SB015
Biology 1
Semester 1
Session 2023/2024
2 hours

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BIOLOGI
2 jam

JANGAN DIBUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU.
DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO.

Untuk kegunaan pemeriksa	
No. Soalan	**Markah**
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Jumlah	

INSTRUCTIONS TO CANDIDATE:
This question paper contains **7** questions. Answer **all** questions in the space provided in this question paper.

1 (a) Desribe the events occur in mitosis. [5 *marks*]

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(b) **FIGURE 1** shows chromosomal behavior of cell division.

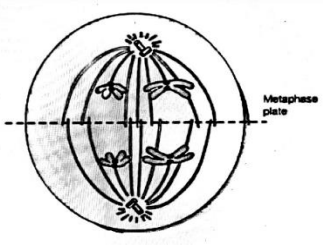

FIGURE 1

(i) Identify the stage of cell division in **FIGURE 1**. [1 *mark*]

_____

(ii) Give **one (1)** chromosomal behavior difference between stage **FIGURE 1** and stage in mitosis. [1 *mark*]

_____
_____

2 (a) **FIGURE 2** shows parts of the monohybrid cross of a plant.

Parental : Tall X Dwarf

Gametes : G1 G2

F1 generation : All tall

F2 generation : 788 tall and 263 dwarfs

FIGURE 2

(i) State the parental genotype for the following: [2 *marks*]

Tall : _____

Dwarfness : _____

(ii) State the generation F1 genotype. [1 *mark*]

_____

(iii) Determine the ratio of plants for tallness and dwarfness. [1 *mark*]

_____

(b) Black coloured body & vestigial wing in Drosophila is controlled by two recessive allele (**b**) and (**vg**) respectively. Dominant alleles, (**b+**) and (**vg+**) produced wild type fly (grey-coloured body, normal wing). A homozygous wild type is crossed to a homozygous fly with black-coloured body and vestigial wing. The F1 progeny produced is test crossed. The F2 generations are as follows:

Wild type	1930
Black vestigial	1888
Black normal	412
Grey vestigial	370

(i) What type of the inheritance shown above? [1 *mark*]

_____

(ii) What are the expected phenotypic ratio of the F2 generation according to the Mendelian Law. [1 *mark*]

_____

(iii) Conclude why the observed ratio shown above does not fit the expected ratio? [1 *mark*]

_____

(c) In fruit flies, eye colour is a sex-linked trait. Red eye is dominant to white eye. Show the cross of a white-eyed female with a red-eyed male. [3 *marks*]

(d) The colour of flowers for *Antirrhinum* sp. (snapdragon) are controlled by genotype $\mathbf{C^RC^R}$ for red flowers, $\mathbf{C^RC^W}$ for pink flowers and $\mathbf{C^WC^W}$ for white flowers.

(i) State the type of inheritance of the flower colours. [1 *mark*]

_____

(ii) State the possible crossings which do not produce plants with white flowers. [2 *marks*]

_____

_____

3 In the study of human blood groups, its was found that among a population of 600 individuals, 502 were **Rh+** and 98 were **Rh-**. Assuming that the **Rh+** traits is controlled by a dominant allele (**R**).

(a) State the Hardy-Weinberg law. [2 *marks*]

_____

_____

_____

(b) Find the frequency of individuals with **Rh+** trait but carry the allele **r**. (Calculate up to three decimal places). [4 *marks*]

4 (a) **FIGURE 3** shows part of the process that occurs during protein synthesis.

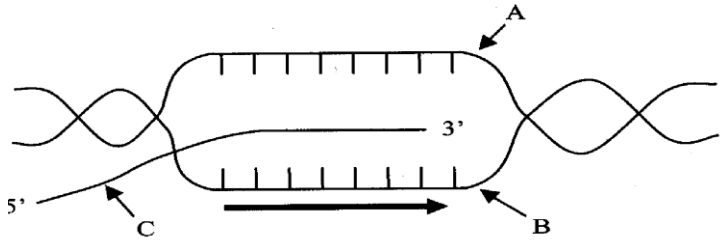

FIGURE 3

(i) If **A** in **FIGURE 3** has the following sequence

5'-GATACATGGAATTCCATGCTGA-3', what is the sequence of **B** and **C** strands? [2 *marks*]

B: _____

C: _____

(ii) Name structure **C** and give its function in protein synthesis. [2 *marks*]

_____

_____

(b) **FIGURE 4** shows a translation process in protein synthesis. State and describe the process shown by analyzing the 3 step cycle. [10 *marks*]

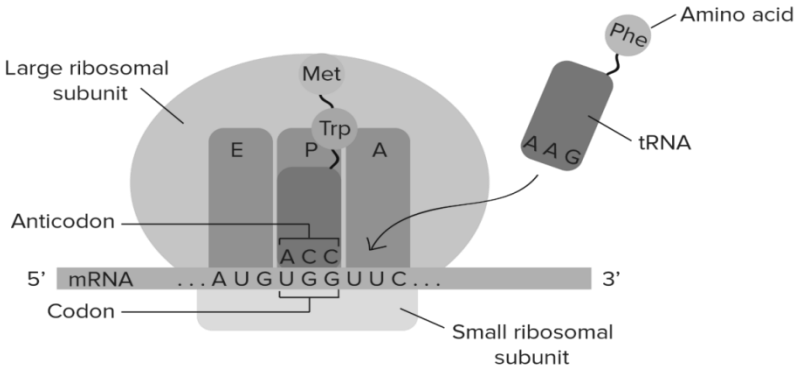

FIGURE 4

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5 **FIGURE 5** shows a fragment of DNA with specific base sequence and its altered sequence resulting from a gene mutation.

