



KOLEJ MATRIKULASI KELANTAN

**PROGRAM BIO Leap UP FOR Excellence 3 (BLUE 3)
SEMESTER 1
SESSION 2023/2024**

DO NOT OPEN THIS QUESTION PAPER UNTIL YOU ARE TOLD TO DO SO

Instructions:

- 1. This question booklet consists of 7 questions.**
- 2. Answer all questions in the space provided in the question paper.**

Name : _____

Class : _____

For examiner use only	
QUESTION	MARK
1	/7
2	/13
3	/6
4	/14
5	/11
6	/13
7	/16
TOTAL	/80

1 **FIGURE 1** shows meiosis of a diploid cell in cell division.

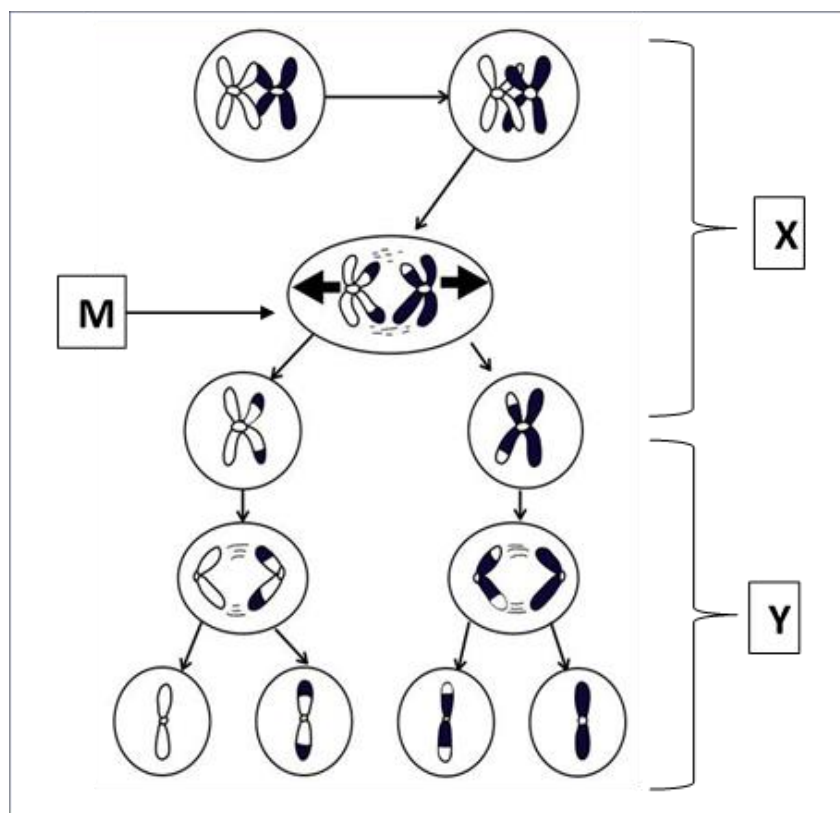


FIGURE 1

(a) Name X and Y [2 marks]

(b) (i) State **stage M** and briefly explain the chromosomal behavior in the stage [2 marks]

(ii) State the importance of **stage M** in meiosis [1 mark]

(c) (i) Explain how genetic materials are exchanged between homologous chromosomes [2 marks]

- 2 (a) State two Mendel's Laws. [2 marks]

- (b) (i) In monohybrid cross, Mendel cross pea plant true breeding tall (**TT**) with true breeding short (**tt**). For the first generation (F₁), it was found that all offspring were tall. Draw the genetic diagram completely up to F₁. [4 marks]

- (ii) Mendel crossed F₁ with F₁ to get the second generation (F₂). Name the cross. [1 mark]

- (c) Differentiate between multiple allele and polygene. [2 marks]

- (d) In fruit flies, eye colour is a sex-linked trait. Red eye is dominant (R) to white eye (r). Show the cross of a white-eyed female with a red-eyed male [4 marks]

- 3 In ladybug population, the spot color of yellow ladybug was controlled by two alleles. The black spot (B) is dominant over red spot (b). In a population of 600 ladybugs, the following data is recorded in **TABLE 3**.

Phenotypes	Genotypes	Number of individuals
Black spot ladybugs	BB	350
Black spot ladybugs	Bb	130
Red spot ladybugs	bb	120

TABLE 3

- (a) What is the gene pool size for spot color of the ladybug population? [1 mark]

- (b) What is the frequency of dominant allele, B? [1 mark]

(c) What is the frequency of recessive allele, b?

