Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Standard level
Paper 1A

12 May 2025

Zone A afternoon | **Zone B** afternoon | **Zone C** afternoon

1 hour 30 minutes [Paper 1A and Paper 1B]

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer all questions.
- For each question, choose the answer you consider to be the best and indicate your choice on the answer sheet provided.
- A calculator is required for this paper.
- The maximum mark for paper 1A is **[30 marks]**.
- The maximum mark for paper 1A and paper 1B is **[55 marks]**.

18 pages

2225 – 6010
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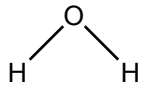
1. Which symbol indicates the polarity of the oxygen atom in the water molecule?



A. $\delta +$

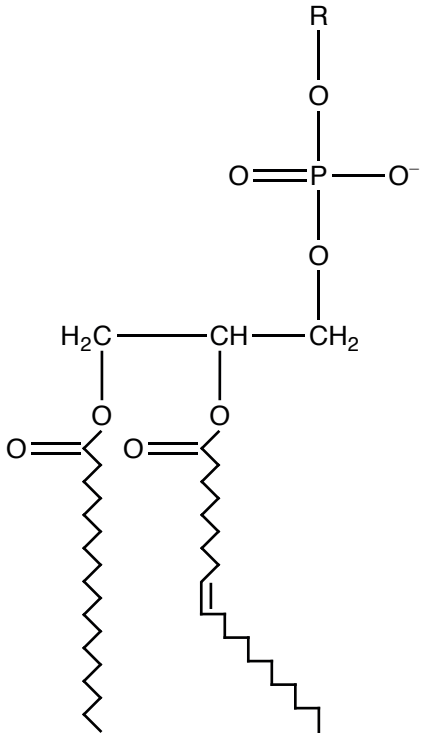
B. $\delta -$

C. $+$

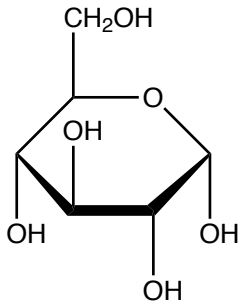
D. $-$

2. Which of these molecules is amphipathic?

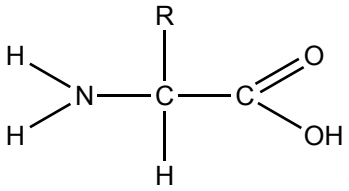
A.



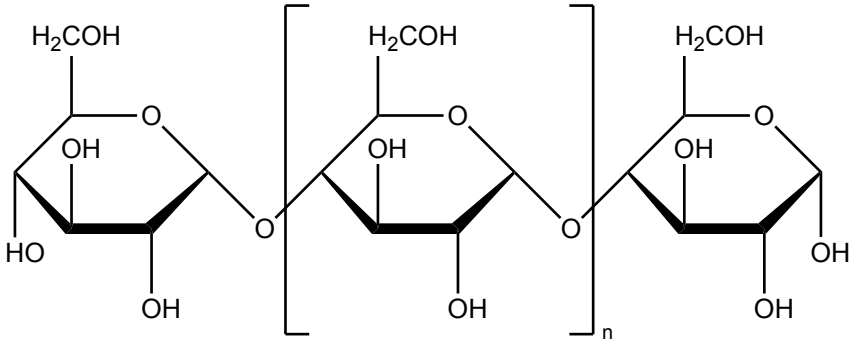
B.



C.



D.



