

Section A [15 marks]

Answer *all* questions.

1. The hierarchical taxonomic system of a domestic dog is shown below.

<i>Taxon</i>	<i>Domestic dog</i>
Kingdom	Animalia
Phylum	I
Class	Mammalia
Order	Carnivora
Family	II
Genus	III
Species	IV

Complete the table above.

	I	II	III	IV
A.	Chordata	Canidae	<i>Canis</i>	<i>familiaris</i>
B.	Canidae	Chordata	<i>familiaris</i>	<i>Canis</i>
C.	<i>Canis</i>	<i>familiaris</i>	Chordata	Canidae
D.	<i>familiaris</i>	<i>Canis</i>	Canidae	Chordata

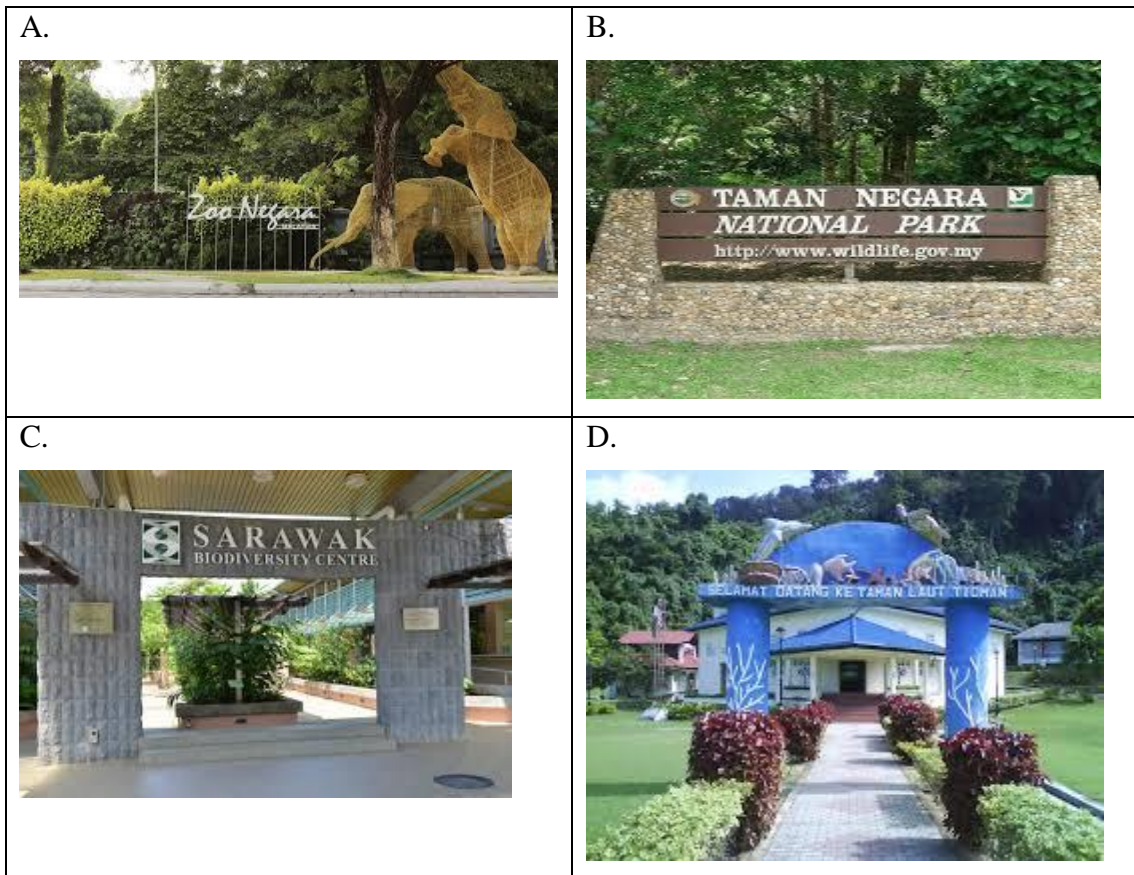
2. A study to estimate the population of two plant species, *Imperata* sp. and *Digitaria* sp using the quadrat sampling method was done in a field. Ten quadrats of 1 m x 1 m were placed randomly in the area. The result obtained from the study is shown in the table below.

