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]

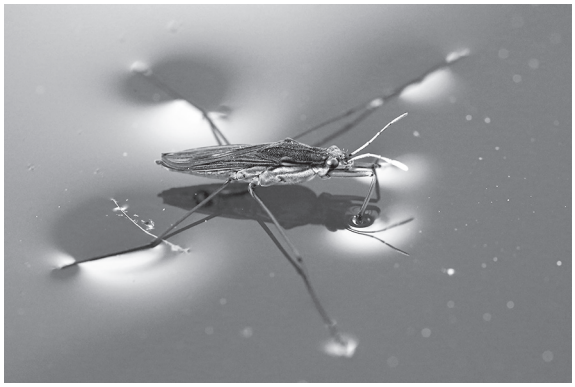
Instructions to candidates

- 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]**.

2225 – 6022

16 pages

1. The photograph shows a pond skater.



Which property of water allows the insect to walk on water?

A. Adhesion

B. Capillarity

C. Surface tension

D. Transparency

2. What allows DNA to store very large amounts of data?

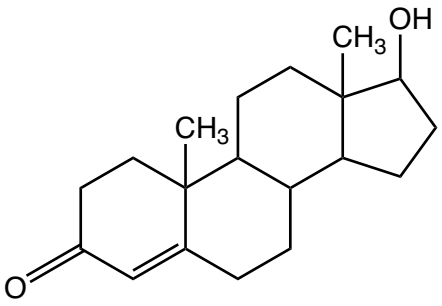
A. Two strands of DNA

B. Base sequence

C. Complementary base pairing

D. Sugar–phosphate backbone

3. A simplified diagram of molecule X is shown.



What describes molecule X?

A. Lipid able to pass through the bilayer of membranes

B. Lipid used for energy storage in mammals

C. Carbohydrate transported in the blood

D. Carbohydrate used for energy storage in plants

4. What must vegans ensure when they plan their diet?

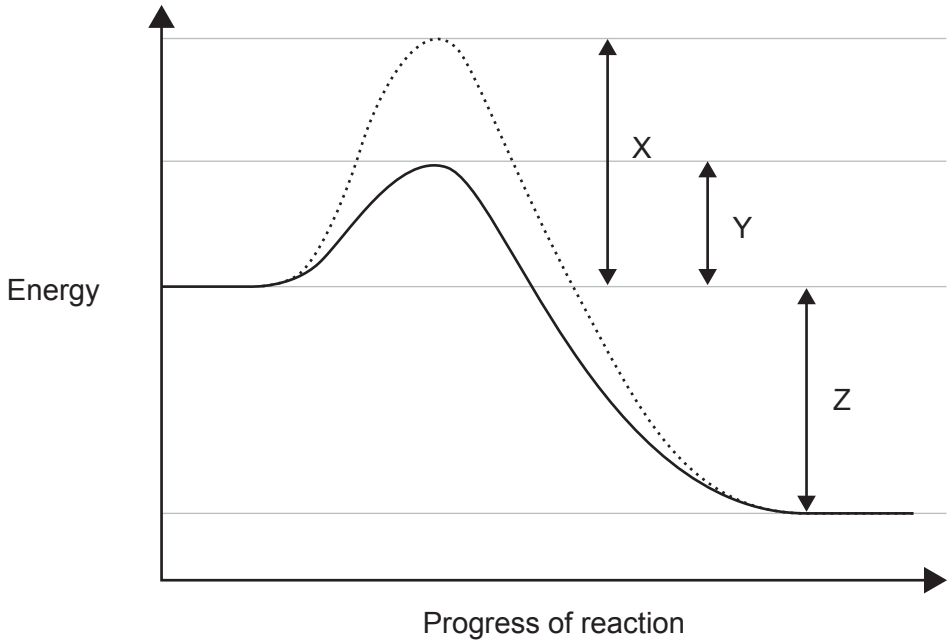
A. Higher protein consumption than meat-eaters

B. Sufficient quantities of all essential amino acids are consumed

C. Only proteins with all 20 amino acids are consumed

D. Higher fat consumption than meat-eaters

5. The graph shows energy changes during a reaction both with and without an enzyme present.



Which statement correctly identifies two of the regions labelled X, Y and Z in the graph?

