

CONFIDENTIAL\*/SULIT\*

964/2

**BIOLOGY (BIOLOGI)**

**PAPER 2 (KERTAS 2)**

**STRUCTURE AND ESSAY (SRTUKTUR DAN ESED)**

**Two and a half hours (Dua jam setengah)**

**JABATAN PENDIDIKAN NEGERI JOHOR**

**PEPERIKSAAN PERCUBAAN STPM**

**2009**

Instructions to candidates:

*Answer all the questions in Section A in the spaces provided.  
Answer any four questions from Section B. For this section, write your answers on the answer sheets provided. Begin each answer on a fresh sheet of paper. Answers should be illustrated by large, clearly labelled diagrams wherever suitable.*

*Answers may be written in either English or Malay.  
Arrange your answers in numerical order and tie the answer sheets to this booklet.*

Arahan kepada calon:

*Jawab semua soalan dalam Bahagian A dalam ruang yang disediakan.  
Jawab mana-mana empat soalan daripada Bahagian B. Untuk bahagian ini, tulis jawapan anda pada helaian jawapan yang dibekalkan. Mulakan setiap jawapan pada helaian kertas yang baru. Jawapan hendaklah disertai gambar rajah yang besar dan mempunyai label yang jelas di mana-mana yang sesuai.  
Jawapan boleh ditulis dalam bahasa Inggeris atau bahasa Melayu.  
Susun jawapan anda mengikut tertib berangka dan ikat helaian jawapan bersama denan buku soalan ini.*

For examiner's use  
(Untuk kegunaan  
Pemeriksa)

1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total (Jumlah)	

**This question paper consists of 10 printed pages.  
(Kertas soalan ini terdiri daripada 10 halaman bercetak)**

964/2

\*This question paper is CONFIDENTIAL until the examination is over.

\*Kertas soalan ini SULIT sehingga peperiksaan kertas ini tamat.

[Turn over (lihat sebelah)  
**CONFIDENTIAL\***  
**SULIT\***

**Section A [40 marks]**

Answer all questions in this section.

1. Diagrams (i) and (ii) show the stages of the life cycle of a green plant. The pictures in diagram (i) are not in the correct sequence.

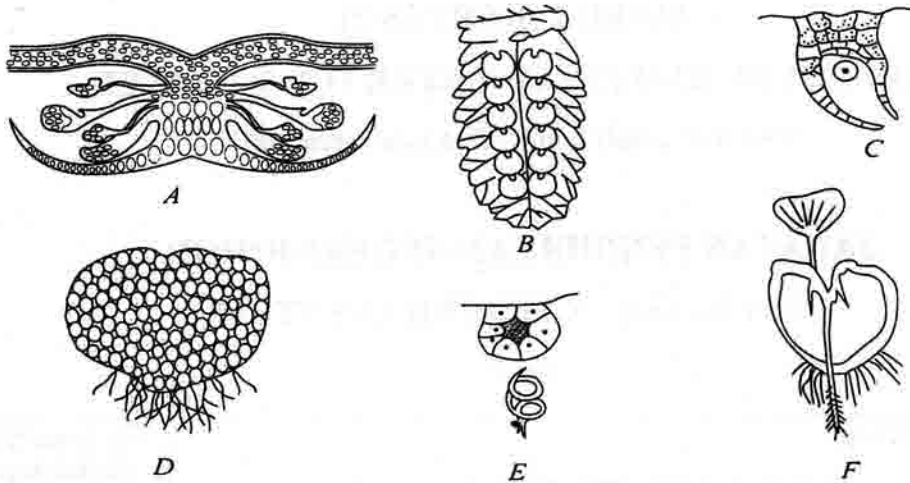


Diagram (i)

