium reproduced every 20 minutes, how many would there be in 3 hours (10%)

## IV. Which kind of physical methods you will use to control microbial growth in the following materials? (10%)

1. milk, 2. wine, 3. empty glassware, 4. fruit juices, 5. vaccines

## V. Bacterial colonies grow on X-gal plus ampicillin in a blue-white screening test. Which colonies have the recombinant plasmid? Why the small satellite colonies do not have the plasmid but still appear on the medium 48 hours after the larger colonies? (6%)

## Part (B):

## I. Please describe the difference between the eubacteria and archeal in terms of their components and genetic and metabolism. (6%)

## II. 1. What is the nitrification? (2%)

2. What is the enzyme responsible for converting the ammonia to the intermediate hydroxylamine and what is its application for detection of their functional soil microorganisms (3%)

## III. The virus in terms of DNA and RNA; describe the replication methods for the following viruses:

1. double stranded DNA virus
2. single strand (+) DNA virus
3. double stranded RNA virus
4. plus (+) RNA virus
5. virus with minus-strand RNA virus
6. virus with single stranded RNA genomes (Retrovirus) (12%)

## IV. Human Leukocyte antigen (HLA) can be classified into three groups: class I, class II and class III, please describe their functions (6%)

## V. Explain the term: 1. high-throughput screening 2. the secondary metabolites 3. probiotic 4. putrefaction (8%)

## VI. To identify the bacteria from the specimens, describe the procedures (5%)

## VII. What are the green house gases and why they were be called with this term (3%)

## VIII. 1. What is the AB toxins? (2%) 2. Please describe the mechanism for their mechanism for causing disease (3%)