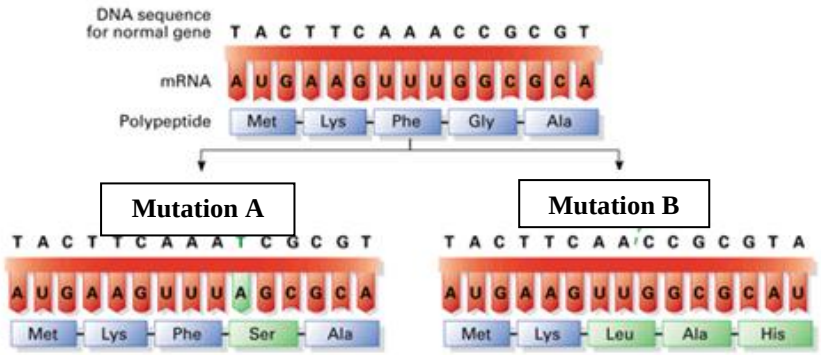

FIGURE 5

(a) (i) Identify mutation **A**. [1 *mark*]

Mutation **A**: _____

(ii) What is the effect of gene mutation **A** in **FIGURE 5**. [2 *marks*]

_____

_____

(iii) Explain the effect of mutation B. [4 *marks*]

_____

_____

_____

_____

(b) **FIGURE 6** shows formation of polyploidy in plants.

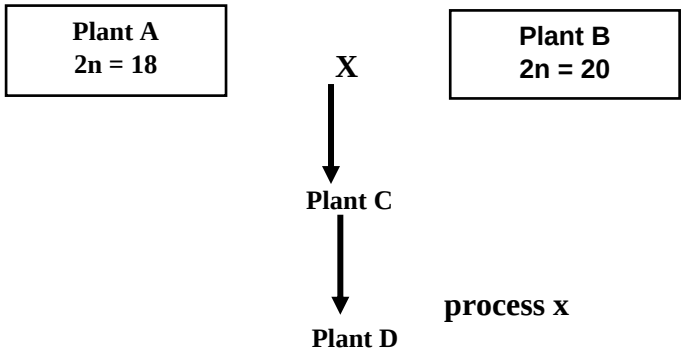

FIGURE 6

Based on **FIGURE 6** answer the following questions.

(i) Identify the type of ploidy. [1 *mark*]

(ii) Determine the chromosome number for plant **C**. [1 *mark*]

(iii) Explain how process **X** cause plant **D** become fertile. [2 *marks*]

6 (a) Explain the function of the cloning vector and the importance of its characteristic in recombinant DNA technology. [4 *marks*]

(b) **FIGURE 7** below shows part of donor DNA containing a specific gene used in recombinant DNA technology

FIGURE 7

(i) Identify the base sequence at which the restriction enzyme cleaves the DNA. [1 *mark*]

(ii) The base sequence identified in (i) is a palindrome. Describe what is meant by palindrome. [1 *mark*]

(iii) State the restriction enzyme that cleaves the base sequence in **FIGURE 7** and explain how the restriction enzyme acts. [3 *marks*]

_____

_____

(iv) Draw the DNA fragments produced when it is cleaved by the restriction enzyme.

[1 *mark*]

(v) Explain how the fragment produced in (iv) is used in recombinant DNA technology. [3 *marks*]

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7 (a) **FIGURE 8** shows structure of a secondary oocyte.

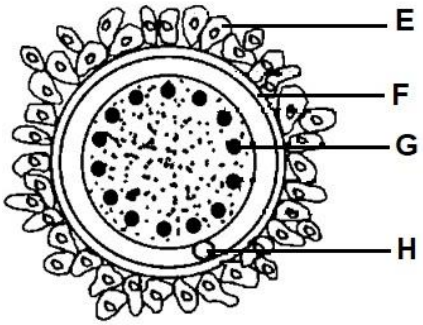

FIGURE 8

(i) Name structure E. [1 *mark*]

_____

(ii) Structure G contains enzyme. What is the effect of enzyme releases by structure G on structure F. [1 *mark*]

_____

(iii) Secondary oocytes are formed through meiosis. In which stage of meiosis do they arrest before fertilization? [1 *mark*]

_____

(iv) Give ONE difference between primary oocyte and secondary oocyte in terms of genetic content. [1 *mark*]

_____

_____

(b) Describe the stages that are involved in fertilization process in the fallopian tube.

[8 *marks*]

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(c) **FIGURE 9** shows growth pattern of maize plant.

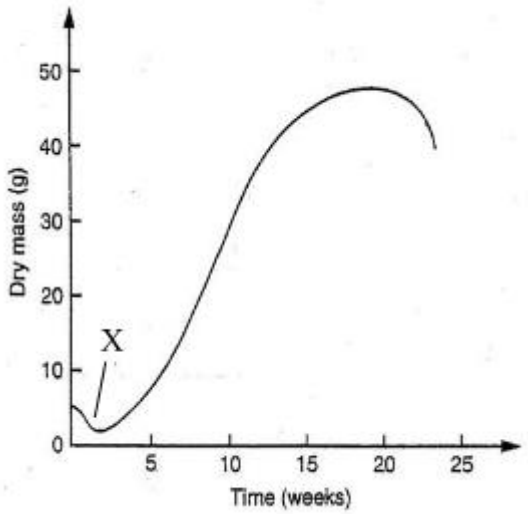

FIGURE 9

(i) Why there is sudden increase in mass after phase **X**. [2 *marks*]

_____

_____

(ii) Give **two (2)** differences between growth pattern of maize plant and Meranti tree. [2 *marks*]

_____

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