

External assessment 2021

Multiple choice question book

Biology

Paper 1

General instruction

- Work in this book will not be marked.



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Section 1

QUESTION 1

In mammals, inherited mutations can cause variations in the genotype of offspring when they occur in

- (A) red blood cells.
- (B) somatic cells.
- (C) nerve cells.
- (D) sex cells.

QUESTION 2

The process of change in the species structure of an ecological community over time is known as

- (A) cyclic succession.
- (B) primary succession.
- (C) ecological succession.
- (D) secondary succession.

QUESTION 3

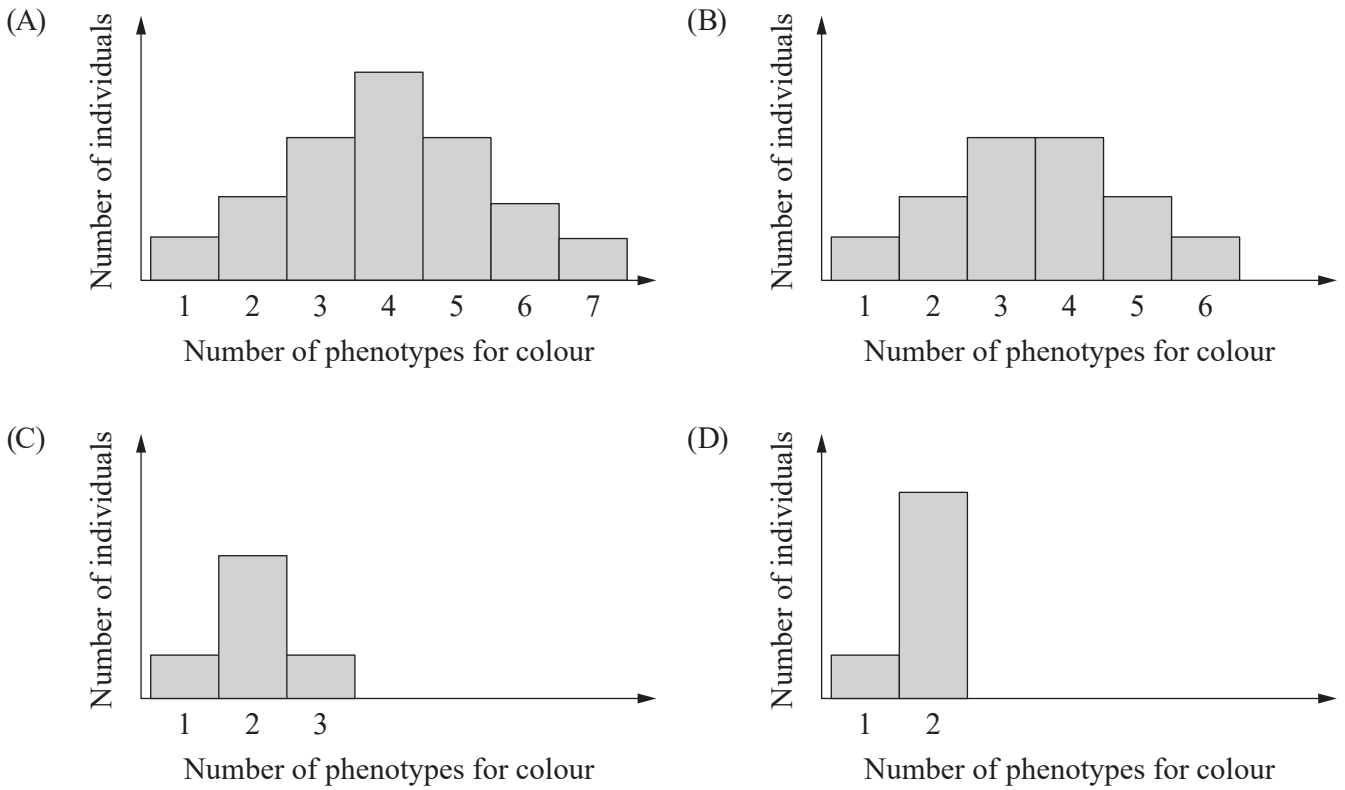
In ocean food webs, where phytoplankton is in the first trophic level, the second trophic level of zooplankton often has a higher biomass than the phytoplankton at any given time. Which explanation would account for this?

