

本科目不得使用計算機

本科目試題共 1 頁

1. Please explain the **inhibitory mechanism** on microbial growth of the following agents. (22%)
 - (1) Antibiotics (4%)
 - (2) Bacteriocin (3%)
 - (3) Autoclave (3%)
 - (4) Alcohols (3%)
 - (5) Radiation (3%)
 - (6) Formaldehyde (3%)
 - (7) Bleach (3%)
2. Please use an example to explain what **biocontrol** is and its applications in agriculture (5%).
3. In a study published in 2001, the authors claimed that the essential oils containing cinnamaldehyde from leaves of indigenous cinnamon [*Cinnamomum osmophloeum* Kaneh. (Lauraceae)] were effective antibacterial agents. They used the broth dilution method to test the antibacterial susceptibility of nine bacterial strains, including *Escherichia coli*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, methicillin-resistant *Staphylococcus aureus* (MRSA), *Klebsiella pneumoniae*, *Salmonella* sp., and *Vibrio parahaemolyticus*, to reveal that the MICs of the leaf oil were 500 µg/ml against both *K. pneumoniae* and *Salmonella* sp. and 250 µg/ml against the other seven strains of bacteria.

Based on the above description, please answer the following questions. (23%)

 - (1) In the nine tested bacterial strains, please list the **Gram+** and **Gram-** strains and describe how they are differentiated by staining. (6%)
 - (2) Please describe how **broth dilution test** is done to test the antibacterial susceptibility. (3%)
 - (3) Please explain what **MIC** is. (3%)
 - (4) Please describe the **biological characteristics** of *Escherichia coli*, *Pseudomonas aeruginosa*, and methicillin-resistant *Staphylococcus aureus* (MRSA) (6%)
 - (5) *K. pneumoniae* and *Salmonella* sp. appear to be more tolerant to the indigenous cinnamon leaf oils, please list the **possible factors** that may be involved in the **tolerance**. (5%)
4. Recently a food poisoning outbreak occurs in the elementary school in Taipei, Taiwan. It is suggested either the norovirus or *Bacillus cereus* may be the causal agent. Please describe and contrast the characteristics of the **norovirus** and *Bacillus cereus* in terms of **classification**, **genetic composition** and **structure**. (10%)
5. Please describe **procedures** and **mechanisms** how you could assess the extracellular enzymes activities such as **amylase**, **lipase** and **lecithinase** activities by microorganisms. (15%)
6. **Design experiments** to differentiate these two bacteria *Bacillus subtilis* and *Pseudomonas fluorescens* and describe the **basic concepts** as to why you choose these methods and **the proposed results**. (10%)
7. Describe and contrast the **basidiomycetes**, **ascomycetes**, **zygomycetes**, **oomycetes**, and **deuteromycetes** based on their characteristics of **hyphae structure**, **reproductive structures**, and **cell wall compositions**. (15%)