External assessment

Multiple choice question book

Biology

Paper 1

General instruction

- Work in this book will not be marked.

Queensland Government | QCAA Queensland Curriculum & Assessment Authority

Section 1

QUESTION 1

In prokaryotes, deoxyribonucleic acid (DNA) is found as unbound circular DNA in the

(A) mitochondria.

(B) chloroplasts.

(C) nucleus.

(D) cytosol.

QUESTION 2

Which form of inheritance usually determines traits that display continuous phenotypic variation?

(A) polygenic

(B) sex-linked

(C) multiple allele

(D) incomplete dominance

QUESTION 3

A genome is defined as

(A) the molecular unit of heredity.

(B) all the genetic material in the chromosomes of an organism.

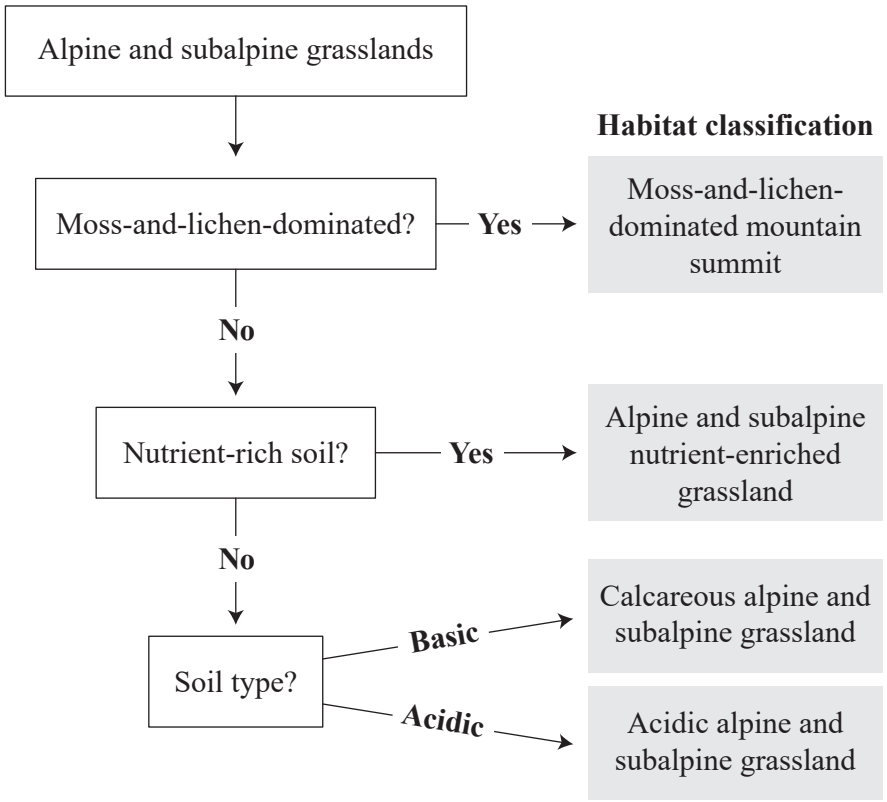
(C) the sequence of triplets of DNA nucleotides that make up a gene.

(D) the combination of alleles for a particular trait carried by an individual.

QUESTION 4

The following information includes:

- a key that is used to classify the types of alpine and subalpine grassland habitats
- a table of abiotic and biotic data obtained from a habitat survey.



Abiotic physical parameter	Reading	Reference range for nutrient-poor soil (mg/kg)
pH	6.1	
Nitrates/nitrites (mg/kg)	4	< 5
Ammonia (mg/kg)	1	< 4
Total phosphorous	16	< 20

Biotic description: Small amount of low-lying moss, growing on soil substrate. Predominantly low-lying grasses.

Using the data in the table and the key, this alpine and subalpine grassland would be classified as

(A) a moss-and-lichen-dominated mountain summit.