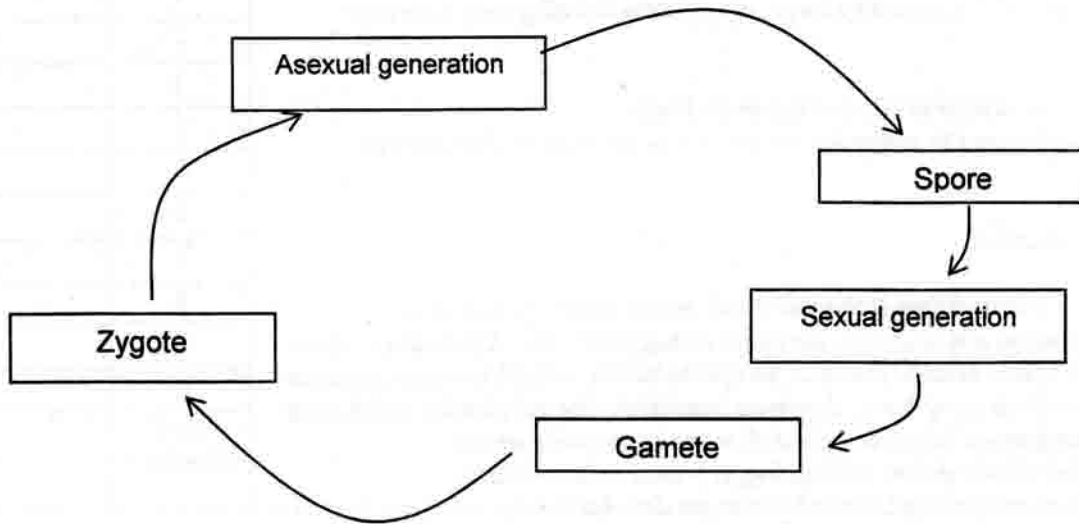


Diagram (ii)

- (a) The life cycle of this plant shows *alternation of generations*. Define the term *alternation of generations*.

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[2 marks]

- (b) Which of the pictures labelled A - F in diagram (i) is known the young sporophyte?

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[1 mark]

(c) Name the male and female reproductive structures of the gametophyte.

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[2 marks]

(d) Mark on Diagram (ii) the positions where mitosis and meiosis occur.

[2 marks]

(e) State **three** characteristics of the plant that are considered more advanced compared to bryophytes.

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[3 marks]

2. Cystic fibrosis is a recessive condition that affects about 1 in 2,500 babies in the Caucasian population of the United States.

(i) Calculate the frequency of the recessive allele in the population.

[2 marks]

(ii) Calculate the frequency of the dominant allele in the population.

[1 mark]

(iii) Determine the percentage of heterozygous individuals (carriers) in the population.

[1 mark]

(b) In a population of butterflies brown body (B) is dominant to white (b). 40% of butterflies in the population are white. Using the information given, calculate the following:

(i) The percentage of butterflies in the population that are heterozygous.

[3 mark]

(ii) The frequency of homozygous dominant individuals.



[1 mark]

(c) Give two conditions for a population to be in Hardy-Weinberg equilibrium.

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[2 marks]



[1 mark]

[1 mark]

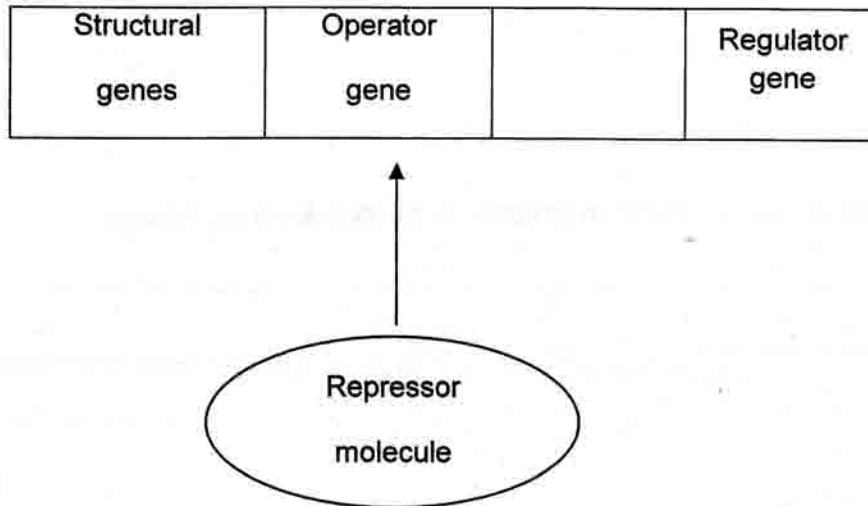
[1 mark]

[1 mark]

[1 mark]

[1 mark]

3. In lactose metabolism,  $\beta$ -galactosidase enzyme catalyses the hydrolysis of lactose. In an *E. coli* bacterial cell, this enzyme would not be produced if lactose is absent. The diagram below shows the mechanism involved in the regulation of lactose metabolism when lactose is absent.