3. What describes the structure of cellulose?

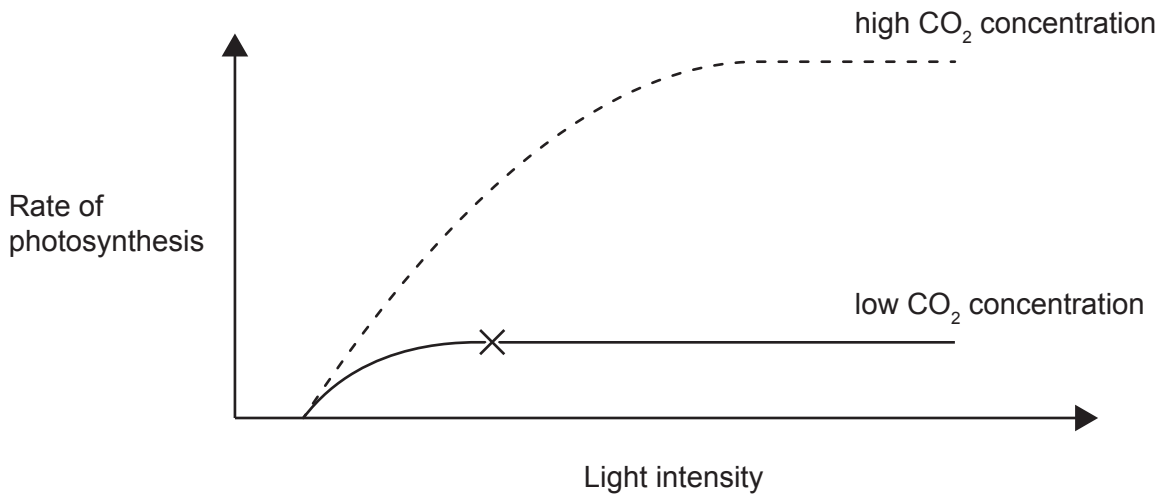
A. Branched with bonds between alpha-glucose and beta-glucose molecules

B. Branched with bonds between alpha-glucose molecules

C. Linear with bonds between alpha-glucose molecules

D. Linear with bonds between beta-glucose molecules

4. The graph shows the effect of light intensity on the rate of photosynthesis of a green plant at different CO_2 concentrations. The temperature is kept constant at 25 °C.



What is the limiting factor at ×?

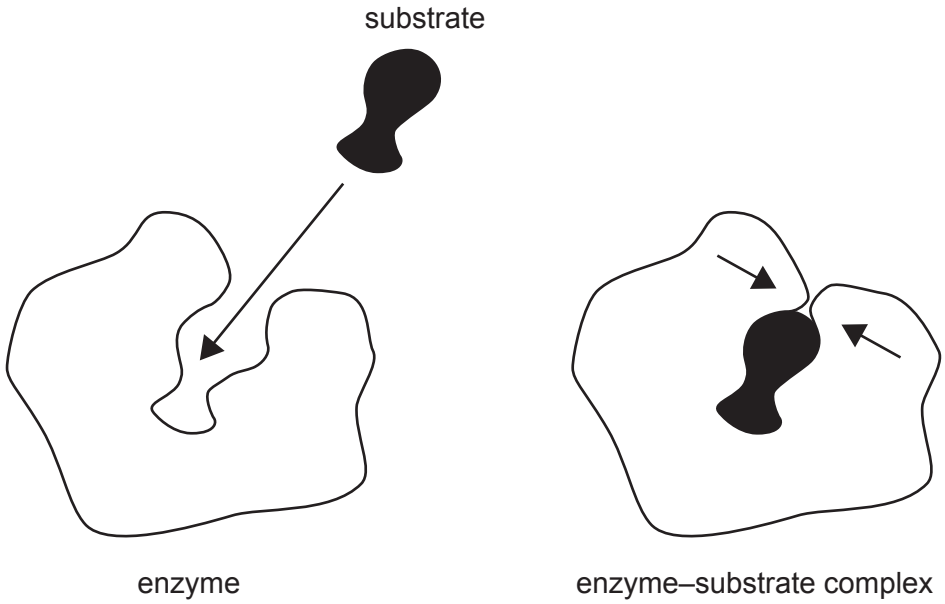
A. Chlorophyll

B. CO_2 concentration

C. Temperature

D. Light intensity

5. The diagram shows the formation of an enzyme–substrate complex.



What describes the process shown in the diagram?

