UNIVERSITI SAINS MALAYSIA

First Semester Examination
2013 / 2014 Academic Session

December 2013 / January 2014

BTT 304/3 – Genetic Engineering
[Kejuruteraan Genetik]

Duration: 3 hours
[Masa: 3 jam]

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

[Sila pastikan bahawa kertas peperiksaan ini mengandungi ENAM 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.]*

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

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

1. [a] The genotype of *E. coli* strain XL1-Blue is as follows :

[Genotip E. coli strain XL1-Blue adalah seperti berikut :]

***E. coli* XL1-Blue:** *recA1 endA1 gyrA96 thi-1 hsdR17 supE44 relA1 lac* [F´ *proAB lacIZ*∆*M15* Tn*10* (Tet).]

Explain what will happen to *E. coli* XL1-Blue and F´ if it is cultured in :

[Jelaskan apa akan berlaku kepada E. coli XL1-Blue dan F´ jika ia dikultur dalam :]

[i] rich medium (e.g. nutrient broth)
[medium kaya (contoh: kaldu nutrien)]

[ii] rich medium containing ampicillin
[medium kaya yang mengandungi ampisilin]

[iii] rich medium containing tetracycline
[medium kaya yang mengandungi tetrasiklin]

[iv] minimal medium without thiamine
[medium minimum tanpa tiamina]

[v] minimal medium containing proline
[medium minimum yang mengandungi prolina]

(5 marks / 5 markah)

[b] The genotype of *E. coli* strain JM109 is as follows :

[*Genotip E. coli strain JM109 adalah seperti berikut :]*

E. coli JM109: recA1, endA1, gyrA96, thi, hsdR17, supE44, relA1, Δ(lac-proAB)/F' [traD36, proAB+, lacIq, lacZΔM15]

Explain what will happen to *E. coli* JM109 and F' if it is cultured in :

[Jelaskan apa akan berlaku kepada E.coli JM109 dan F' jika dikultur dalam :]

[i] rich medium (e.g. nutrient broth)

[medium kaya (contoh: kaldu nutrien)]

[ii] rich medium containing ampicillin

[medium kaya yang mengandungi ampisilin]

[iii] minimal medium without thiamine

[medium minimum tanpa tiamina]

[iv] minimal medium containing thiamine

[medium minimum yang mengandungi tiamina]

[v] minimal medium containing proline

[medium minimum yang mengandungi prolina]

(5 marks / 5 markah)

[c] Explain the principle of Blue/White selection and its application in the cloning of DNA.

[Terangkan prinsip pemilihan Biru/Putih dan kegunaannya dalam pengklonan DNA.]

(10 marks / 10 markah)

2. [a] Discuss the benefits and issues that arise from transgenic plant technology ?

[Bincangkan manfaat dan isu yang timbul daripada teknologi tumbuhan transgenic ?]

(10 marks / 10 markah)

[b] Explain the steps to construct herbicide resistant soya beans.

[Terangkan langkah-langkah untuk membangunkan tanaman kacang soya yang rintang herbisid.]

(10 marks / 10 markah)

3. Write an essay on the Human Genome project.

[Tulis satu esei berkenaan projek Genom Manusia.]

(20 marks / 20 markah)

4. [a] The phylogeny of camels, pigs, giraffes, hippopotamuses and whales are difficult to be determined. Explain how SINE and LINE could solve this issue.

[Filogeni unta, khinzir, zirafah, badak sumbu dan ikan paus adalah sukar untuk dipastikan. Terangkan bagaimana SINE dan LINE dapat menyelesaikan isu ini.]

(10 marks / 10 markah)

[b] Explain either the PAM or BLOSUM matrix.

[Terangkan salah satu; matriks PAM atau BLOSUM.]

(10 marks / 10 markah)

5. This question refers to the pET expression system as illustrated below.

[Soalan ini merujuk kepada sistem pengekspresan pET yang dirajahkan di bawah.]