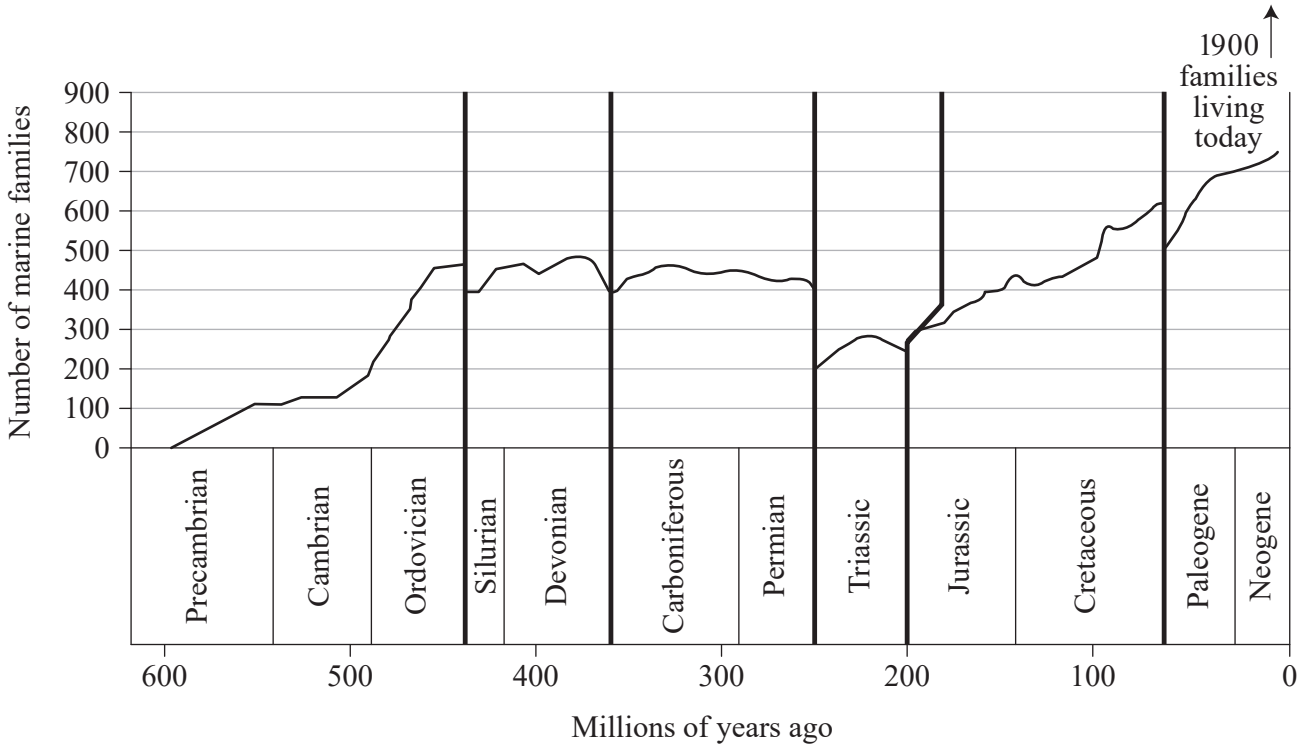
(B) an alpine and subalpine nutrient-enriched grassland.

(C) a calcareous alpine and subalpine grassland.

(D) an acidic alpine and subalpine grassland.

QUESTION 5

The figure shows the diversity of marine animals since the late Precambrian time. The data is from marine animal families that have been reliably preserved in the fossil record.



Which of the following time periods saw the greatest evolutionary radiation of the marine families?

(A) Ordovician

(B) Cretaceous

(C) Devonian

(D) Permian

QUESTION 6

The carrying capacity of an ecosystem refers to the

(A) total biomass of primary producers in the ecosystem at a given time that supports the higher trophic levels.

(B) size of a population that can be supported indefinitely on the available resources and services of that ecosystem.

(C) number of individual top predators in the ecosystem at a given time that can be supported by the lower trophic levels.

(D) maximum population of individuals of different species that the ecosystem can support for an extended period of time.

QUESTION 7

When predicting successional change, which of the following would typically indicate that an ecosystem is progressing toward its climax community?

	Abundance of K-selected species	**Biomass**
(A)	Increasing	Decreasing
(B)	Decreasing	Increasing
(C)	Increasing	Increasing
(D)	Decreasing	Decreasing

QUESTION 8

The table shows the daily energy input and output for a typical leaf.

Process	Energy value (kJ)
Incident sunlight	42.3
Evaporation	31.2
Heat loss (radiation)	2.1
Reflection of sunlight	6.1
Transmission of sunlight	2.1

Calculate the daily net energy stored by the leaf.

