



**UNIVERSITI KUALA LUMPUR
MALAYSIAN SPANISH INSTITUTE**

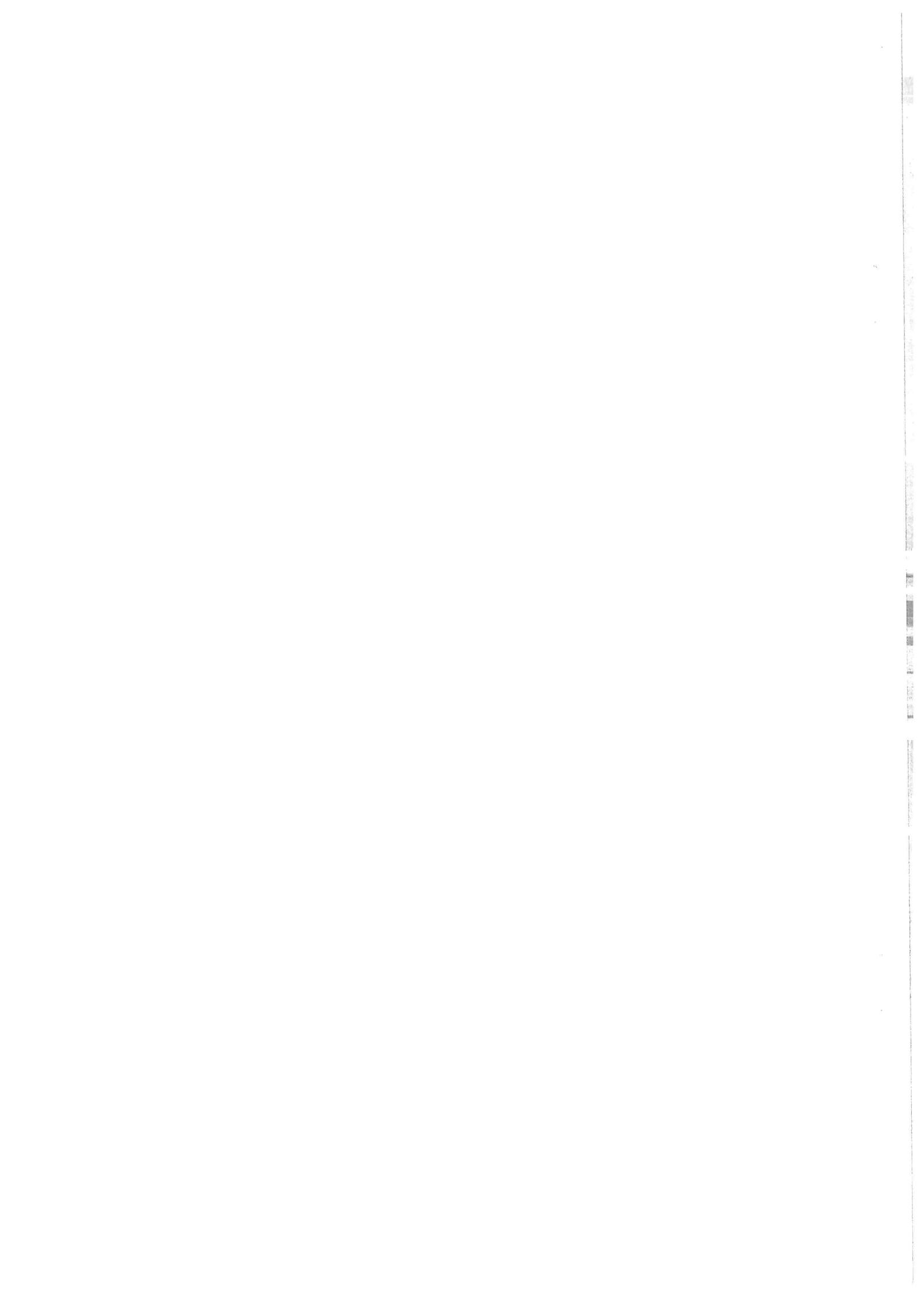
**FINAL EXAMINATION
JULY 2023 SEMESTER**

COURSE CODE : SSP 01404
COURSE NAME : BIOLOGY 1
PROGRAMME NAME : FOUNDATION IN SCIENCE & ARTS (FSA)
DATE : 4 JANUARY 2024
TIME : 09.00 AM – 11.30 AM
DURATION : 2 HOURS 30 MINUTES

INSTRUCTIONS TO CANDIDATES

1. Please **CAREFULLY** read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of **TWO (2)** sections, Section A and Section B.
4. Answer **ALL** questions in Section A.
5. For Section B, from **THREE (3)** questions, answer only **TWO (2)** questions.
6. Please write your answers in the answer booklet provided.
7. Answer all questions in English language **ONLY**.

THERE ARE 8 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.



SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

In dogs, the allele for grey fur (G) is dominant over beige fur (g). The allele for a solid coat (D) is dominant over striped coat (d). A pure breed male dog with a solid coat and beige fur is crossed with a pure breed female dog with striped coat and grey fur.

