

External assessment 2022

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Multiple choice question book

# Biology

## Paper 1

### General instruction

- Work in this book will not be marked.

## Section 1

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### QUESTION 1

What is the molecular unit of heredity?

- (A) gene
- (B) genome
- (C) nucleotide
- (D) chromosome

### QUESTION 2

Which stage of making recombinant DNA requires DNA ligase?

- (A) cutting
- (B) joining
- (C) isolation
- (D) transformation

### QUESTION 3

A survey of grasshopper species was conducted across four eucalypt communities. Counts were conducted and the average abundance per 400 m<sup>2</sup> recorded.

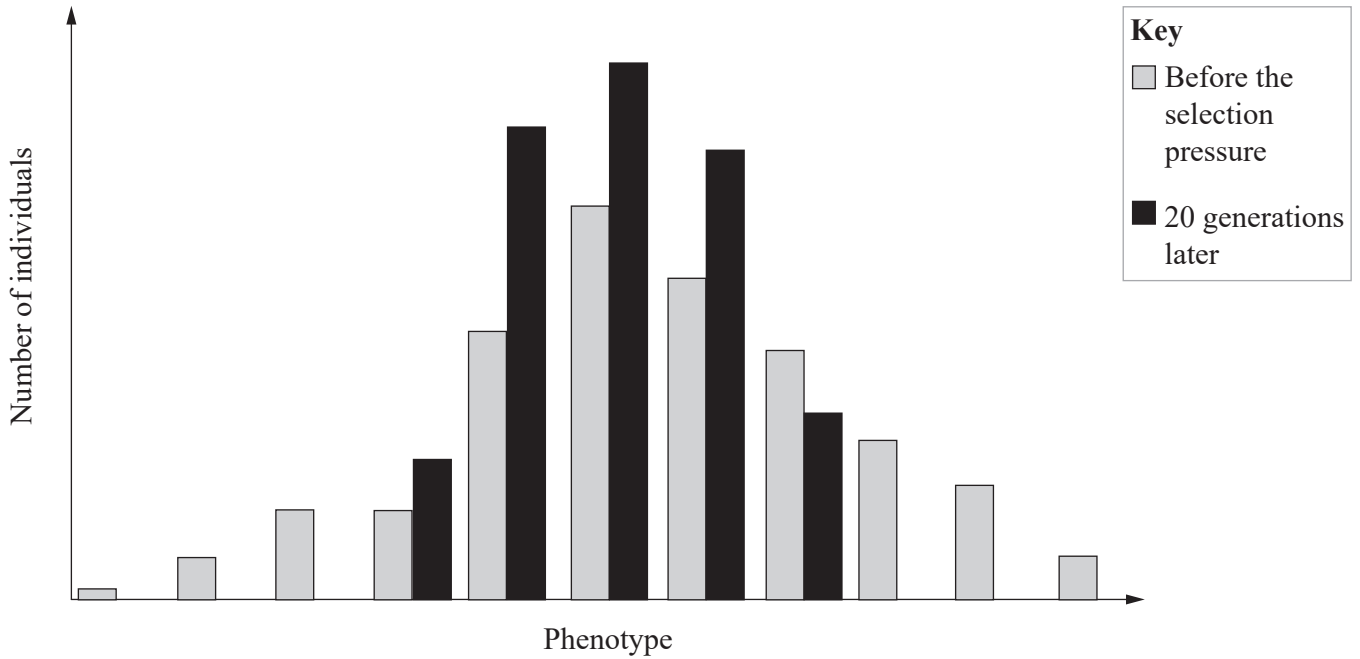
	Grasshopper species (A–F)						
Community	A	B	C	D	E	F	Total
I	32	18	1	3	0	46	100
II	3	2	0	1	3	12	21
III	3	2	28	3	18	51	105
IV	18	13	12	14	16	15	88

Which community has both the highest species richness and highest evenness for grasshoppers?

- (A) I
- (B) II
- (C) III
- (D) IV

### QUESTION 4

The graph shows the effect of a selection pressure on a hypothetical population.



Which mode of phenotypic selection corresponds with the data?

- (A) negative
- (B) disruptive
- (C) stabilising
- (D) directional

### QUESTION 5

A researcher captured, marked and released 36 frogs. The following day they captured 24 frogs and 18 were marked.

Calculate the approximate size of the frog population using the Lincoln index:  $N = \frac{M \times n}{m}$

- (A) 27
- (B) 48
- (C) 54
- (D) 60

## QUESTION 6

The role of helicase in DNA replication is to

- (A) initiate the process by binding to recognition sites along the template strand.
- (B) add complementary bases to the template strand.
- (C) unwind and separate DNA strands.
- (D) join DNA strands together.