A. The lock and key hypothesis, as the substrate is complementary to the enzyme.

B. The substrate permanently alters the shape of the enzyme's active site.

C. The substrate and the active site have the same shape.

D. The active site changes shape to accommodate the substrate in the induced-fit model.

6. What occurs during translation?

I. Polypeptides synthesised on ribosomes

II. RNA polymerase catalyses polypeptide synthesis

III. Complementary base pairing between codons and anticodons

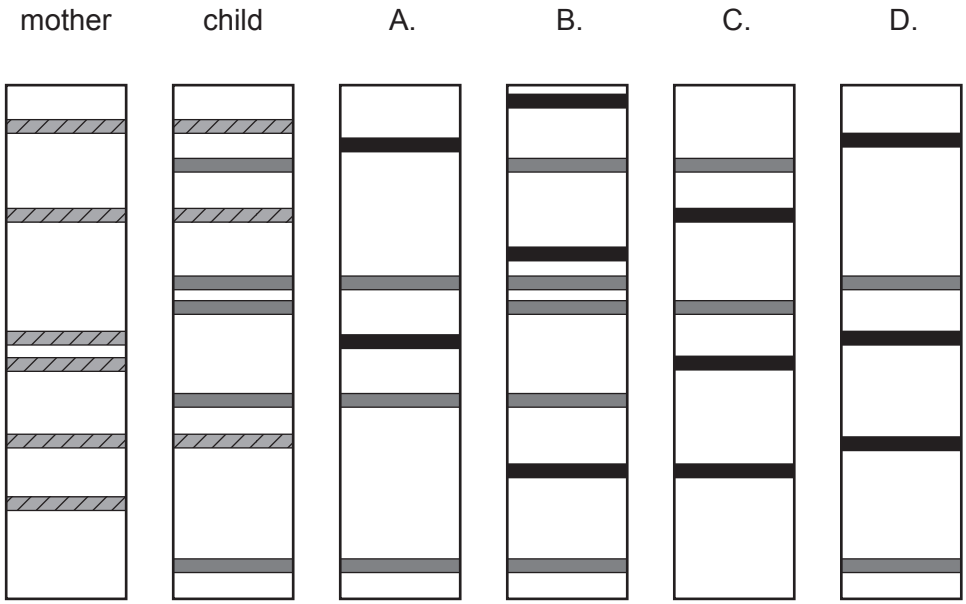
A. I and II only

B. I and III only

C. II and III only

D. I, II and III

7. The DNA profile from a paternity test shows six profiles. Who is the child's father?



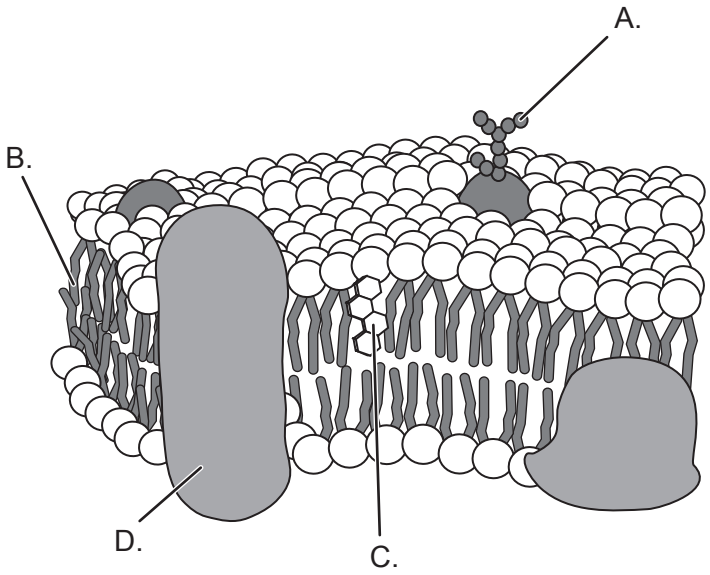
8. The table shows features of three types of cells (X, Y and Z).

Feature	**Cell**		
	X	**Y**	**Z**
Cell wall	absent	present	present
Centrioles	present	absent	absent
Large vacuole	absent	present	present
Plastids	absent	present	absent

To which kingdom do each of the cells belong?