- (A) The zooplankton are also able to photosynthesize.
- (B) Different phytoplankton species are preying on each other.
- (C) Carnivores in the third trophic level have increased their consumption of zooplankton.
- (D) The phytoplankton multiply much faster than zooplankton, but their lifespan is shorter.

QUESTION 4

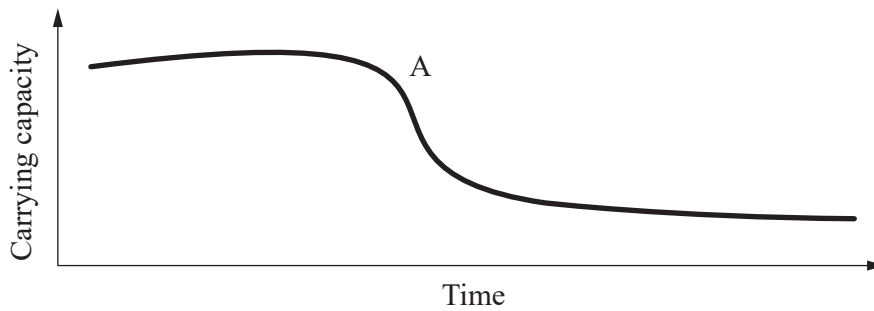
To demonstrate polygenic inheritance of colour in wheat, a cross was performed between two intermediate parents ($AaBbCc \times AaBbCc$). Each dominant allele adds a 'unit' of colour to the phenotype.

Which graph would depict the number of individuals and number of phenotypes for the cross?



QUESTION 5

The graph shows changes for a penguin population and the theoretical carrying capacity of the environment.

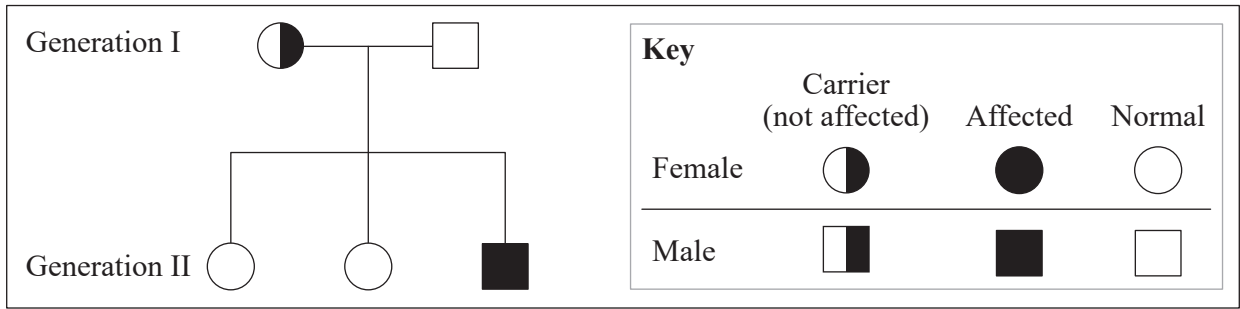


Point A on the graph indicates a change in carrying capacity triggered by

- (A) an increase in penguin pathogens.
- (B) a decrease in the number of mates available.
- (C) a reduction in space available for nesting sites.
- (D) an introduced disease affecting the penguins' survival rates.

QUESTION 6

The pedigree traces a genetic disease across two generations.