(A) 0.8 kJ

(B) 5.0 kJ

(C) 36.2 kJ

(D) 73.5 kJ

QUESTION 9

The table provides population statistics for a species of tree kangaroo in northern Queensland.

Year	Births	Deaths	Immigration	Emigration	Final population
2016	253	175	153	131	1100
2017	290	167	182	140	

Determine the population growth rate for tree kangaroos in 2017.

(A) 14.6%

(B) 15.0%

(C) 26.5%

(D) 86.9%

QUESTION 10

DNA profiling using polymerase chain reaction (PCR) and gel electrophoresis allows the comparison of

(A) genes.

(B) entire genomes.

(C) DNA fragments.

(D) specific sites of mutations.

QUESTION 11

The Linnaean system originally used which type of evidence for classifying organisms?

(A) physical features

(B) common ancestry

(C) molecular phylogeny

(D) reproduction methods

QUESTION 12

In the structure of DNA, adenine pairs with which other base?

(A) uracil

(B) guanine

(C) cytosine

(D) thymine

QUESTION 13

Which of the following molecules is involved in the transcription of DNA?

(A) RNA polymerase

(B) DNA helicase

(C) transfer RNA

(D) amino acids

QUESTION 14

One of the common assumptions in cladistics is that

(A) not all organisms are related by descent.

(B) the characteristics of organisms in a population stay the same over time.

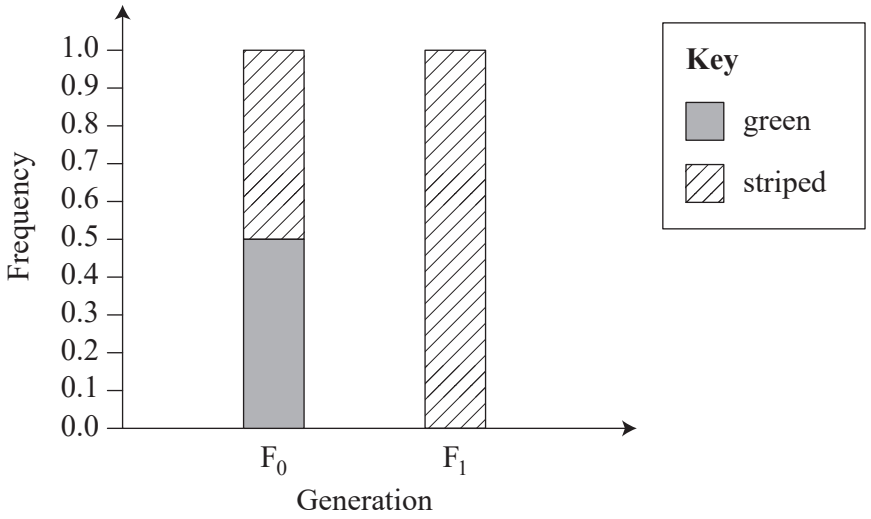
(C) new kinds of organisms may arise when existing populations divide into two groups.

(D) the more shared characteristics two organisms have, the more closely related they are.

QUESTION 15

In watermelon, skin colour is controlled by a single autosomal gene. The two phenotypic variants are green and striped. Two plants, one homozygous for the green alleles, and one homozygous for the striped alleles, were crossed.

The figure shows the phenotypic frequency for the initial (F_0) generation and the subsequent (F_1) generation.



A cross was then performed between members of the F_1 generation. What would be the expected frequency of striped watermelon in the next (F_2) generation?