- (a) The diagram above illustrates the mechanism of an operon concept.

- (i) Name the operon concept shown.

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- (ii) What type of operon is it?

[1 mark]

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- (iii) Explain your answer to (a) (ii).

[1 mark]

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- (b) (i) Name the gene that codes for the  $\beta$ -galactosidase enzyme.

[1 mark]

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- (ii) What products are formed when  $\beta$ -galactosidase acts on lactose?

[1 mark]

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- (c) State the function of the regulator gene in this operon.

[1 mark]

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[1 mark]

(d) Explain briefly how the absence of lactose prevents the production of the  $\beta$ -galactosidase enzyme.

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(e) If a mutation alters the promoter in this operon, suggest what would happen to the production of the enzyme  $\beta$ -galactosidase enzyme. [2 marks]

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[2 marks]

	X				
		X			
			X		
				X	
		X			
			X		
				X	
		X			

4. Taxonomists organise species into hierarchical systems to show phylogenetic relationships. They find algae difficult to classify. The photosynthetic pigments in algae are used to distinguish among the major groups or phyla. These phyla are the green algae (Chlorophyta), the brown algae (Phaeophyta) and the red algae (Rhodophyta). The major features of Chlorophyta, Phaeophyta and Rhodophyta are shown in Table 1.

Features	Chlorophyta	Phaeophyta	Rhodophyta
Vegetative morphology	Unicellular, colonial, thalloid	Simple or branched, filamentous, thalloid	Unicellular, filamentous, thalloid
Flagellate stages in the life cycle	/	/	X
Carbohydrate storage product	Starch	Laminarin	Floridean starch
Cell wall polysaccharides	Cellulose	Cellulose Alginic acid Fucinic acid	Cellulose Polysulphate esters
Photosynthetic pigment : Chlorophyll a	/	/	/
Chlorophyll b	/	X	X
B carotene	/	/	/
Lutein	/	X	/
Fucoxanthin	X	/	X
R- phycoerythrin	X	X	/
R- phycocyanin	X	X	/

Table 1

(a) With reference to Table 1:

- i. Name two features that all three phyla share with the plant kingdom.

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[2 marks]

- ii. List two characteristics of brown algae which are not found in the other two phyla.

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[2 marks]



iii. Suggest two reasons why taxonomists think that the three phyla of algae may not be closely related.

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(b) State one function of flagella in unicellular algae. [2 marks]

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i. Define the term taxon. [1 mark]

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ii. State one major function of a natural classification. [1 mark]

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iii. State one major function of an artificial classification. [1 mark]

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[1 mark]

**Section B [60 marks]**

*Answer any four questions in this section.*

5. a) Polysaccharides play an important role as structural and storage compounds in plants. By giving one example for each of these compounds, explain how their molecular structures are related to their functions. [8 marks]
- (b) (i) With the aid of a diagram, show how a triglyceride is formed through the esterification process. [3 marks]
- (ii). Describe the structure of lecithin and its importance in cell membrane structure. [4 marks]
6. Chemoautotroph and photoautotroph are two groups of autotrophic organisms.
- (a) By giving one example from each group, compare the two groups. [3 marks]
- (b) Heterotrophic organisms can be further classified into holozoic, saprophytic and parasitic organisms.
- (i) Saprophytic organisms play an important role in ecology. Explain the statement by using a suitable example. [8 marks]
- (i) Parasites can be classified into obligate and facultative organisms. Explain these two types of parasites by giving one example of each.
7. (a) Explain what is meant by the Bohr effect. [5 marks]
- (b) Explain the regulation of breathing in humans. [10 marks]
8. (a) Describe how an action potential is transmitted along a non-myelinated neurone. [7 marks]
- (b) Explain how a nerve impulse is transmitted across a synapse. [8 marks]
9. (a) Differentiate between gene mutation and chromosomal mutation. [4 marks]
- (b) Explain the different types of gene mutation, giving specific examples where relevant. [8 marks]
- (c) Down's Syndrome is caused by chromosomal mutation. Explain how this may occur. [4 marks]
10. (a) In recombinant DNA technology, a desired gene is obtained and inserted into a host cell to be cloned.
- (i) Describe the ways of obtaining a desired gene. [7 marks]
- (ii) Explain how the desired gene can be inserted into a host cell. [5 marks]
- (b) List three applications of recombinant DNA technology in the medical field. [3 marks]