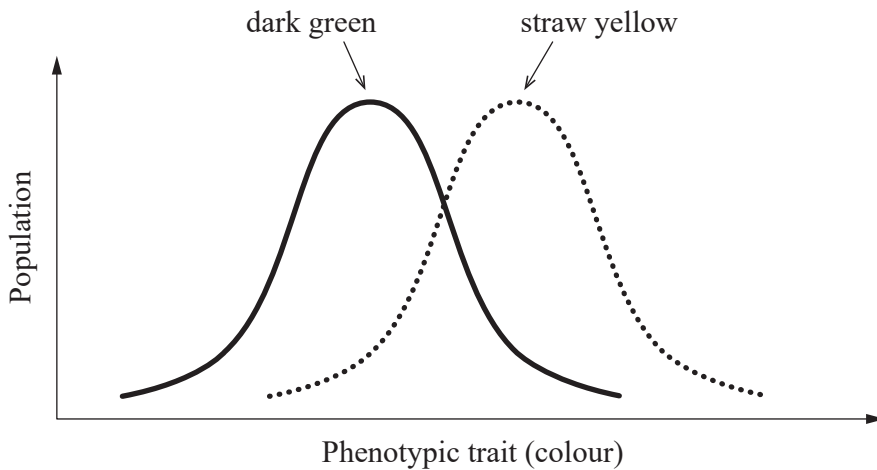


The inheritance pattern of this disease can be classified as

- (A) incomplete dominant.
- (B) autosomal dominant.
- (C) sex linked.
- (D) polygenic.

QUESTION 7

In a long-term study of grasshopper colour in a grassland ecosystem, it was found that the most abundant phenotype changed from dark green to straw yellow.



This change in the phenotype is an example of

- (A) diversifying selection.
- (B) directional selection.
- (C) stabilising selection.
- (D) disruptive selection.

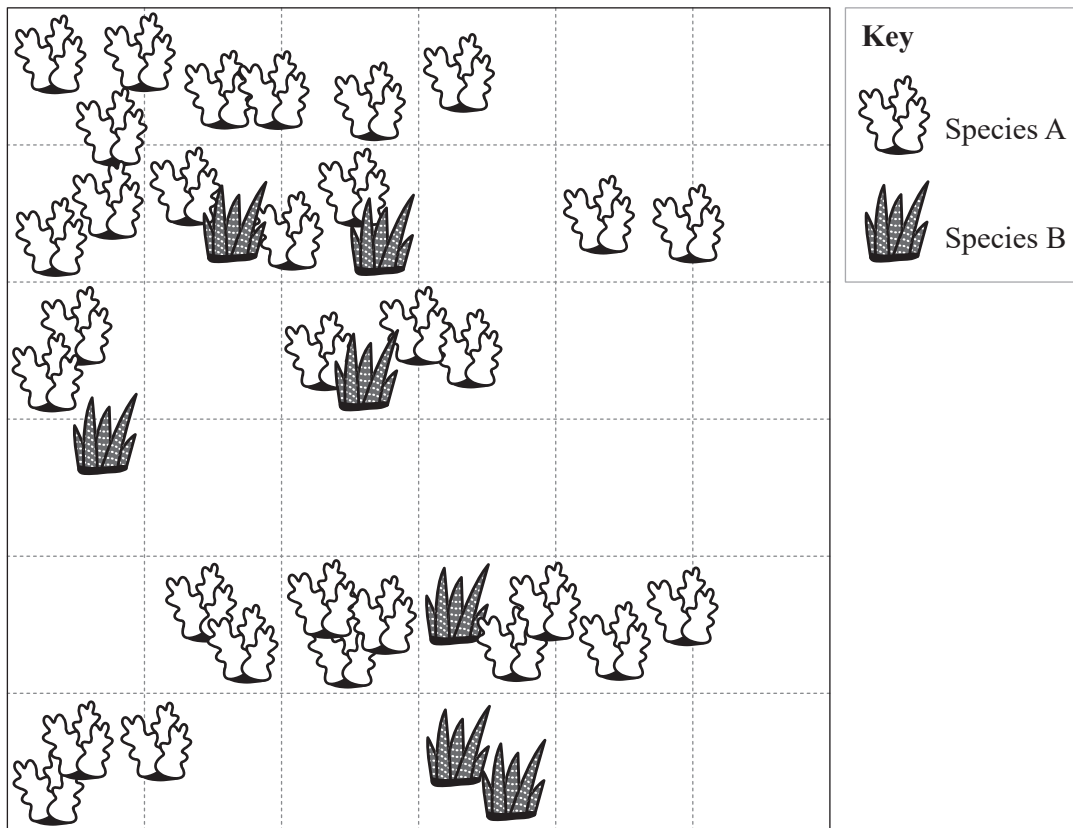
QUESTION 8

The place where an organism lives is called its

- (A) niche.
- (B) habitat.
- (C) community.
- (D) environment.