<i>Quadrat number</i>	1	2	3	4	5	6	7	8	9	10
<i>Number of individuals</i>										
<i>Imperata</i> sp.	15	8	3	0	0	11	9	14	7	7
<i>Digitaria</i> sp.	9	0	12	5	7	8	0	0	4	6

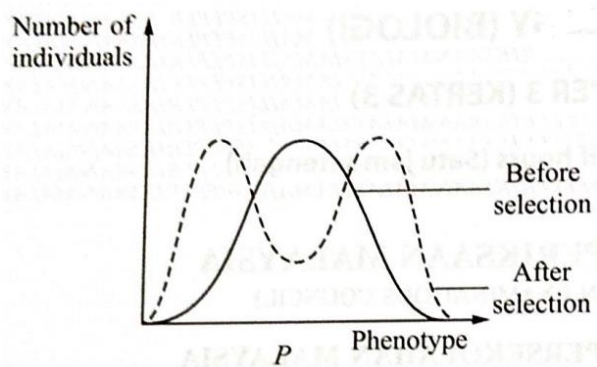
What is the species density of *Digitaria* sp?

- A. 2.0 per m² B. 4.1 per m² C. 5.1 per m² D. 7.4 per m²

3. Which of the following show the example for *Ex situ* conservations?



4. The mode of natural selection is shown in the graph below.



Which of the followings are the effects of selection in P?

- I. Genetic diversity increases.
- II. Genetic diversity decreases.
- III. Lowers the frequency of alleles in the population.
- IV. Increases the frequency of alleles in the population.

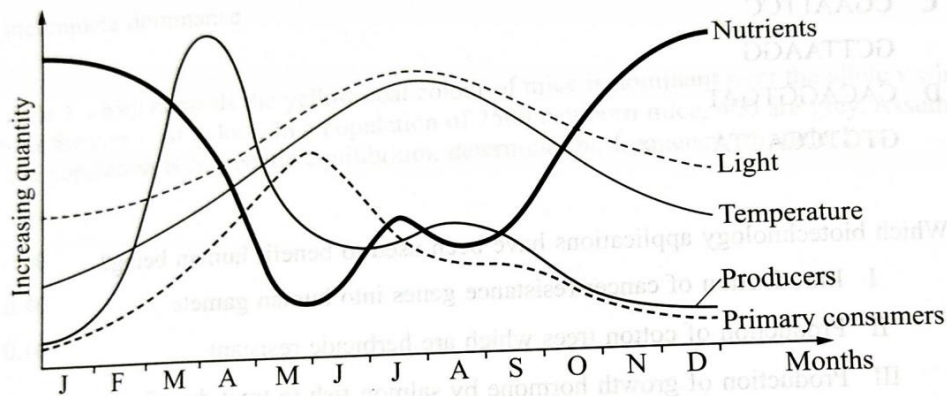
A. I and III

B. I and IV

C. II and III

D. II and IV

5. Fluctuation of population in fresh water lake ecosystem is shown in the diagram below.



Which of the following statements are true?

- I. The population of the primary consumer increases when food supply from the producer increases.
- II. The population of the primary consumer decreases when food supply from the producer increases.
- III. The population of the primary consumer increases when food supply from the producer decreases.
- IV. The population of the primary consumer decreases when food supply from the producer decreases.

- A. I and IV B. II and III C. II AND IV D. III and IV

6. Which of the following is correct match for the types of reproductive isolation mechanism with the examples ?

<i>Reproductive isolation mechanism</i>	<i>Examples</i>
(a) Prezygotic mechanism	I Habitat isolation
(b) Postzygotic mechanism	II Hybrid inviability
	III Hybrid breakdown
	IV Mechanical isolation

- | | | | | |
|----|-----|-----|-----|-----|
| | I | II | III | IV |
| A. | (a) | (b) | (b) | (a) |
| B. | (a) | (b) | (a) | (b) |
| C. | (b) | (a) | (b) | (a) |
| D. | (b) | (b) | (a) | (a) |

7. Which of the following is the major reservoir for phosphorus in the phosphorus cycle?
 A. Soil B. Rock C. Plants D. Rainwater

8. The following table shows map distances between genes along a chromosome.

Linked genes	AB	AC	AD	BC	BD	CD
Map distance(%)	30	5	10	35	20	15

- A **BADC** B **BCAD** C **BDAC** D **BACD**

9. Ali is married to Linda. They are healthy individuals. However, Linda's father is a haemophilia patient.

What is the genotype of Ali and Linda?

- | | | |
|----|------------|--------------|
| | <u>Ali</u> | <u>Linda</u> |
| A. | X^HY | X^HX^H |
| B. | X^HY | X^HX^h |
| C. | X^HY | X^hX^h |
| D. | X^hY | X^HX^h |

10. In a population under the Hardy-Weinberg equilibrium, 80% of the population are able to taste PTC.

Calculate the allele frequency of the non-taster.