	X	**Y**	**Z**
A.	Animal	Fungi	Plant
B.	Fungi	Animal	Protist
C.	Animal	Plant	Fungi
D.	Protist	Animal	Plant

9. Which part of the membrane allows cell recognition?



10. Which term describes very early-stage embryonic stem cells in a mouse?

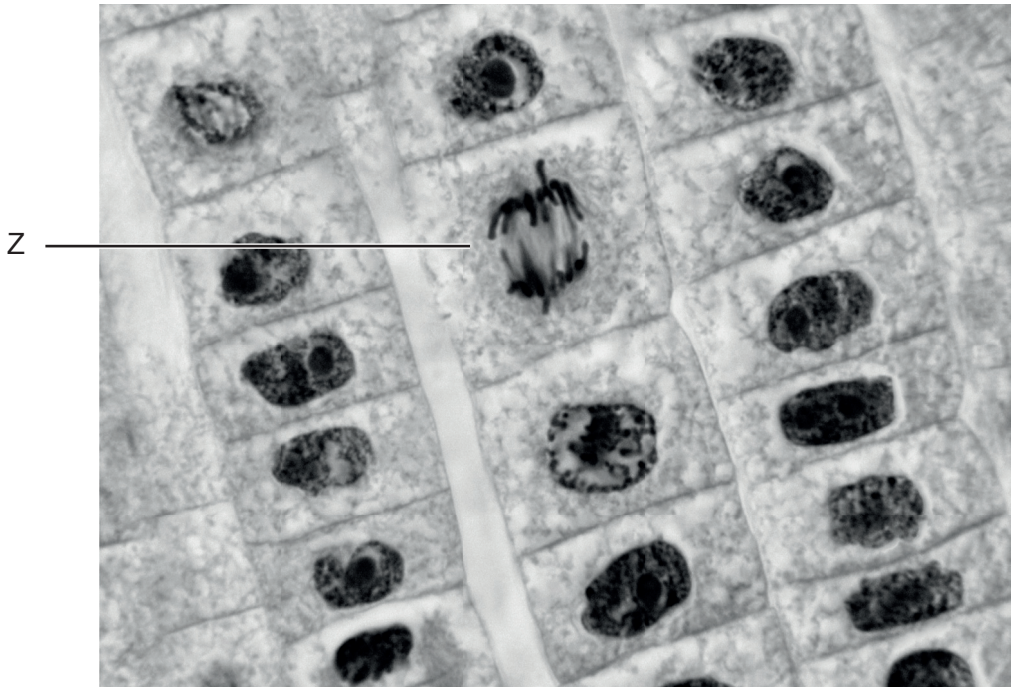
A. Totipotent

B. Pluripotent

C. Multipotent

D. Unipotent

11. The micrograph shows onion (*Allium cepa*) root tip cells dividing by mitosis.



In which phase is cell Z?

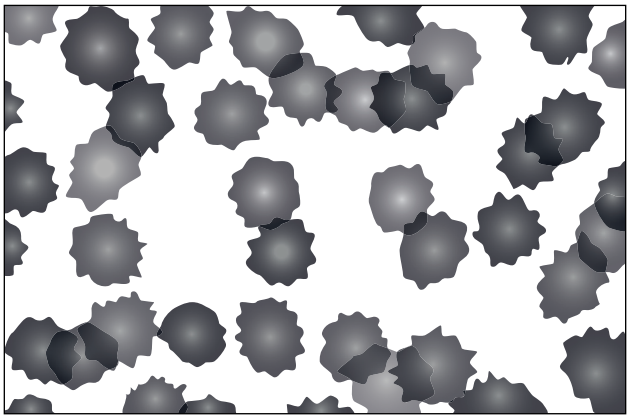
A. Interphase

B. Prophase

C. Metaphase

D. Anaphase

12. The image shows human blood cells immersed in a solution.



What can be deduced from the image?

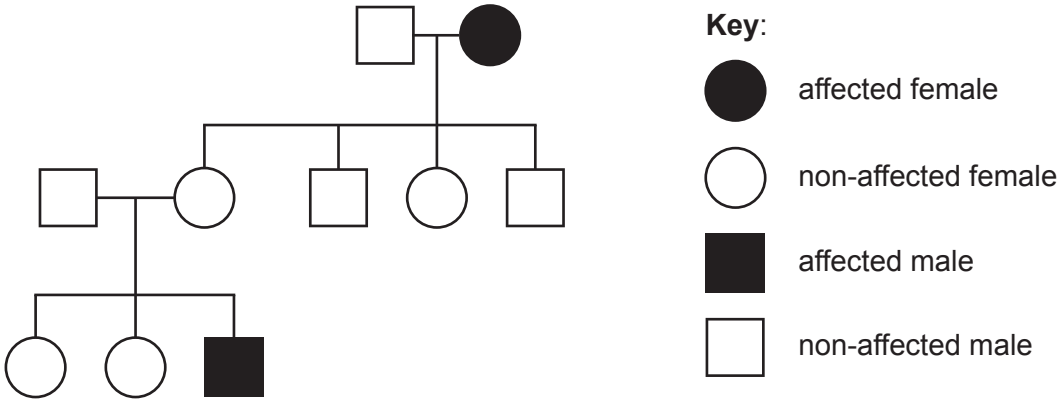
A. The solution is hypotonic as the cells are crenated.