QUESTION 9

The image represents a gridded quadrat of 20 cm × 20 cm squares used in a plant survey. To calculate cover for a species, the surveyor identified each plant species and then counted the number of squares in which the species appeared.



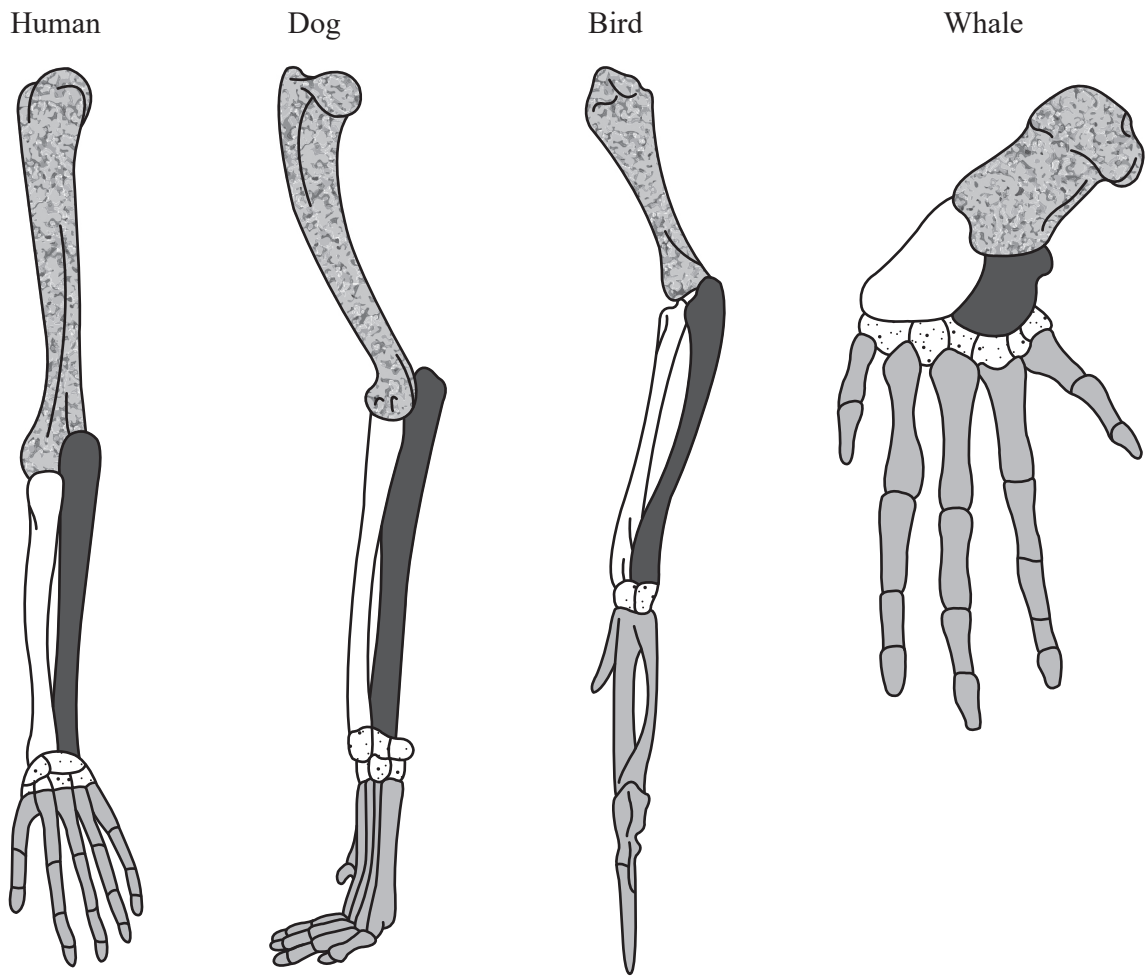
Not to scale

What is the approximate percentage cover of Species A?

- (A) 22%
- (B) 44%
- (C) 53%
- (D) 58%

QUESTION 10

The forelimbs of humans, dogs, birds and whales have a very similar pattern of bones.