- (a) i. genotype for both male and female dogs. (2 marks)
ii. genotype and phenotype of the F1 offspring. (2 marks)
- (b) Draw the schematic diagram of the cross producing F1 offspring. (5 marks)
- (c) A cross between pure breed solid and beige dog parent with F1 offspring gives rise to F2 generation. Name the type of cross involved. (1 mark)
- (d) Draw a schematic diagram of the cross to produce F2 generation. (3 marks)
- (e) Find the number of F2 offspring for a population of 4000 individuals who are heterozygous for both characteristics. (2 marks)

Question 2

Figure 1 shows a lac operon which consists of three main structural genes: *lac Z*, *lac Y*, and *lac A* located on a DNA of a particular organism.

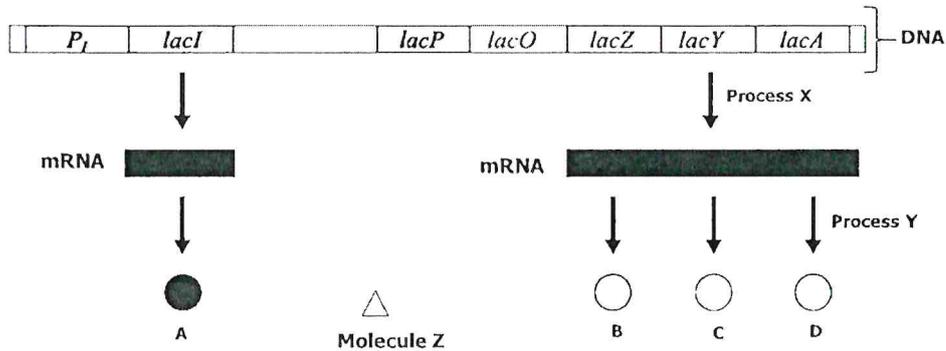


Figure 1

- (a) State the type of organism where process in **Figure 1** occurs. (1 mark)

- (b) List **one** differences between **Process X** and **Process Y**. (2 marks)

- (c) State:
 - i. the name of structures labelled **A**, **B**, **C** and **D**. (4 marks)
 - ii. the role of each structural gene, *lac Z*, *lac Y* and *lac A*. (3 marks)

- (d) *Lac I* is a gene required in synthesizing structure **A**. State the role of **A** in this process. (2 marks)

- (e) Briefly explain the function of molecule **Z** in the lac operon. (3 marks)

Question 3

Figure 2 shows a crossing between two species of wheat which produces a hybrid species M which later undergoes process Y and produces species N.

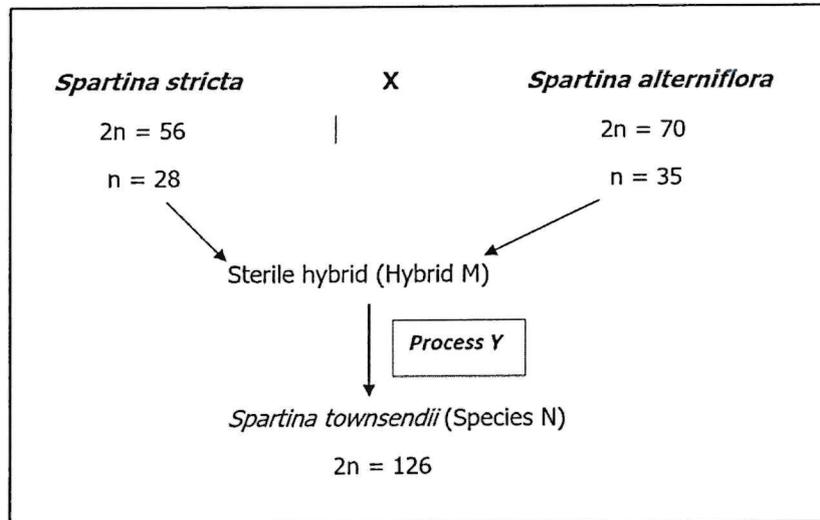


Figure 2

- (a)
- i. State the type of mutation undergone by hybrid M which later produces a new species, *Spartina townsendii* (Species N). (1 mark)
 - ii. Name the process Y. (1 mark)
 - iii. Find the chromosome number for hybrid M. (1 mark)
 - iv. Briefly elaborate **one** reason why hybrid M is sterile while species N is fertile. (2 marks)
 - v. Identify **two** benefit/strength of species N compared to their parent species (*Spartina stricta* and *Spartina alterniflora*). (2 marks)

- (b) Define these terms:
- i. Gene mutation (2 marks)
 - ii. Missense mutation (2 marks)
 - iii. Frameshift mutation (2 marks)
 - iv. Aneuploidy (2 marks)

Question 4

Figure 3 shows a cross section of a seminiferous tubule.