- A. 0.20 B. 0.45 C. 0.67 D. 0.89

11. A part of phosphate sugar in DNA molecule with the following sequence:

GCA TTA ACA TTT CAA

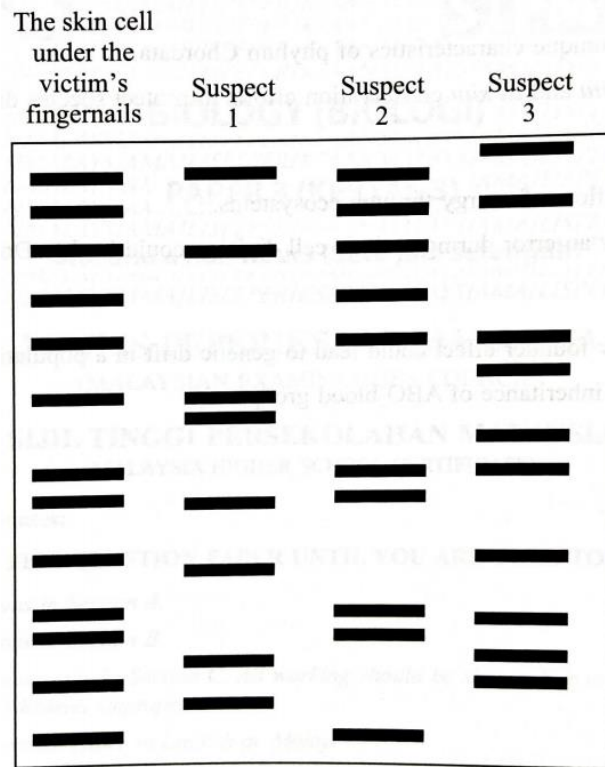
Which of the following sequences can be found at RNA messenger that duplicate from the base series above?

- | | |
|------------------------|------------------------|
| A. GCU TTU UCU TTT CUU | B. CGT AAT TGA AAA ATT |
| C. GCA TTA ACA TTT CAA | D. CGU AAU UGU AAA GUU |

12. The central dogma of molecular biology is that information is transferred from

- | | |
|--------------------------|--------------------------|
| A. RNA to protein to DNA | B. DNA to protein to RNA |
| C. protein to DNA to RNA | D. DNA to RNA to protein |

13. You have an RNA transcript that is 105 nucleotides long. A frameshift mutation occurs at the 85th nucleotide. How many amino acids will be correct?
- A. 3 B. 7 C. 28 D. 35
14. Which of the followings can be used to describe the characteristics of cloning vector **except**
- A. It must be small in size.
 B. It has selectable marker genes.
 C. It have specific restriction sites.
 D. It is only able to take in a small amount of DNA.
15. The result of DNA analysis from the skin cell found under the fingernails of a murder victim and the DNA profiling of three suspects are shown in the diagram below.