[1 mark]

(d) If the ladybugs were left to breed randomly and the population remain in equilibrium, how many individuals are expected to be heterozygous in the next generation of 1500 ladybugs?

[3 marks]

4 (a) **FIGURE 4** shows a process that occur before a cell divides.

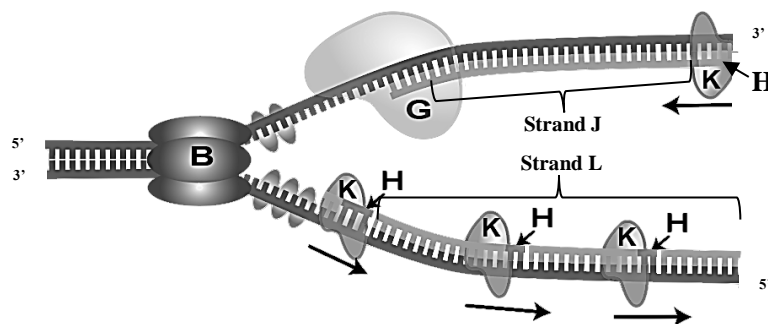


FIGURE 4

(i) Suggest a model that best describe the process shown in **FIGURE 4**.

[1 mark]

(ii) Give **TWO** differences between the synthesis of strand J and strand L in **FIGURE 4**.

[2 marks]

- (iii) Briefly describe the function of enzyme K in the synthesis of strand J and L. [2 marks]

- (iv) Identify enzyme B and predict what happen if the gene encoded for the synthesis of enzyme B is exposed to a mutagen. [2 marks]

- (b) Explain transcription and the stages involved in the formation of mRNA strand. [7 marks]

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface.

- 5 (a) Infants with *Cri du chat* syndrome often have a high-pitched cry that sounds like that of a cat while patients with Chronic Myelogenous Leukemia have their bone marrow producing too many white blood cells. Both *Cri du chat* syndrome and Chronic Myelogenous Leukemia are caused by chromosomal aberration mutation.

- (i) State the type of chromosomal aberration that cause: [2 marks]

Cri du chat: _____

Chronic Myelogenous Leukemia: _____

- (ii) Give ONE difference between chromosomal aberrations that caused *Cri du chat* and Chronic Myelogenous Leukemia. [1 mark]

- b) Draw a meiotic diagram to show how nondisjunction in meiosis I during spermatogenesis can cause Turner Syndrome. [4 marks]

- (c) Hybrid Triticum aestivum evolved from hybrid Triticum turgidum through polyploidization. Interbred between Triticum monococcum ($2n=14$) and Triticum searsii ($2n=14$) produces hybrid Triticum turgidum which is sterile.

- (i) State the chromosome number of Triticum aestivum. [1 mark]

- (ii) Explain why hybrid Triticum aestivum has become a fertile plant. [2 marks]

- (iii) Name the type of reproduction carried out by Triticum turgidum. [1 mark]

6

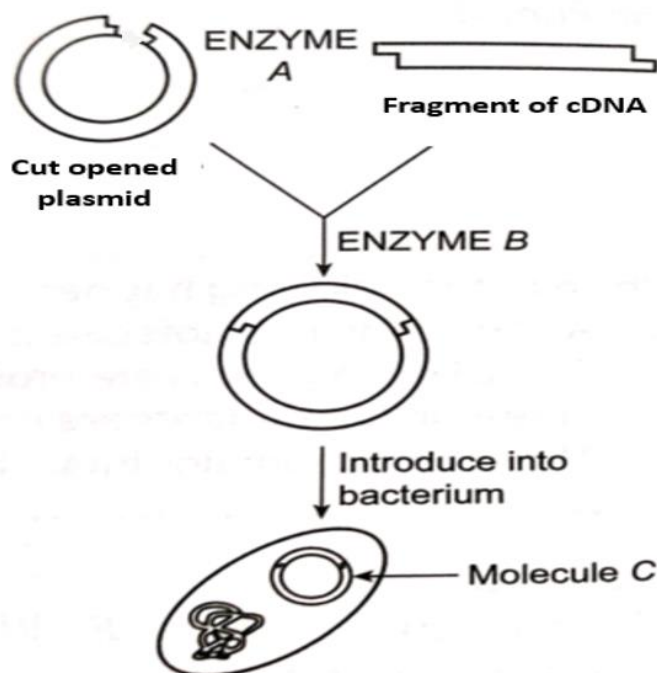


FIGURE 6

The diagram in **FIGURE 6** above is a simplified method used in gene cloning

- (a) Give **ONE** example of enzyme A used above [1 mark]