B. The solution is hypotonic as the cells are turgid.

C. The solution is hypertonic as the cells are crenated.

D. The solution is hypertonic as the cells are turgid.

13. A pedigree chart is shown.



What is the most likely pattern of inheritance?

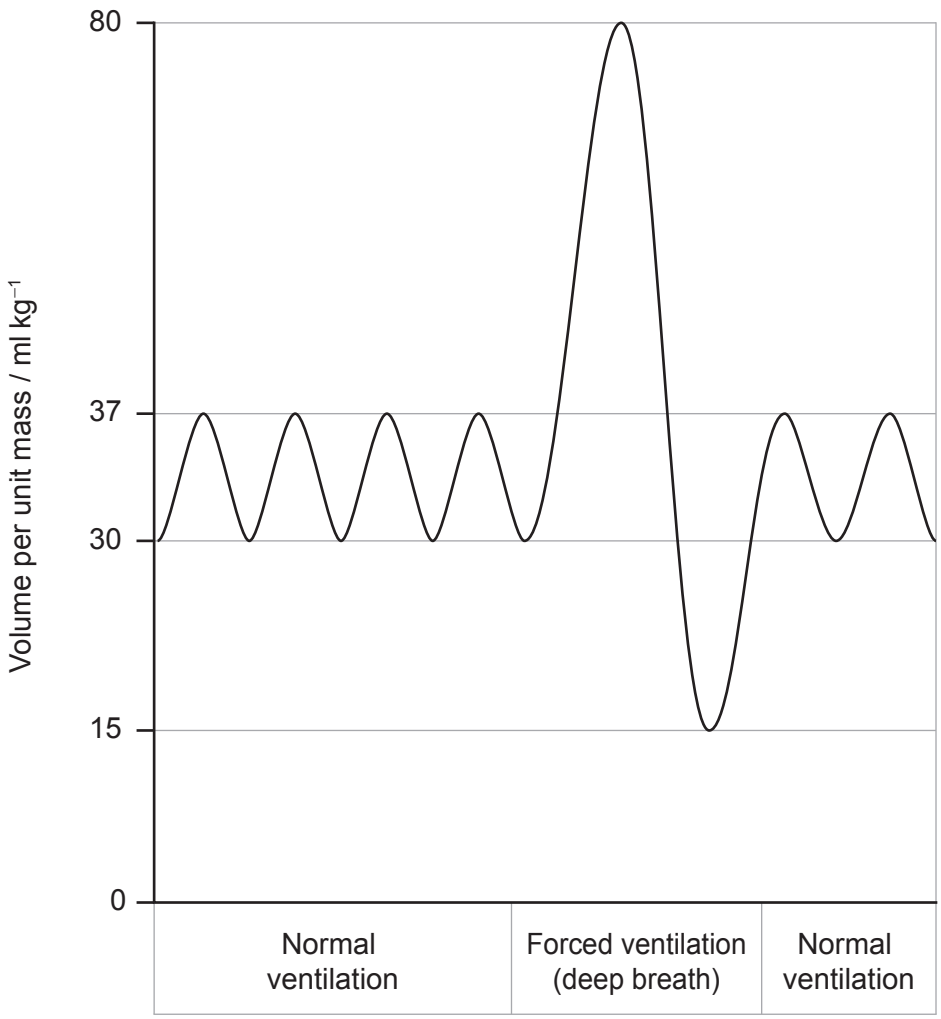
A. Sex-linked recessive

B. Sex-linked dominant

C. Autosomal recessive

D. Autosomal dominant

14. The graph shows changes in lung volume during normal ventilation and forced ventilation (taking a deep breath).



What is the vital capacity?

