UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2013/2014

June 2014

BBT 303/3 – Plant Molecular Biology
[Biology Molekul Tumbuhan]

Duration: 3 hours
[Masa: 3 jam]

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

[Sila pastikan bahawa kertas peperiksaan ini mengandungi EMPAT 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.

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

1. [a] What are the challenges faced by nitrogenase during carbon fixation in the nodules and explain how they can be overcome?

   [Apakah halangan yang dihadapi oleh nitrogenase semasa pengikatan karbon dalam nodul dan terangkan bagaimana ianya boleh diatasi?]

   (8 marks / 8 markah)

   [b] Summarize the events leading to the transformation of plant cells by *Agrobacterium tumefacians*.

   [Rumuskan langkah-langkah yang berlaku yang membawa kepada transformasi sel tumbuhan oleh Agrobacterium tumefacians.]

   (12 marks / 12 markah)

2. [a] With the aid of a labelled diagram, discuss the organization of a shoot meristem.

   [Dengan bantuan gambar rajah berlabel, huraikan susunatur meristem pucuk.]

   (10 marks / 10 markah)

   [b] Explain how "*leafy*" and other proteins play a role in activating the A, B, and C group genes during flowering.

   [Terangkan bagaimana protein "leafy" dan protein lain memainkan peranan dalam mengaktifkan kumpulan gen A, B dan C semasa pembungaan.]

   (10 marks / 10 markah)

3. [a] Discuss the sequence of events during compatible and incompatible interactions between pollen and stigma.

[Bincangkan urutan peristiwa semasa tindak balas keserasian dan tindak balas ketakserasian antara debunga dan stigma.]

(8 marks / 8 markah)

[b] Briefly discuss the stages at which gene expression can be regulated.

[Bincangkan dengan ringkas peringkat-peringkat di mana pengekspresan gen boleh dikawal atur.]

(12 marks / 12 markah)

4. [a] Compare plants' nuclear, chloroplast and mitochondrial genomes in term of structure, size and gene organization.

[Bandingkan genom nuklear, kloroplast dan mitokondria dari sudut struktur, saiz dan organisasi gen.]

(12 marks / 12 markah)

[b] Describe the process of gene silencing by RNA interference.

[Huraikan proses penyenyapan gen oleh gangguan RNA.]

(8 marks / 8 markah)

5. [a] Describe the stages of embriogenesis in *Arabidopsis*.

[Huraikan peringkat embriogenesis dalam Arabidopsis.]

(10 marks / 10 markah)

[b] Explain the roles of seed storage protein. Name and describe the types of storage proteins.

[Terangkan peranan protein simpanan biji benih. Namakan dan huraikan jenis protein simpanan.]

(10 marks / 10 markah)

6. [a] Using a diagram, explain the virus-mediated transformation used in genetic engineering of plants.

[Dengan menggunakan gambar rajah, terangkan transformasi perantaraan-virus yang digunakan dalam kejuruteraan genetik tumbuhan.]

(10 marks / 10 markah)

[b] Define the meaning of epigenetics and give an example of an epigenetically controlled process.

[Takrifkan maksud epigenetik dan berikan satu contoh proses yang dikawal epigenetik.]

(4 marks / 4 markah)

[c] Describe the two common types of epigenetic marks.

[Huraikan dua jenis petanda epigenetik yang umum.]

(6 marks / 6 markah)

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