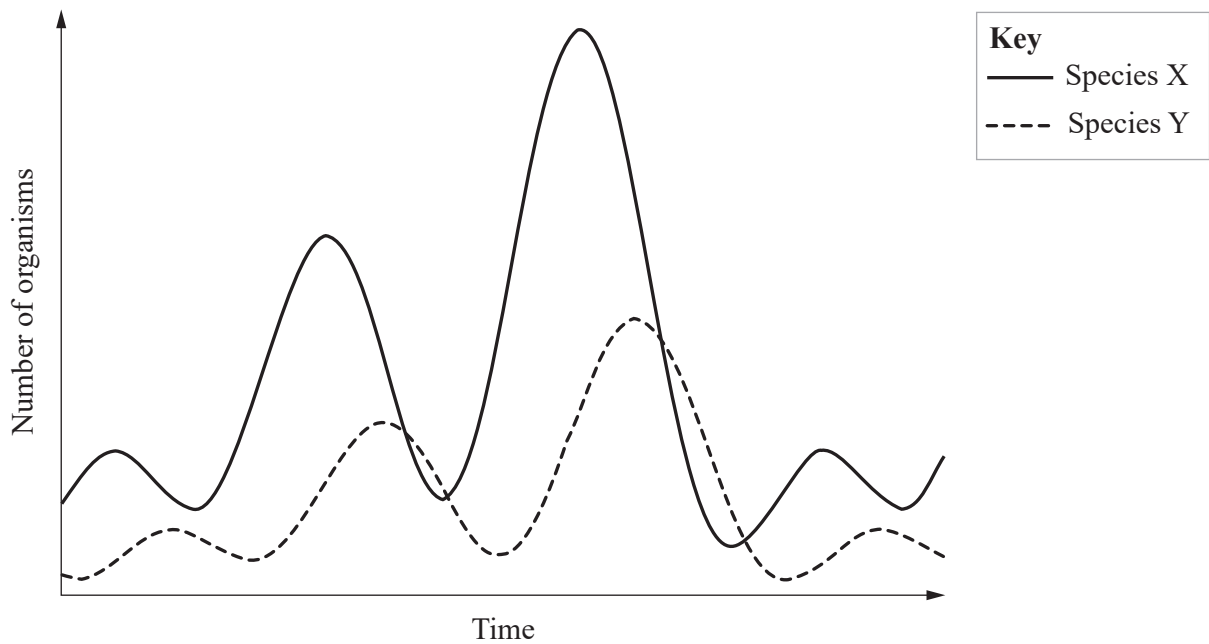
## QUESTION 7

What is used directly by plants for protein synthesis?

- (A) nitrite,  $\text{NO}_2^-$
- (B) nitrate,  $\text{NO}_3^-$
- (C) ammonia,  $\text{NH}_3$
- (D) atmospheric nitrogen,  $\text{N}_2$

## QUESTION 8

The graph shows how the populations of two species in an ecosystem change over time.



Which species interaction is represented?

- (A) predation, where species X preys on species Y
- (B) predation, where species Y preys on species X
- (C) competition, where species X outcompetes species Y
- (D) competition, where species Y outcompetes species X

## QUESTION 9

Polygenic inheritance involves multiple

- (A) alleles for a single gene.
- (B) genes with the same alleles.
- (C) genes coding for a single characteristic.
- (D) characteristics resulting from a single gene.

### QUESTION 10

Wings in birds, bats and pterosaurs are phenotypically similar, though they belong to different families and do not have a common ancestor with the trait. While the general morphology is similar, the structure and organisation of each wing is different.

This is an example of

- (A) coevolution.
- (B) parallel evolution.
- (C) divergent evolution.
- (D) convergent evolution.

### QUESTION 11

Evolutionary relationships were investigated by sequencing a section of protein from five different species. Each letter represents an amino acid.

<b>Species I</b>	D	E	V	G	W	E	A	L	G	R	L	V	S
<b>Species II</b>	D	E	V	G	W	E	G	L	G	R	A	V	S
<b>Species III</b>	D	E	A	G	S	E	G	L	A	R	L	E	S
<b>Species IV</b>	D	E	V	G	S	E	G	L	G	R	L	E	S
<b>Species V</b>	D	E	V	G	W	E	A	L	A	R	L	V	S

It can be inferred that Species I is most closely related to

- (A) Species II.
- (B) Species III.
- (C) Species IV.
- (D) Species V.

## QUESTION 12

Speciation occurs when

- (A) the gene pool of an existing species becomes too small to support a viable population.
- (B) selection pressures cause significant changes to the allele frequencies of a population.
- (C) genetic drift is no longer occurring within populations.
- (D) gene flow is no longer occurring between populations.

## QUESTION 13

An error during DNA replication resulted in the following change to mRNA transcripts.

mRNA before	AUGAAGUUUGGCAUC ... (continued)
mRNA after	AUGAAGUUUGCAUCG ... (continued)

The DNA replication error most likely involved

- (A) deletion of cytosine.
- (B) insertion of guanine.
- (C) substitution of uracil with guanine.
- (D) substitution of guanine with cytosine.

## QUESTION 14

Prior to fertilisation, a secondary oocyte will arrest at which stage of meiosis?