A. X is the activation energy with an enzyme and Z is the net energy released from the reaction.

B. X is the energy released from the reaction and Y is the activation energy with an enzyme.

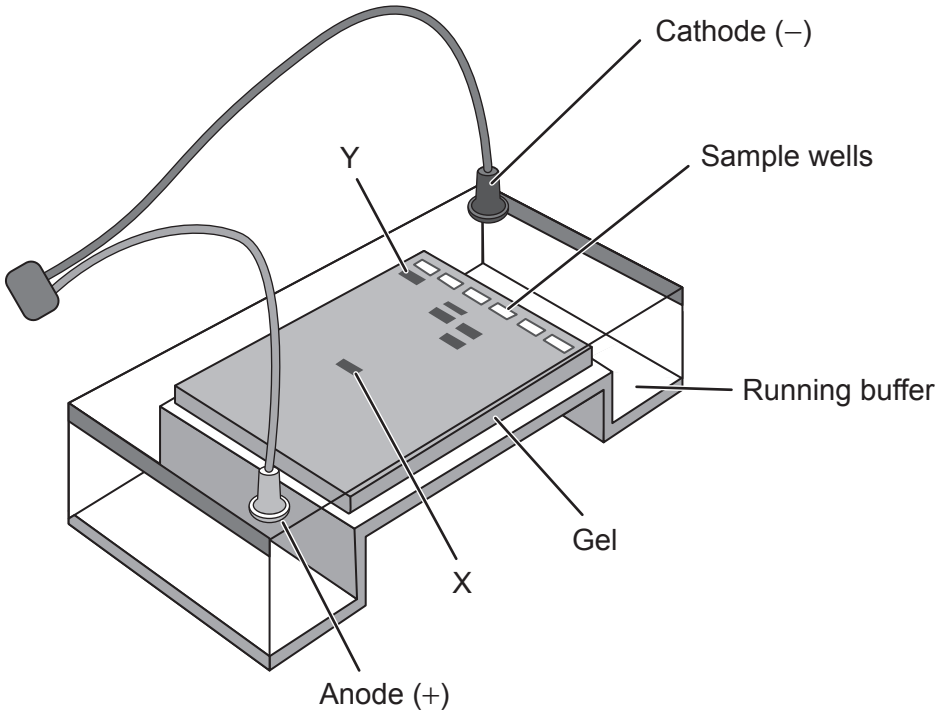
C. Y is the energy released with an enzyme and Z is the energy released when bonds are broken.

D. Y is the activation energy with an enzyme and Z is the net energy released.

6. What are the product(s) and site of anaerobic respiration in human cells?

	Product	**Site of anaerobic respiration**
A.	lactate	mitochondria
B.	carbon dioxide + water	mitochondria
C.	lactate	cytoplasm
D.	carbon dioxide + water	cytoplasm

7. The diagram shows a gel electrophoresis apparatus.



What can be deduced from the diagram?

A. X is the smallest fragment.

B. Y is positively charged.

C. X is moving towards the cathode.

D. Y travels at the greatest rate.

8. What is a feature of mutations?

A. They occur randomly.

B. They only occur in germ cells.

C. The frequency cannot be increased by external factors.

D. They only occur in certain base sequences of the genome.

9. Which cell organelle is common to all prokaryotic and eukaryotic cells?

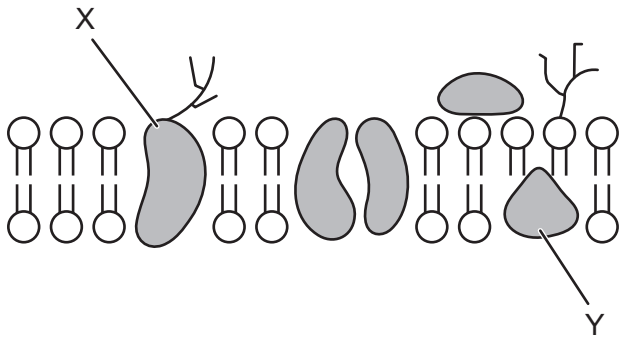
A. Nucleus

B. Cell wall

C. Vesicle

D. Ribosome

10. The diagram shows a portion of fluid mosaic membrane.



What are the membrane structures X and Y?

	X	Y
A.	glycoprotein	integral protein
B.	integral protein	peripheral protein
C.	channel protein	integral protein
D.	glycoprotein	peripheral protein

11. Which is a description of stem cells?

A. Hair follicle stem cells are pluripotent.

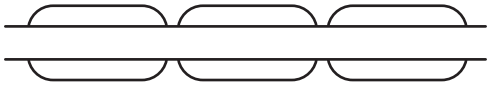
B. Stem cells in bone marrow are multipotent.