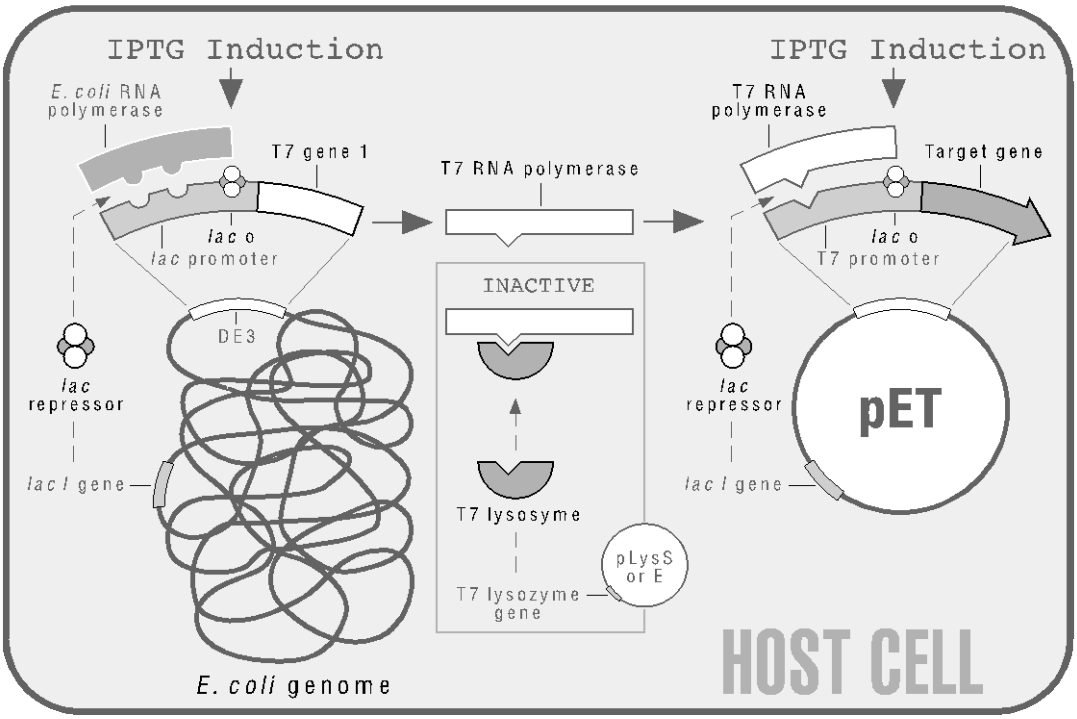

Figure 1. Control elements of the pET System.

[a] What problem does the pET expression system try to overcome ?

[Apakah masalah yang cuba diatasi oleh sistem pengekspresan pET ?]

(4 marks / 4 markah)

[b] Explain the role of the T7 lysozyme.

[Terangkan peranan lisozim T7.]

(2 marks / 2 markah)

[c] Explain the role of pLysS.

[Terangkan peranan pLysS.]

(2 marks / 2 markah)

[d] Why is the target gene regulated by the T7 promoter ?
[Kenapa gen sasar dikawalatur oleh promoter T7 ?]

(3 marks / 3 markah)

[e] What is the unique characteristic of the *E. coli* BL21 (DE3) and its significance?
[Apakah ciri unik sel E. coli BL21 (DE3) dan kesignifikannya ?]

(4 marks / 4 markah)

[f] Explain the origin of the T7 promoter.
[Terangkan sumber promoter T7.]

(2 marks / 2 markah)

[g] What is the reason for the presence of the *LacI* gene on the pET when a copy of it is already present on the *E. coli* BL21 chromosome ?
[Kenapa terdapat gen lacI dalam plasmid pET sedangkan ianya sudah wujud dalam kromosom E. coli BL21 ?]

(3 marks / 3 markah)

6. [a] Write an essay on Synthetic Biology.
[Tulis esei berkenaan Biologi Sintetik.]

(10 marks / 10 markah)

[b] Describe how a knock-out mouse is created.
[Terangkan bagaimana tikus "knock-out" dihasilkan.]

(10 marks / 10 markah)

- oooOooo -