- (b) Explain why the same enzyme A is used to cut both plasmid and cDNA? [3 marks]

- (c) Name and explain the function of enzyme B. [2 marks]

Enzyme B: _____

Function: _____

- (d) Bacterial cell with molecule C might be identified as white colonies during screening technique. Describe how white colonies can be form in a medium containing ampicillin and X-gal. [3 marks]

- (e) Plasmid in **FIGURE 6** above are accidently modified so that foreign DNA are inserted to ampicillin resistance gene. Predict what happen to bacterial cell in **FIGURE 6** above when exposed to medium containing ampicillin? [1 mark]

- (f) cDNA also can be amplify using PCR technique. Briefly explain this technique. [3 marks]

- 7 (a) **FIGURE 7.1** shows a cross section of an embryo sac in a flowering plant

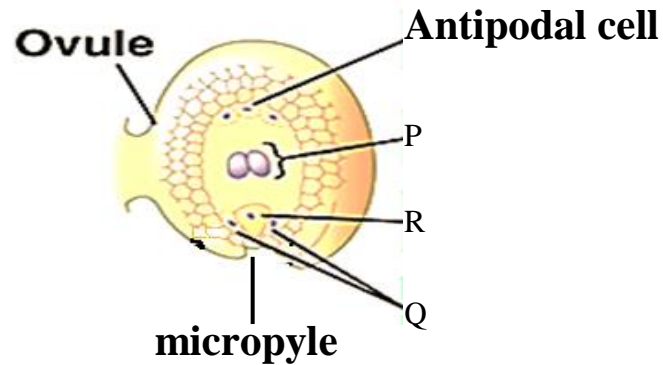


FIGURE 7.1

- (i) What type of cell division that produce 8 nuclei of an embryo sac? [1 mark]
- _____
- _____
- (ii) Name the structure that will be formed after fertilization between [2 marks]
- a. Male gamete and nucleus of P: _____
- b. Male gamete and nucleus of R: _____
- (iii) If the chromosome number of this plant is 28, what is the [1 mark]
- chromosome number for the structure in ii(a)?
- _____
- (iv) State the function of cell Q in double fertilization [1 mark]
- _____

Various stages of the ovarian cycle are shown in **FIGURE 7.2** below.



FIGURE 7.2

[7 marks]

[illegible]

- (c) In **FIGURE 7.3** below, M, N and O represent the growth curves of specific human organs and tissues while P represents the growth curve of the human body as a whole.

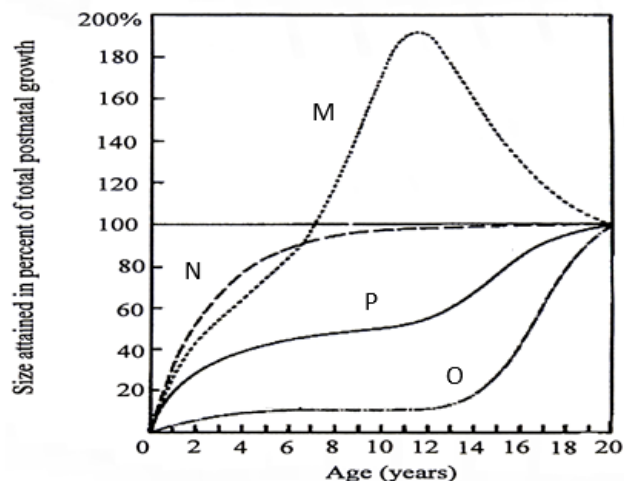


FIGURE 7.3

- (i) Name the type of growth pattern shown. [1 mark]
- _____
- (ii) Which parts of the body, organs or tissues have the growth pattern shown by [2 marks]
- a. Curve M: _____
- b. Curve N: _____
- (iii) Why will the growth rate of a boy slow down and finally become constant after 20 years? [1 mark]
- _____

-END OF QUESTION PAPER-