
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2009/2010

April/May 2010

IBG 102 – Biology for Technologists
[Biologi Untuk Ahli Teknologi]

Duration: 3 hours
[Masa: 3 jam]

Please check that this examination paper consists of ELEVEN pages of printed material before you begin the examination.

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

Instructions: Answer **FIVE (5)** out of six questions. Answer **FOUR** questions from SECTION A and **ONE** question from SECTION B. You may answer the questions either in Bahasa Malaysia or in English.

*[**Arahan:** Jawab **LIMA (5)** daripada enam soalan. Jawab **EMPAT** soalan daripada BAHAGIAN A dan **SATU** soalan daripada BAHAGIAN B. Anda dibenarkan menjawab soalan sama ada [untuk KBI] dalam Bahasa Malaysia atau Bahasa Inggeris.]*

In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai].

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SECTION A. Answer ALL questions.

1. Answer all parts of this question.
 - (a) Discuss the advantages and disadvantages of dark-field microscopy compared to that of bright-field microscopy.

(7 marks)
 - (b) Explain the need of immersion oil in bright field microscopy.

(3 marks)
 - (c) Explain the concept of scanning electron microscopy.

(10 marks)

2. Answer all parts of this question.
 - (a) Antibiotics are generally secondary metabolites. Define secondary metabolism.

(2 marks)
 - (b) Describe the fermentation of penicillin production by *Penicillium chrysogenum* and the factors that affect the fermentation process.

(18 marks)

3. Answer all parts of this question.
 - (a) Briefly describe the following vaccines:
 - (i) Inactivated vaccines.

(2 marks)
 - (ii) Live attenuate vaccines.

(2 marks)
 - (iii) Subunits vaccines.

(2 marks)
 - (iv) Toxoids vaccines.

(2 marks)
 - (b) Briefly explain the advantages of using mammalian cell lines for the production of vaccines.

(4 marks)
 - (c) Describe the process of vaccine production by using mammalian Vero cell lines.

(8 marks)

4. Answer all parts of this question.
- (a) Describe bioaugmentation and biostimulation, and discuss the differences between these two processes.
(10 marks)
 - (b) Describe the advantages of plant tissue culture in phytoremediation.
(10 marks)

SECTION B. Answer ONE question.

5. Answer all parts of this question.

- (a) Determine the length and width of the microorganism as observed in Figure 1.
(10 marks)

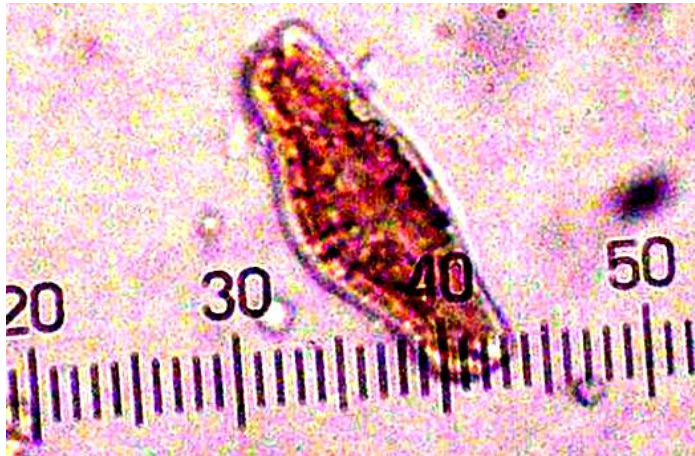
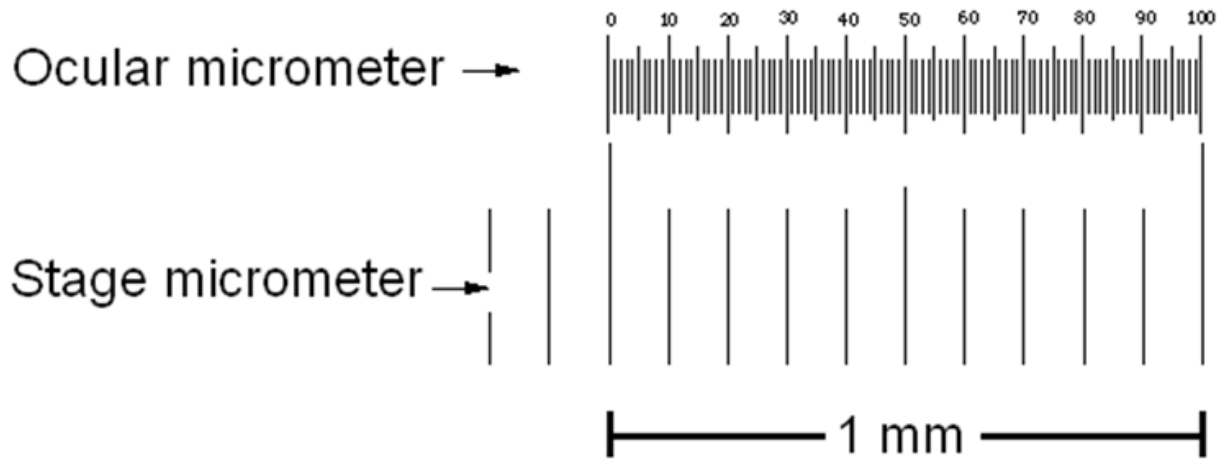


