
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2008/2009

April/May 2009

BMT 302 – Environmental Microbiology
[Mikrobiologi Persekitaran]

Duration: 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains FIVE printed pages before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi LIMA muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instructions: Answer **FIVE** (5) out of **SIX** (6) questions, in English or Bahasa Malaysia. Each question carries 20 marks.

[Arahan: Jawab **LIMA** (5) daripada **ENAM** (6) soalan yang diberikan dalam Bahasa Inggeris atau Bahasa Malaysia. Tiap-tiap soalan bernilai 20 markah.]

...2/-

- 2 -

1. [a] Define and include a specific example for each of the terms listed.
- [i] Cometabolism
 - [ii] Commensalism
 - [iii] Mutualism
 - [iv] Amensalism
 - [v] Synergism
- (10 marks)
- [b] Define bioremediation. Discuss the benefits and limitations of the process in the management of oil spills.
- (10 marks)
2. [a] Define symbiotic N₂ fixation process.
- (5 marks)
- [b] Describe the steps in the development of root nodules on a leguminous plant and explain how do *nod* factors help control this? How does this compare with *Agrobacterium*-plant recognition system?
- (15 marks)
3. Design an experiment to measure the activity of sulfur-oxidizing bacteria in soil. How could you prove the activity if only certain species of the sulfur-oxidizers present were metabolically active? How would you prove that your activity measurement was not due to abiotic activity?
- (20 marks)

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4. Discuss the chemical and microbiological factors that lead up to acid mine drainage. Suggest ways to treat acid mine drainage.

(20 marks)

5. [a] Explain biofilm formation.

(5 marks)

- [b] The surface of rock in a flowing stream will often contain a biofilm. What advantages could be conferred on bacteria growing in a biofilm compared with growth within the flowing stream? How can biofilms complicate treatment of infectious diseases?

(15 marks)

6. [a] Why is the coliform test used to assess the purity of drinking water?

(10 marks)

- [b] Why is reduction in the BOD of wastewater a primary goal of wastewater treatment? What are the consequences of releasing wastewater with a high BOD into local water sources such as lakes or streams?

(10 marks)

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1. [a] Takrif dan sertakan contoh bagi setiap istilah berikut:
- [i] Kometabolisme
 - [ii] Komensalisme
 - [iii] Mutualisme
 - [iv] Amensalisme
 - [v] Sinergisme
- (10 markah)
- [b] Berikan takrifan bioremediasi. Bincangkan kebaikan dan kelemahan proses ini untuk pengurusan tumpahan minyak.
- (10 markah)
2. [a] Takrifkan proses pengikatan N_2 simbiotik.
- (5 markah)
- [b] Huraikan langkah-langkah perkembangan nodul akar tanaman kacang dan jelaskan bagaimanakah faktor *nod* membantu mengawal proses ini? Bagaimanakah ini berbanding dengan sistem pengenalan *Agrobacterium*-tumbuhan?
- (15 markah)
3. Rekabentuk satu eksperimen untuk mengukur aktiviti bakteria pengoksida sulfur di dalam tanah. Bagaimanakah anda dapat membuktikan aktiviti ini sekiranya hanya spesies pengoksida sulfur tertentu yang hadir adalah aktif secara metabolik? Bagaimanakah anda dapat membuktikan aktiviti yang anda ukur bukan disebabkan oleh aktiviti abiotik?
- (20 markah)

4. Bincangkan faktor-faktor kimia dan mikrobiologi yang mengakibatkan saliran kumbahan asid. Cadangkan beberapa cara untuk merawat saliran kumbahan asid.

(20 markah)

5. [a] Jelaskan pembentukan biofilem.

(5 markah).

- [b] Permukaan batu di dalam aliran sungai selalu mengandungi biofilem. Apakah kebaikan yang akan diperolehi oleh bakteria yang tumbuhan di dalam biofilem berbanding tumbuh di dalam aliran sungai? Bagaimanakah biofilem merumitkan rawatan ke atas penyakit berjangkit?

(15 markah).

6. [a] Mengapa ujian koliform digunakan untuk menilai kebersihan air minuman?

(10 markah)

- [b] Mengapa pengurangan nilai BOD air kumbahan merupakan matlamat utama rawatan air kumbahan? Apakah akibatnya melepaskan air kumbahan dengan nilai BOD tinggi ke dalam sumber air setempat seperti tasik atau sungai?

(10 markah)

11/20/70

2

1. The first part of the report is a general introduction to the subject of the study. It discusses the importance of the problem and the objectives of the research.

2. The second part of the report is a detailed description of the methodology used in the study. It includes a discussion of the data sources and the statistical methods employed.

3. The third part of the report is a presentation of the results of the study. It includes a discussion of the findings and their implications for the field of research.

4. The fourth part of the report is a conclusion and a list of references. It summarizes the main points of the study and provides a list of the sources used in the research.

5. The fifth part of the report is a list of appendices. It includes a list of the data used in the study and a list of the statistical tables and figures.

6. The sixth part of the report is a list of footnotes. It includes a list of the footnotes used in the text of the report.

7. The seventh part of the report is a list of references. It includes a list of the references used in the study.

8. The eighth part of the report is a list of appendices. It includes a list of the data used in the study and a list of the statistical tables and figures.

9. The ninth part of the report is a list of footnotes. It includes a list of the footnotes used in the text of the report.

10. The tenth part of the report is a list of references. It includes a list of the references used in the study.

11. The eleventh part of the report is a list of appendices. It includes a list of the data used in the study and a list of the statistical tables and figures.

12. The twelfth part of the report is a list of footnotes. It includes a list of the footnotes used in the text of the report.

13. The thirteenth part of the report is a list of references. It includes a list of the references used in the study.