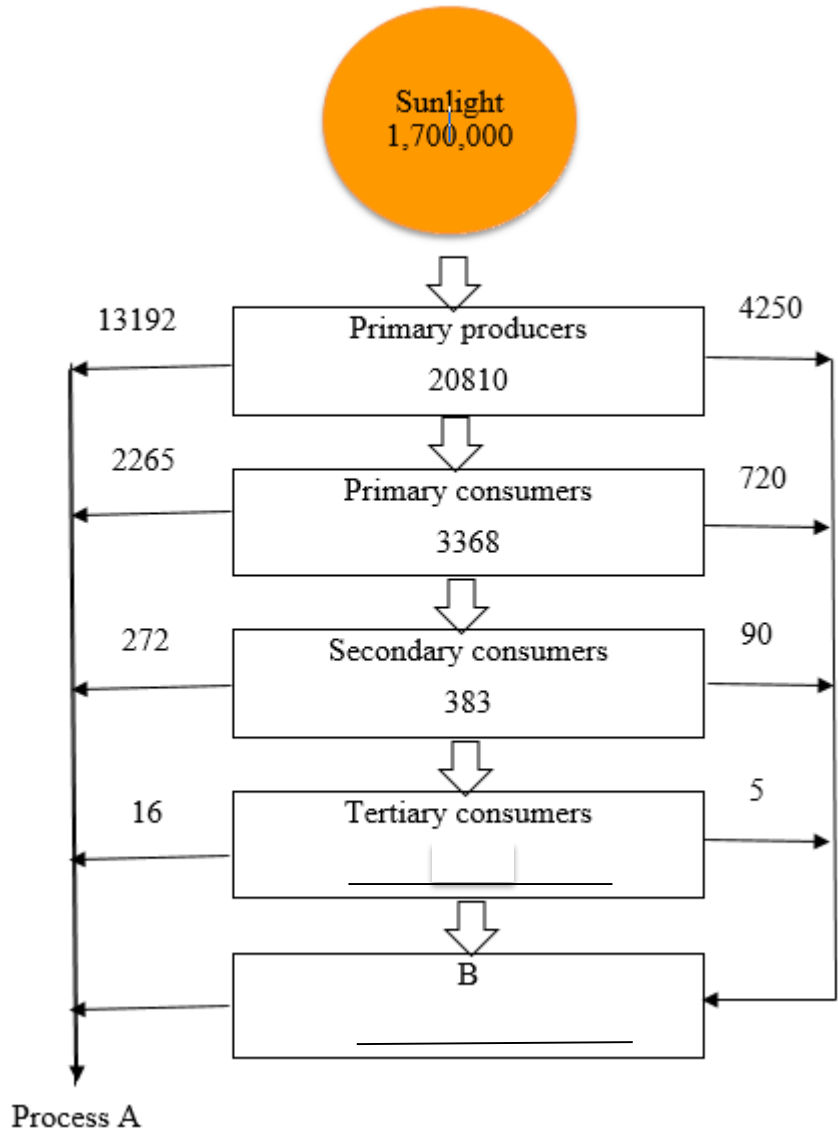


- Based on the diagram above, which suspect was the murderer?
- A. 1 B. 2 C. 3 D. none of them

Section B [15 marks]

Answer **all** questions.

16. The diagram shows the energy flow through an ecosystem.



All units are kcal/m²/yr

(a) Name [2]

(i) Process A :

(ii) The group of organisms represented by Box B :

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(b) (i) What percentage of the energy is fixed by primary producers? [2]

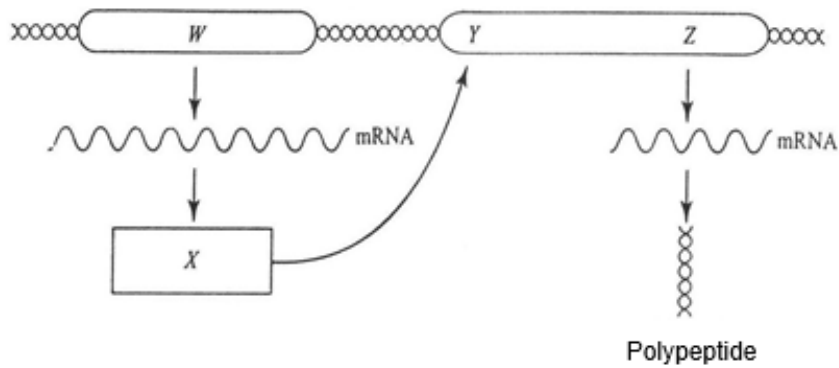
(ii) Calculate the net primary production. [2]

(c) Complete the box shown above. [2]

(i) Calculate the amount of energy which goes to tertiary consumers.

(ii) Calculate the total energy available to decomposers.

17. The diagram below shows a model of the lac operon.



(a) Label the structures of W, X, Y and Z. [4]

- (i) W :
- (ii) X :
- (iii) Y :
- (iv) Z :

(b) Based on the diagram above, this operon is activated by [1]

(c) What would be the most likely effect of a mutation in the operator of a lac operon? [1]

.....

(d) A mutation in the lactose operon occurs which causes the repressor protein not being able to bind with the operator region. What will happen? [1]

.....

Section C [30 marks]

Answer two questions only.

18. (a) Describe the main characteristic of the following phyla. [8]
(i) Coniferophyta
(ii) Porifera
- (b) Botanic gardens play an important role in protecting endangered species. [7]
Describe the role of the botanic gardens.
19. (a) Explain how different species could maintain their identities through the [10]
isolation mechanism.
- (b) Polymorphism is the presence of different physical forms of one type of [5]
species. There are **two** types of polymorphism selected.
Distinguished between them.
20. (a) (i) Explain the reasons why plasmids is useful as cloning vectors. [7]
(ii) Give two advantages of phage vector over plasmid vector. [2]
- (b) Describe chorionic villus sampling and state **one** of its uses. [6]