Not to scale

The similarity of these structures is best explained by which pattern of evolution?

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

QUESTION 11

In which environment would primary succession occur?

- (A) fresh lava field
- (B) harvested wheat crop
- (C) grassland cleared by fire
- (D) forest damaged by a cyclone

QUESTION 12

The phenotypic expression of genes is regulated by

- (A) transcription factors.
- (B) random fertilisation.
- (C) DNA polymerase.
- (D) helicase.

QUESTION 13

Which combination of processes demonstrates spermatogenesis?

	Where process occurs	Outcome of process
(A)	testes	one functional gamete with 2–3 polar bodies
(B)	ovaries	four functional haploid gametes
(C)	testes	four functional haploid gametes
(D)	ovaries	one functional gamete with 2–3 polar bodies

QUESTION 14

Which event could cause a frameshift mutation?

- (A) non-disjunction during meiosis
- (B) error during replication
- (C) base pair substitution
- (D) heat damage

QUESTION 15

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 who has 45 chromosomes ($2n-1$) due to an autosomal condition, which condition do they have?

- (A) Cri du chat syndrome
- (B) Down syndrome
- (C) Klinefelter syndrome
- (D) Turner syndrome

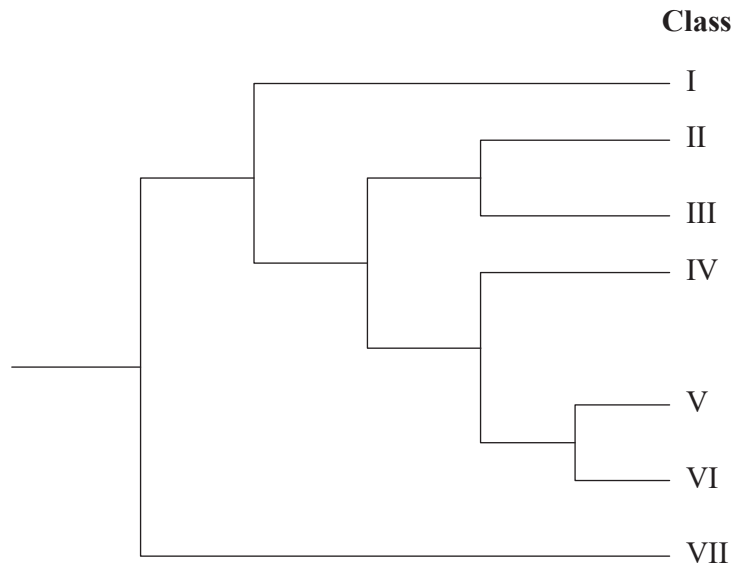
QUESTION 16

A small group of dingoes migrated to a new area and established a population. After several generations, the new population showed a different genetic composition from the original population. This is an example of

- (A) microevolution and gene flow.
- (B) macroevolution and gene flow.
- (C) microevolution and genetic drift.
- (D) macroevolution and genetic drift.

QUESTION 17

This is a cladogram for seven different classes of organisms (I–VII).



Which two classes of organisms are most closely related?

- (A) I and VII
- (B) IV and VI
- (C) I and II
- (D) III and IV

QUESTION 18

Which scenario would create a selection pressure on a given population?

- (A) change in fur colour
- (B) change in weather patterns
- (C) greater resistance to disease
- (D) improved ability to locate food sources

QUESTION 19

What is the role of DNA polymerase in DNA replication?

- (A) breaking the hydrogen bonds that hold the complementary bases of DNA together
- (B) adding complementary nucleotide bases to the exposed DNA strands
- (C) sealing the sequence of DNA into two continuous double strands
- (D) joining RNA primers to the lagging strand of DNA

QUESTION 20

A keystone species is defined as a species that

- (A) is the top predator in an ecosystem.
- (B) is a major producer in an ecosystem.
- (C) has a unique and crucial role in an ecosystem.
- (D) directly influences all species in an ecosystem.

References

Question 10

Adapted from OpenStax 2018, *Figure 6* in 'OpenStax Biology 2e', *Lumencandela*, available at <https://courses.lumenlearning.com/suny-osbiology2e/chapter/understanding-evolution/>. Licensed under CC BY 4.0.



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