Figure 1: A single cell as observed under the microscope

- (b) An aliquot of sample from a microbial solution was placed on a Neubaur chamber with a depth of 0.1 mm (Figure 2).

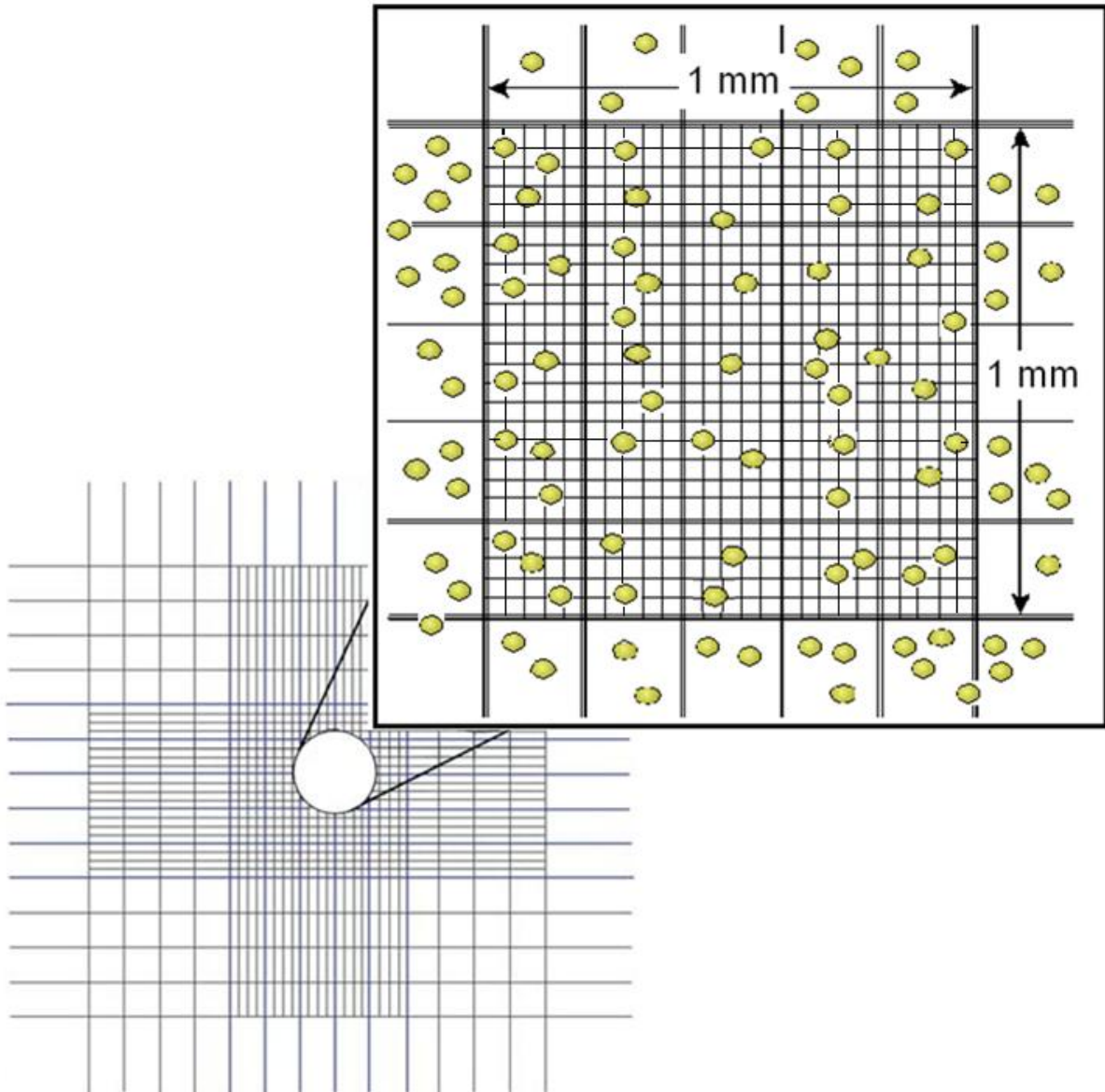


Figure 2: Cells as observed on a Neubaur chamber

Assuming without dilutions, calculate the number of bacterial cells per mL of the sample.
(10 marks)

6. Answer all parts of this question.
- (a) Discuss the importance of aseptic techniques in bioprocess laboratory practice.
(3 marks)
 - (b) Describe the principles of an autoclave.
(7 marks)
 - (c) Beginning with the aseptic transfer of microorganisms from a universal bottle using a micropipette, detail the steps involved in pour plating.
(10 marks)

BAHAGIAN A. Jawab SEMUA soalan.

1. Jawab semua bahagian dalam soalan ini.
 - (a) Bincangkan kebaikan dan keburukan mikroskopi medan-gelap berbanding dengan medan-cerah.
(7 markah)
 - (b) Jelaskan keperluan minyak pencelup dalam mikroskopi medan-cerah.