A. $7\,ml\,kg^{-1}$

B. $37\,ml\,kg^{-1}$

C. $65\,ml\,kg^{-1}$

D. $80\,ml\,kg^{-1}$

15. What are features of veins?

	Valves	**Wall**
A.	present	thick
B.	absent	thick
C.	absent	thin
D.	present	thin

16. Which row has the correct information regarding the endocrine system?

	Gland	**Hormone**	**Action**
A.	pineal	melatonin	controls circadian rhythm
B.	adrenal	Epinephrine (adrenaline)	controls circadian rhythm
C.	adrenal	melatonin	prepares the body for vigorous activity
D.	pineal	Epinephrine (adrenaline)	prepares the body for vigorous activity

17. Which of these structures is most likely to be the effector in a pain reflex arc?

A. Grey matter

B. Skeletal muscle

C. Motor neuron

D. Pineal gland

18. Which cell type is part of the innate immune system?

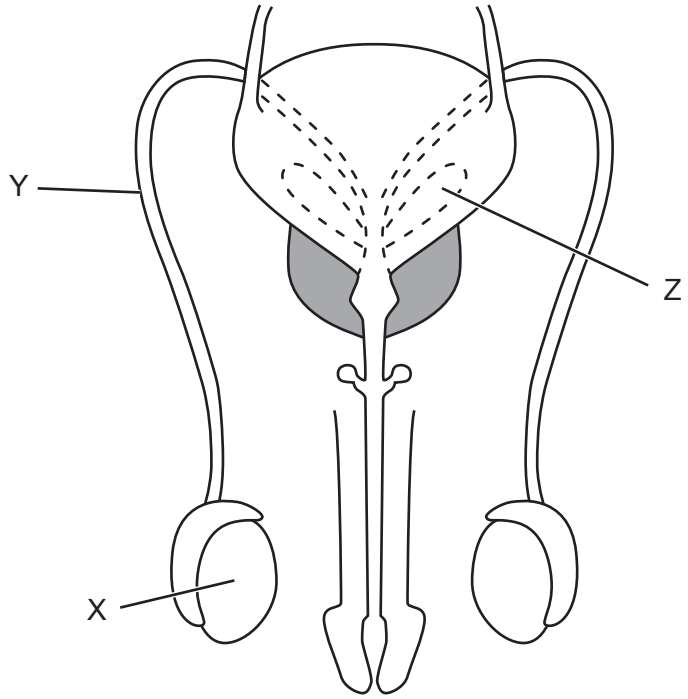
A. Phagocytes

B. B-lymphocytes

C. T-lymphocytes

D. Helper T-cells

19. The diagram shows the male reproductive system in front view.



Which structures are indicated by the letters X, Y and Z?

	X	**Y**	**Z**
A.	testis	sperm duct	seminal vesicle
B.	epididymis	sperm duct	prostate gland
C.	testis	urethra	prostate gland
D.	epididymis	urethra	seminal vesicle

20. A *Mirabilis jalapa* plant with red flowers was crossed with one with white flowers. All plants in the F1 generation had pink flowers. What phenotype ratio would be expected in the F2 generation?

A. 100 % pink

B. 50 % red and 50 % white

C. 25 % white, 50 % pink and 25 % red

D. 75 % red and 25 % white

21. What is the body's response to an increase in environmental temperature?

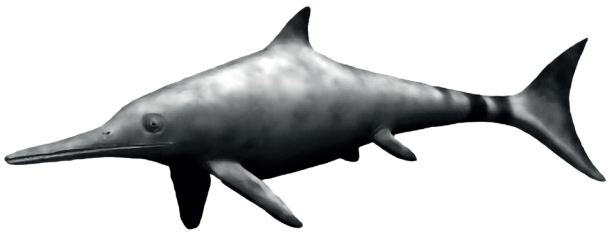
A. Uncoupled respiration in brown adipose tissue

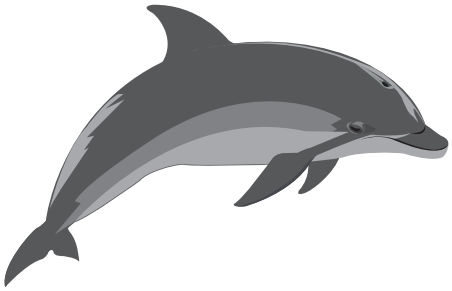
B. Vasodilation

C. Vasoconstriction

D. Shivering

22. The images show an ichthyosaurus and a dolphin. Ichthyosaurus is an extinct aquatic reptile, known only from fossil remains. Dolphins are mammals.