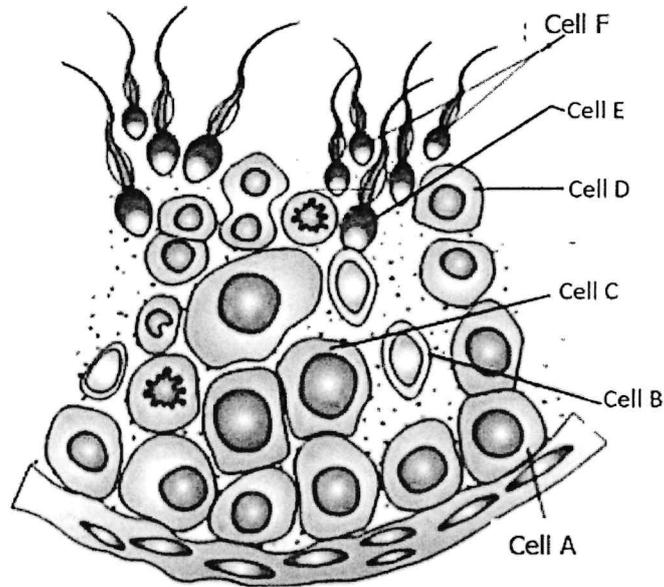


Figure 3

- (a) Name the cell **A**, **B**, **C** and **D**. (4 marks)
- (b) Identify:
- i. the process and transformation which produces Cell **F**. (2 marks)
 - ii. the role of Cell **B** in process **4(b)**. (1 mark)
 - iii. effect of high temperature on Cell **F**. (2 marks)
 - iv. the cell (in the **Figure 3**) which undergo meiosis I. (1 mark)
 - v. the cell (in the **Figure 3**) which undergo meiosis II. (1 mark)
- (c) Provide **two** differences between the gametogenesis process in **Figure 3** and the gametogenesis process occurring in ovary. (4 marks)

SECTION B (Total: 40 marks)

INSTRUCTION: Answer TWO questions ONLY.

Please use the answer booklet provided.

Question 1

In a study of the people of Hopi, a Native American tribe of central Arizona, Woolf and Dukepoo (1959) found 26 albino individuals in a total population of 6000. This form of albinism is controlled by a single gene with two alleles: albinism is recessive to normal skin coloration.

(a) If the population were in Hardy-Weinberg equilibrium.

Calculate:

i. dominant and recessive allele frequencies.

(4 marks)

ii. homozygous recessive genotype, homozygous dominant and heterozygous genotype frequencies.

(6 marks)

iii. number carrier among Hopi people.

(4 marks)

(b) i. Briefly explain **two** factors that can change the genetic equilibrium in a population.

(4 marks)

ii. Explain the gene pool of Hopi people in Hardy-Weinberg population.

(2 marks)

Question 2

Figure 4 shows strand of DNA. Analyze the figure and answer the questions below.

TGAATTC	GAATTCC
ACTTAAG	CTTAAGG

Part of donor's DNA

GAAGAATTCTTC
CTTCTTAAGAAG

Part of the plasmid

Figure 4

- (a) One restriction enzyme cuts DNA and plasmid at certain sequence of bases. Based on **Figure 4** determine the sequence of bases. Explain your answer. (4 marks)
- (b) i. The cut made by the restriction enzyme produce a sticky end. Show the cut plasmid and restricted DNA fragment. (3 marks)
- ii. Explain the importance using the strand with sticky end in gene cloning. (3 marks)
- (c) Provide **three** differences between sticky end and a blunt end. (6 marks)
- (d) Elaborate **one** significance of having a restriction enzyme as a cutting tool in genetic engineering. (4 marks)

Question 3

Figure 5 shows a process occurring in cell.

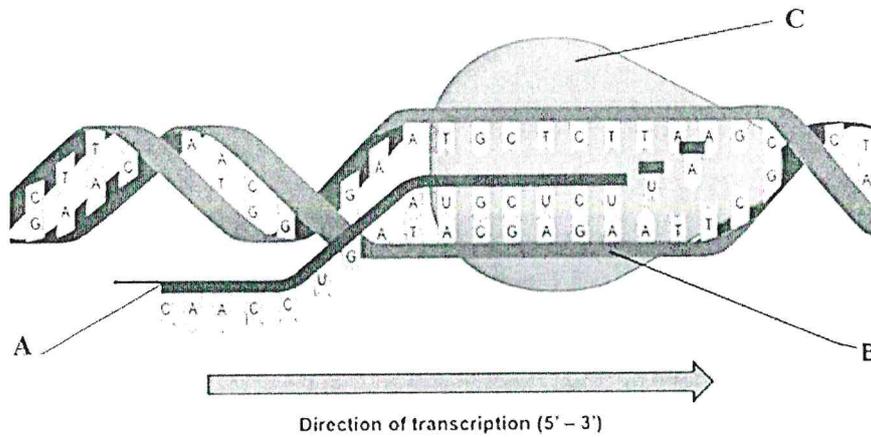


Figure 5

- (a) i. Explain the structure and function of A. (3 marks)
- ii. State the name of structures labeled B and C. (2 marks)
- (b) Name the process in **Figure 5** and elaborate **one** outcome if the process above fails to proceed or error occur during the process. (5 marks)
- (c) Outline **three** differences between the process in **Figure 5** and DNA replication. (6 marks)
- (d) State **two** differences between product of the process in **Figure 5** and DNA. (4 marks)

END OF EXAMINATION PAPER