(3 markah)
 - (c) Jelaskan konsep mikroskopi pensakanan elektron.
(10 markah)

2. Jawab semua bahagian dalam soalan ini.
 - (a) Antibiotik secara umumnya adalah metabolit sekunder. Taksirkan metabolisme sekunder.
(2 markah)
 - (b) Jelaskan fermentasi penghasilan penisilin oleh *Penicillium chrysogenum* dan factor-faktor yang mempengaruhi proses fermentasi tersebut.
(18 markah)

3. Jawab semua bahagian dalam soalan ini.
 - (a) Jelaskan secara ringkas vaksin yang berikut:
 - (i) Vaksin teraktif.
(2 markah)
 - (ii) Vaksin hidup ternyahaktif.
(2 markah)
 - (iii) Vaksin subunit.
(2 markah)
 - (iv) Vaksin toksoid.
(2 markah)
 - (b) Jelaskan secara ringkas kebaikan sel mamalia untuk penghasilan vaksin.
(4 markah)
 - (c) Jelaskan proses penghasilan vaksin melalui sel mamalia Vero.
(8 markah)

4. *Jawab semua bahagian dalam soalan ini.*

(a) *Jelaskan bioaugmentasi dan biostimulasi, dan bincangkan perbezaan di antara kedua-dua proses ini.*

(10 markah)