How have these species evolved?

A. Their streamlined bodies show divergent evolution.

B. Their streamlined bodies are analogous structures.

C. Their pentadactyl limbs are an example of convergent evolution.

D. Their pentadactyl limbs are analogous structures.

23. The North Island giant moa (*Dinornis novaezealandiae*) went extinct some time between the arrival of humans in New Zealand and the 1800s.

What do scientists believe to be the cause of this extinction?

A. Deforestation

B. New diseases

C. Competition with other megafauna

D. Overhunting

24. What is an abiotic factor in an ecosystem?

A. The mutualistic relationship between zooxanthellae and coral

B. The predator–prey relationship between wolves and elk

C. The salinity surrounding marram grass on a sand dune

D. An infectious disease affecting a population of rabbits

25. What occurs during competitive exclusion between two species?

I. They compete for the same resources so cannot coexist in the same niche.

II. Competing species are regulated by predators in the ecosystem.

III. Both species are restricted to a part of their fundamental niche.

A. I and II only

B. I and III only

C. III only

D. I, II and III

26. A capture–mark–release–recapture experiment was used, together with the Lincoln index formula (population size estimate = M × N/R), to estimate the population size of common periwinkles (*Littorina littorea*) on a rocky shore. The table shows the data collected.

Individuals captured and marked initially	100
Individuals recaptured	50
Marked individuals recaptured	10

What is the estimated size of the population?

A. 160

B. 500

C. 1000

D. 5000

27. The paradise tree (*Ailanthus altissima*) produces a chemical called ailanthone which inhibits the growth of other plants. What is this process?

A. Allelopathy

B. Endemism

C. Mutualism

D. Herbivory

28. Which organisms use oxidation of simple inorganic substances as an energy source?

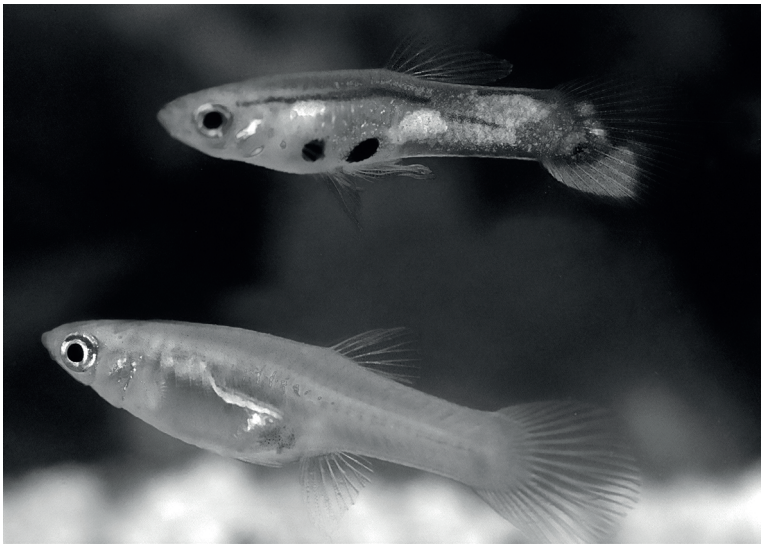
A. Photoautotrophs

B. Heterotrophs

C. Chemoautotrophs

D. Saprotrophs

29. John Endler's experiments modelled sexual and natural selection in Trinidadian guppies (*Poecilia reticulata*) by controlling selection pressures.



What did the experiments of John Endler demonstrate?

A. Guppies have no predators in their natural habitat.

B. Male guppies prefer dull-coloured females for mating.

C. Predation influences the colour of guppies in different environments.

D. Guppies are not affected by the presence of other fish species.

30. What directly causes oxygen levels to drop during eutrophication in aquatic ecosystems?

A. Increased photosynthesis by aquatic plants

B. Enhanced respiration by fish

C. More decomposition of organic matter by bacteria

D. Lower levels of nitrogen in the water

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References:

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