C. Very early embryo stem cells are pluripotent.

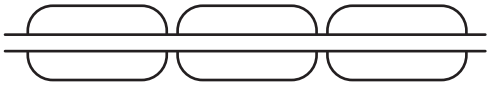
D. Late embryo stem cells are totipotent.

12. The diagrams represent sections through different axons. Which axon has the slowest speed of impulse?

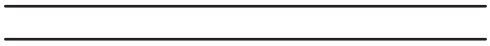
A.



B.



C.



D.

13. What occurs during both mitosis and meiosis?

A. Chromatids are held together by microtubules.

B. Homologous chromosomes are separated.

C. Crossing over occurs.

D. Chromatids are separated.

14. The salamander genus *Ensatina* from California, USA, has evolved several different forms, depending on location. Two such forms are shown.

What determines if these forms are members of the same species?

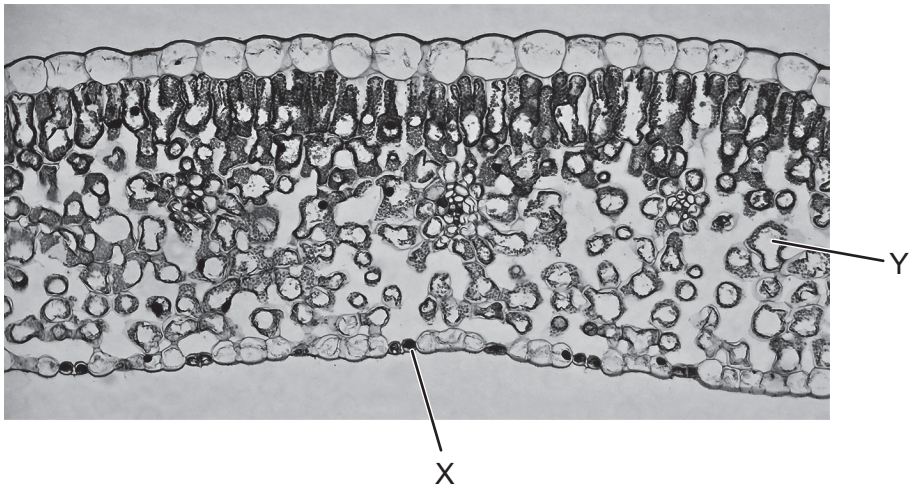
A. Have similar appearance

B. Populations mix freely

C. Produce fertile offspring

D. Can interbreed

15. A cross section of a lily leaf (*Lilium spp.*) is shown.



Which leaf structures are represented by labels X and Y?

	X	Y
A.	palisade mesophyll cell	phloem cell
B.	epidermal cell	palisade mesophyll cell
C.	spongy mesophyll cell	guard cell
D.	guard cell	spongy mesophyll cell

16. What happens in humans to cause inhalation of air?

A. The diaphragm contracts, causing pressure in the thorax to decrease.

B. Abdominal muscles contract, causing pressure in the thorax to decrease.

C. The diaphragm contracts, causing pressure in the thorax to increase.

D. Intercostal muscles contract, causing pressure in the thorax to increase.

17. What describes the control mechanisms for peristalsis that ensure coordinated passage of material through the digestive system?

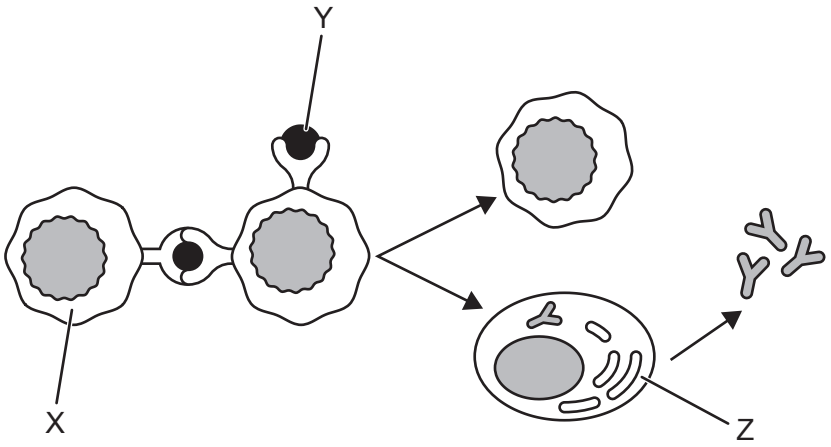
A. Voluntary control by the central nervous system

B. Involuntary control by the enteric nervous system

C. Involuntary control by the central nervous system

D. Voluntary control by the enteric nervous system

18. The diagram shows stages in an immune response.



What is represented by labels X, Y and Z?