- (A) prophase I
- (B) prophase II
- (C) metaphase I
- (D) metaphase II

### QUESTION 15

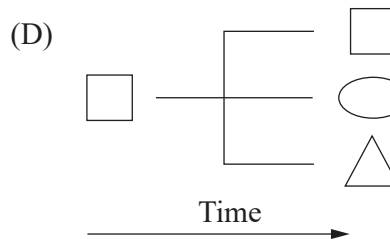
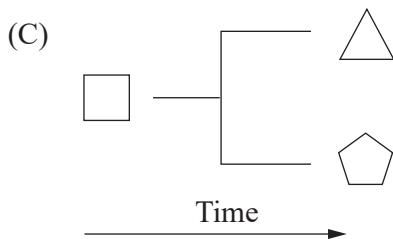
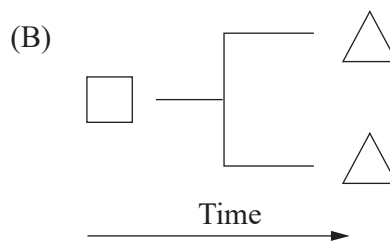
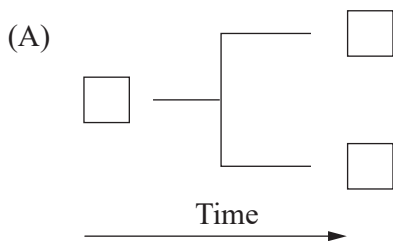
The environment's influence on gene expression can be investigated by comparing the rate of concordance in monozygotic (identical) and dizygotic (non-identical) twins. Concordance occurs when both twins express a trait.

Strong environmental influence is suspected when concordance is

- (A) higher in monozygotic twins.
- (B) only observed in dizygotic twins.
- (C) only observed in monozygotic twins.
- (D) similar in monozygotic and dizygotic twins.

### QUESTION 16

If each shape represents a different species, which diagram shows the common assumptions of cladistics?





### **QUESTION 17**

Students used quadrats to investigate biodiversity in a grassland community with scattered distribution of plant species. The students agreed on a counting criteria for each quadrat to

- (A) reduce the time taken to count the different species.
- (B) minimise statistical uncertainty.
- (C) ensure all strata were sampled.
- (D) minimise bias.

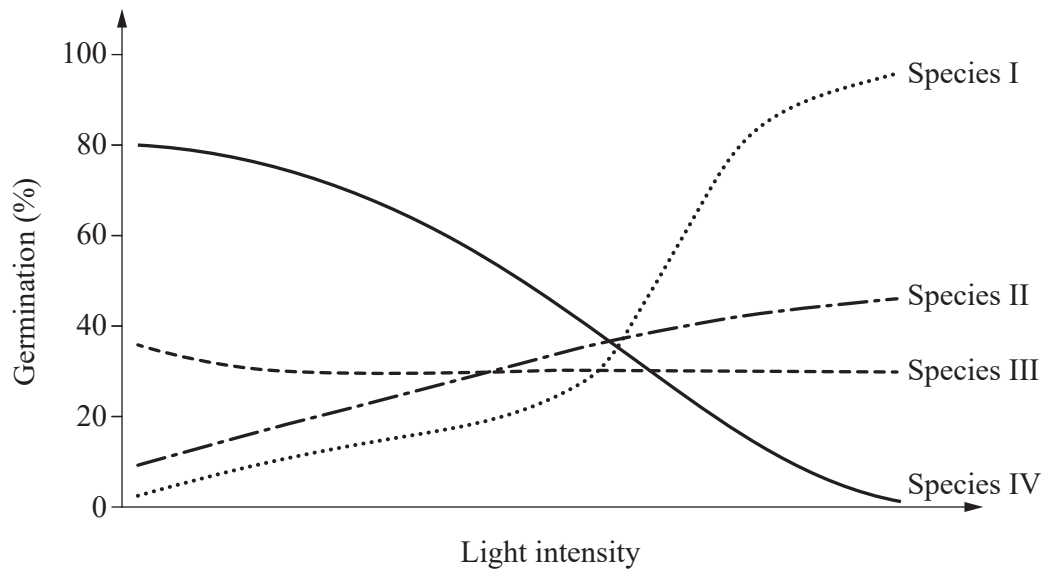
### **QUESTION 18**

The competitive exclusion principle applies to different species occupying the same

- (A) niche.
- (B) habitat.
- (C) environment.
- (D) trophic level.

### QUESTION 19

The graph shows the effect of light intensity on the germination success of seeds from four plant species.



Which is most likely to be a pioneer species?

- (A) I
- (B) II
- (C) III
- (D) IV

## QUESTION 20

A section of DNA is made up of two strands, I and II.

Base	Strand I composition	Strand II composition
adenine		
cytosine		25%
guanine		14%
thymine	29%	

It can be inferred that

- (A) strand I contains 25% cytosine.
- (B) strand I contains 32% adenine.
- (C) strand II contains 29% thymine.
- (D) strand II contains 71% adenine.

## References

### Question 8

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