(A) 1.0

(B) 0.75

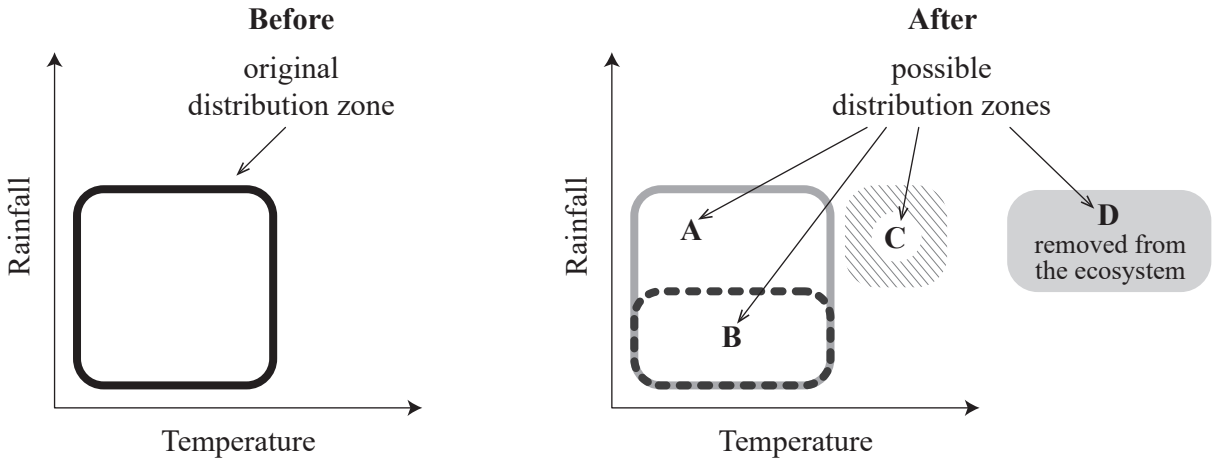
(C) 0.50

(D) 0.25

QUESTION 16

The figures show the original distribution zone of Species I and some possible distribution zones of Species I after the introduction of Species II.

Species II has a competitive advantage over Species I; however, it does not tolerate areas of lower rainfall.



Which of the following would be an accurate prediction of the new distribution zone for Species I?

(A) Zone A, i.e. no change to the distribution

(B) Zone B, i.e. reduced distribution within the original zone

(C) Zone C, i.e. new distribution outside the original zone

(D) Zone D, i.e. complete removal of the species from the ecosystem

QUESTION 17

The table identifies the condition associated with a variety of ploidy changes.

Chromosome number ploidy	Condition name
Monosomy 5	Cri du chat syndrome
Trisomy 21	Down syndrome
Trisomy 23	Klinefelter syndrome
Monosomy 23	Turner syndrome

For a person with XXY sex chromosomes, which condition would they have?

(A) Cri du chat syndrome

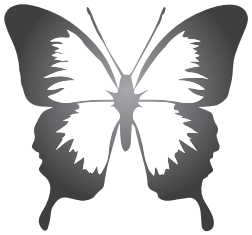
(B) Down syndrome

(C) Klinefelter syndrome

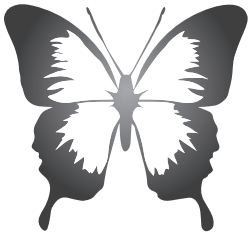
(D) Turner syndrome

QUESTION 18

The diagram shows the abundance (n) of phenotypic and genotypic variation for the colour trait of a species of butterfly.



AA
n = 400



Aa
n = 500

aa
n = 1000

If these butterflies were placed in an environment with light-coloured trees, which option from the table would be the most likely effect on the allelic frequencies?

	Frequency of allele/genotype			
	A	**a**	**AA**	**aa**
(A)	increase	decrease		
(B)			increase	no change
(C)	decrease	increase		
(D)			no change	increase

QUESTION 19

The table of data shows a comparison of amino acids sequences in the same section of haemoglobin molecules from a number of different species.

From the given information, which of the following species's haemoglobin protein is most similar to human haemoglobin protein?

Species	Sequence of amino acids							
Human	Lys	Glu	His	Ile	Val	Glu	Phe	Lys
(A)	Lys	Glu	His	Lys	Val	Met	Phe	Lys
(B)	Lys	Glu	Lys	Ile	Val	Glu	Phe	Lys
(C)	Lys	Asp	His	Leu	Val	Met	Phe	Lys
(D)	Lys	Val	His	Asn	Val	Glu	Phe	Lys

QUESTION 20

Which of the following are features of both microevolution and macroevolution?

(A) mutations only

(B) mutations and gene flow only

(C) gene flow and genetic drift only

(D) mutations, gene flow and genetic drift

THIS PAGE IS INTENTIONALLY BLANK

THIS PAGE IS INTENTIONALLY BLANK

THIS PAGE IS INTENTIONALLY BLANK

References

Question 18

Image adapted from ‘Butterfly insect wings’ by Clker-Free-Vector-Images on Pixabay

Reference ‘Parental generation’, Cyberbridge, http://cyberbridge.mcb.harvard.edu/evolution_4.html