	X	Y	Z
A.	helper T-cell	antibody	plasma cell
B.	B-cell	antigen	memory B-cell
C.	helper T-cell	antigen	plasma cell
D.	B-cell	antibody	memory B-cell

19. Which illness is an example of a zoonosis?

A. Common cold

B. Rabies

C. Cholera

D. Coronary heart disease

20. What happens during fertilization in humans?

A. The nuclear membranes of sperm and egg break down.

B. The sperm enters the egg.

C. The chromosomes undergo joint meiosis.

D. Mitochondria in the zygote come from sperm and egg.

21. When white flowers of the species *Mirabilis jalapa* are fertilized by pollen from red flowers, the resulting plants produce pink flowers. What is the pattern of inheritance and the reason for this?

	Inheritance	**Reason**
A.	incomplete dominance	offspring show both parental phenotypes
B.	codominance	offspring show both parental phenotypes
C.	incomplete dominance	offspring show a blended phenotype of the parents'
D.	codominance	offspring show a blended phenotype of the parents'

22. What occurs if human body temperature decreases?

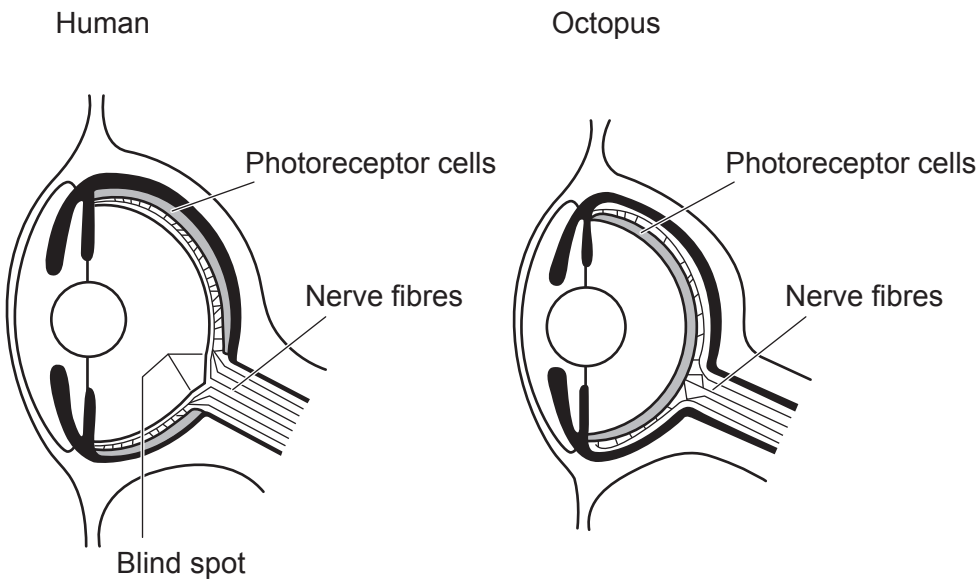
A. Thyroxin secretion decreases

B. Vasodilation of skin arterioles

C. Sweating increases