(b) *Jelaskan kebaikan tisu kultur tumbuhan dalam phytoremediasi.*

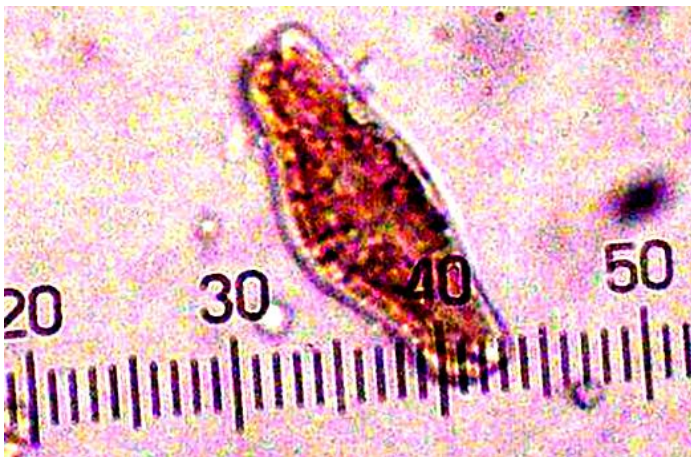
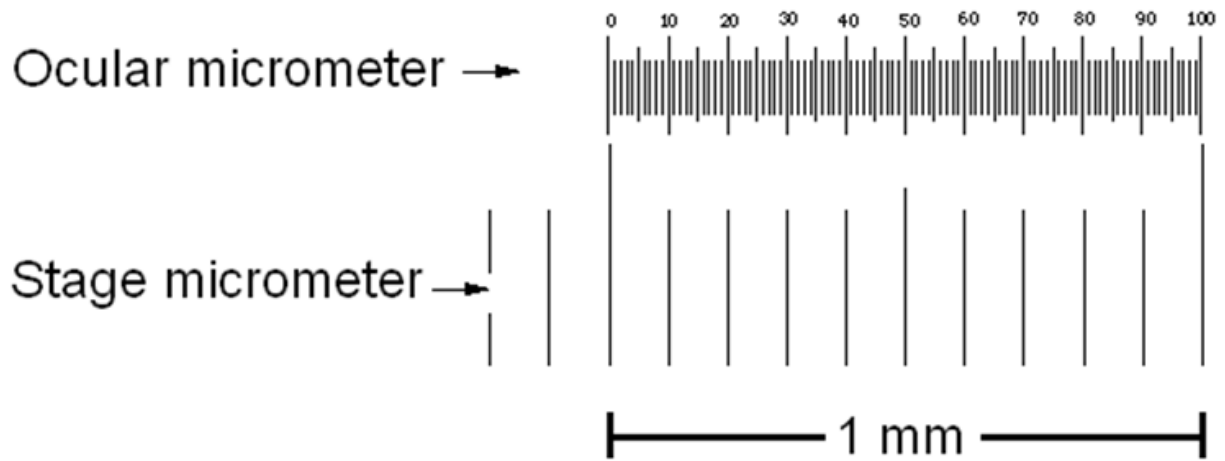
(10 markah)

BAHAGIAN B. Jawab SATU soalan sahaja.