D. Shivering increases

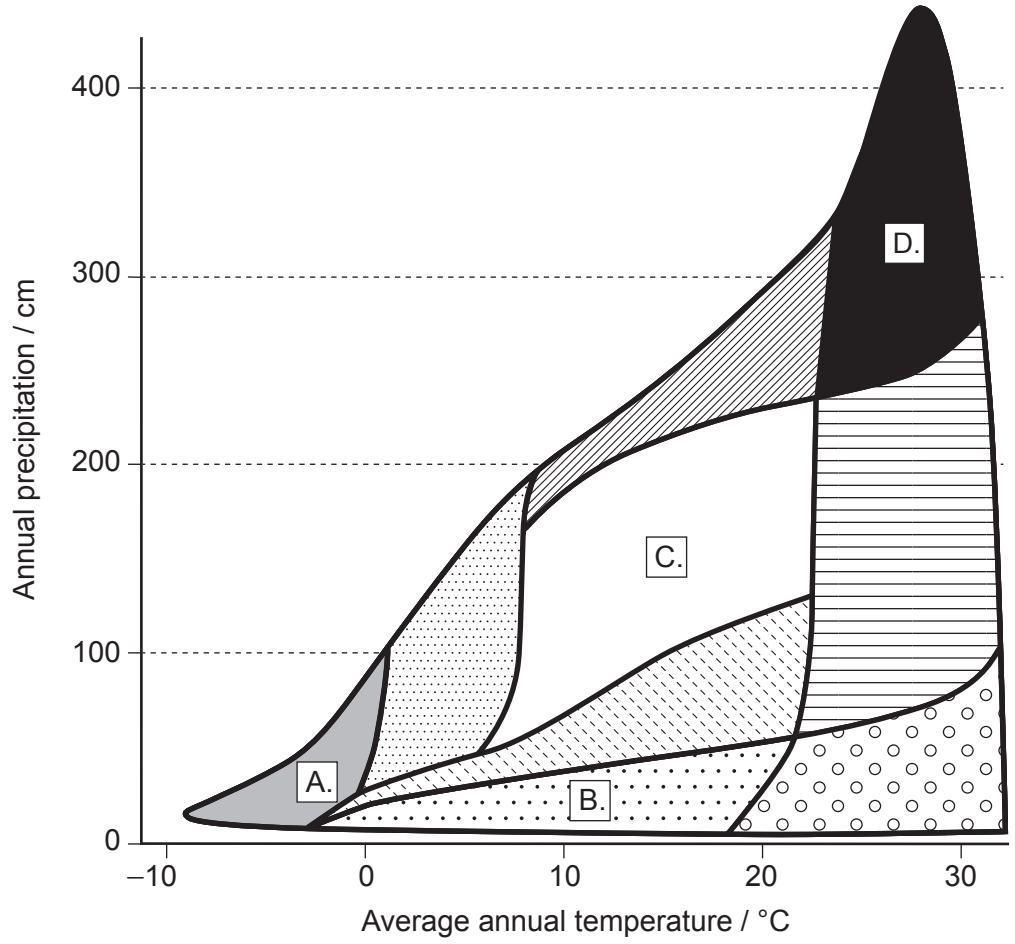
23. Human and octopus eyes have a similar structure and function but humans and octopuses have a different evolutionary origin.



What explains the similar structure of these eyes?

	Type of evolution	Relationship of structures
A.	convergent	analogous
B.	convergent	homologous
C.	divergent	homologous
D.	divergent	analogous

24. A graph of abiotic factors needed for biomes to develop is shown. Which label identifies temperate forest?



25. The image shows *Prorocentrum*, a coastal dinoflagellate that obtains energy from sunlight and from other organisms.

What best describes the mode of nutrition of *Prorocentrum*?

A. Mixotrophic

B. Autotrophic

C. Holozoic

D. Heterotrophic

26. *Bifidobacteria* living in human intestines can synthesise several B vitamins, such as folate and riboflavin. What is the type of interspecific relationship between these bacteria and humans?

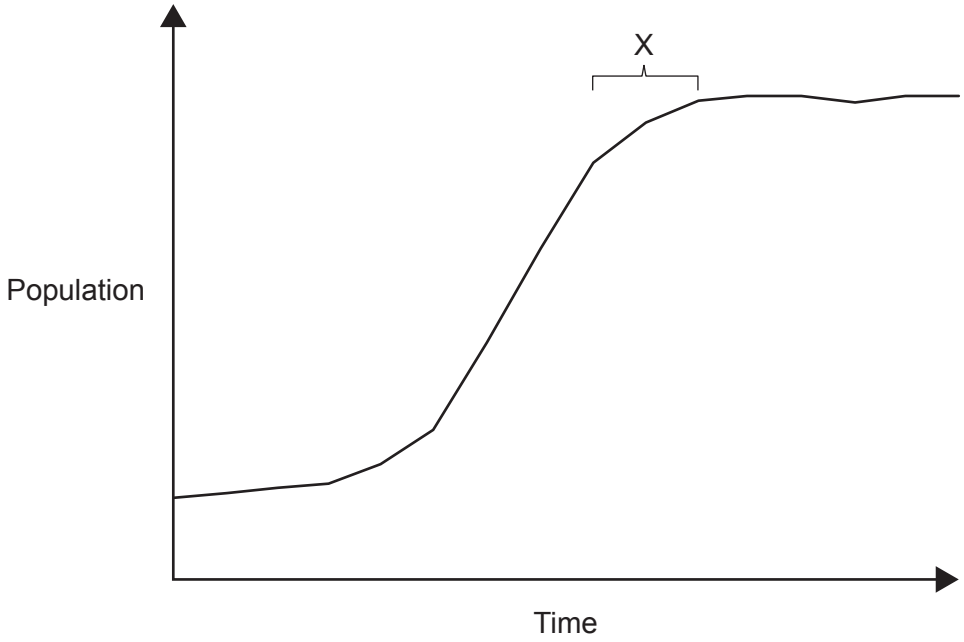
A. Pathogenicity

B. Predation

C. Parasitism

D. Mutualism

27. The graph shows a population growth curve.



What factor could cause the part of the graph indicated by X?

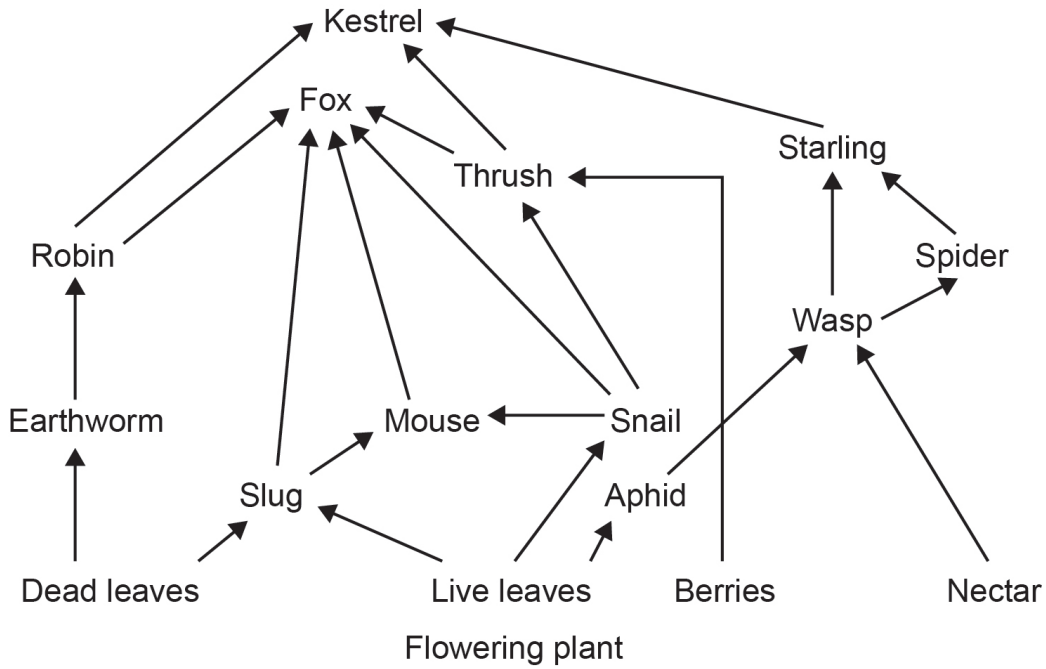
A. Increased food supply

B. Increased disease

C. Reduced predation

D. Reduced competition

28. A terrestrial food web is shown.



How many species in the food web are **only** primary consumers?

A. 3

B. 4

C. 5

D. 6

29. Which action is part of the rewilding of ecosystems?

A. Applying fertilizer

B. Removal of apex predators

C. Reintroduction of keystone species

D. Restricting size for easier management

30. Which action will decrease carbon sequestration?

A. Afforestation

B. Primary production

C. Deforestation

D. Rewetting peatlands

References:

1. Malsam, L., 2020. *Macro of Gerris lacustris or common pond skater.* [image online] Available at: https://www.gettyimages.co.uk/detail/photo/macro-of-gerris-lacustris-or-common-pond-skater-royalty-free-image/1225103683?phrase=pond+skater&adppopup=true [Accessed 13 May 2024]. Source adapted.

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15. Lazaj, D., 2021. *Lily leaf c.s. under microscope*. [image online] Available at: https://www.gettyimages.co.uk/detail/photo/lily-leaf-c-s-under-microscope-royalty-free-image/1335686572 [Accessed 13 May 2024]. Source adapted.

18. VectorMine. 2018. https://www.gettyimages.co.uk/detail/illustration/cells-and-t-cells-schematic-diagram-vector-royalty-free-illustration/907993572?phrase=Vectormine%20immune%20response&adppopup=true. Source adapted.

23. Philcha, 2008. *Vertebrate n octopus eyes*. [image online] Available at: https://commons.wikimedia.org/wiki/File:Vertebrate_n_octopus_eyes.png [Accessed 23 April 2024]. Source adapted. Public domain.

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25. Minami Himemiya. https://commons.wikimedia.org/wiki/File:Prorocentrum_micans.jpg. Licensed under CC BY-SA 3.0. https://creativecommons.org/licenses/by-sa/3.0.