5. Jawab semua bahagian dalam soalan ini.

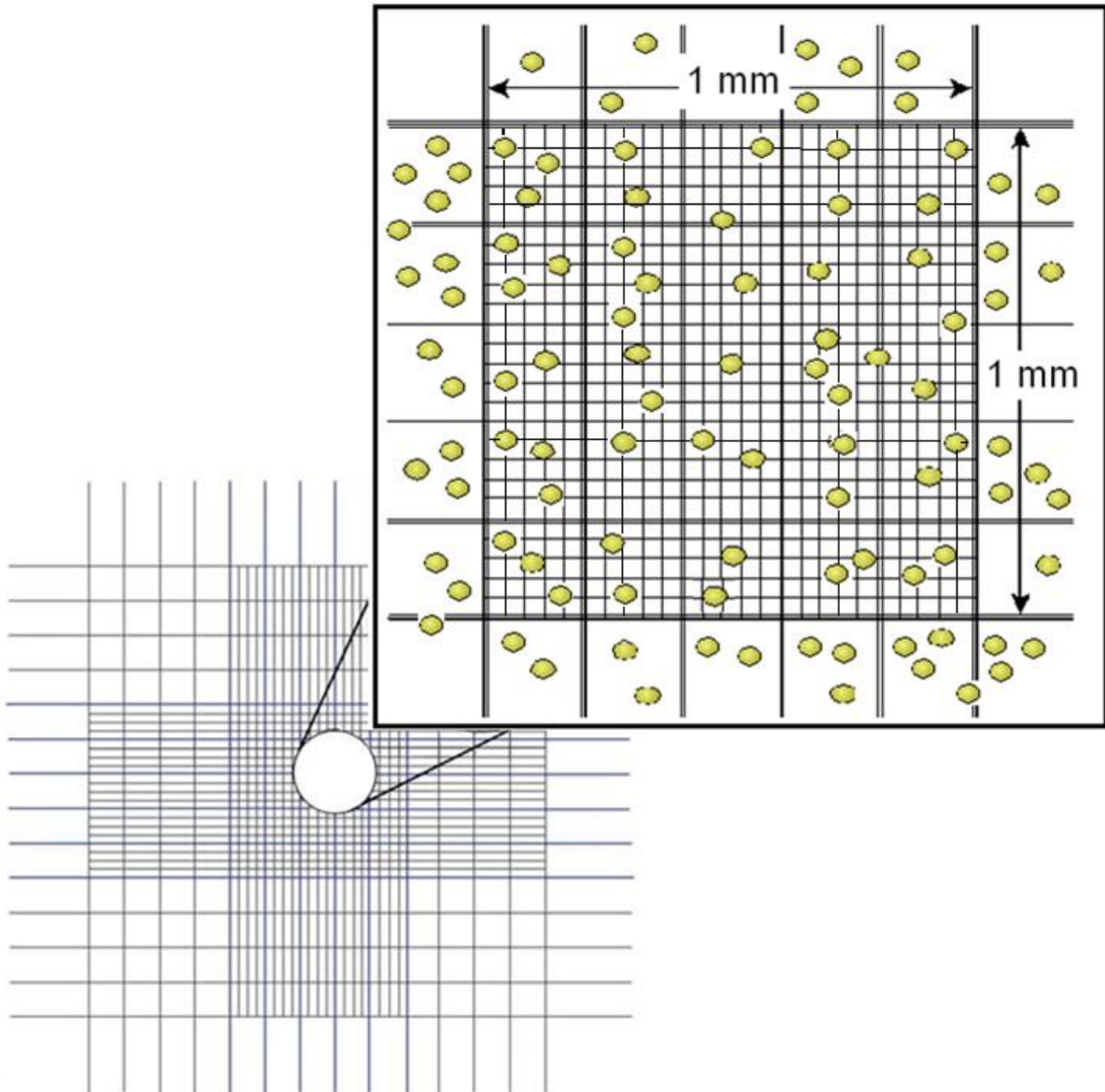
(a) Tentukan panjang dan lebar mikroorganisma seperti yang diperhatikan dalam Rajah 1.

(10 markah)



Rajah 1: Sel tunggal yang diperhatikan di bawah mikroskop

- (b) Aliquot satu sampel daripada larutan microbial diletakkan pada kebuk Neubaur dengan kedalaman 0.1 mm (Rajah 2).



Rajah 2: Sel-sel yang diperhatikan pada kebuk Neubaur

Andaikan tiada pencairan, kirakan bilangan sel bacteria dalam satu mL sampel.

(10 markah)

6. *Jawab semua bahagian dalam soalan ini.*

(a) *Bincangkan kepentingan teknik aseptik dalam amalan makmal bioproses.*
(3 markah)

(b) *Jelaskan prinsipal autoklaf.*
(7 markah)

(c) *Bermula dari pemindahan aseptik mikroorganisma daripada botol universal dengan menggunakan pipet mikro, perincikan langkah-langkah yang terlibat dalam curahan plat.*
(10 markah)