Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Higher level
Paper 1A

11 May 2026

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

2 hours [Paper 1A and Paper 1B]

Instructions to students

- 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 **[40 marks]**.
- The maximum mark for paper 1A and paper 1B is **[75 marks]**.

2226 – 4028

22 pages

1. The common pond skater (*Gerris lacustris*) is an insect that can walk on the surface of water.

Which property of water allows it to do this?

A. Cohesion of water molecules to the legs of the insect

B. Attraction of water molecules to each other due to hydrogen bonding

C. Solvent properties of water linked to transport

D. Adhesion of water molecules to each other forming a surface tension

2. The table shows part of Chargaff's data on the approximate relative amounts of pyrimidines and purines in DNA. The values for guanine in wheat and thymine in sea urchin are not shown.

Organism	**Adenine / %**	**Cytosine / %**	**Guanine / %**	**Thymine / %**
Sea urchin	32.8	P	17.3	
Wheat	Q	22.7		27.1

What were his most likely results for P and Q?

	P	**Q**
A.	23.2	32.6
B.	17.7	27.3
C.	32.9	22.4
D.	25.1	24.9

3. Which statement about amino acids is correct?

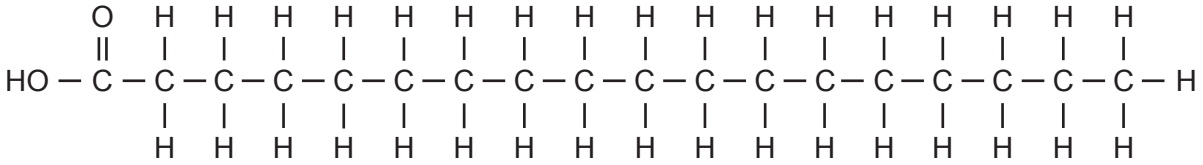
A. Essential amino acids are only contained in food obtained from animals.

B. Dipeptides are formed by the condensation of two amino groups.

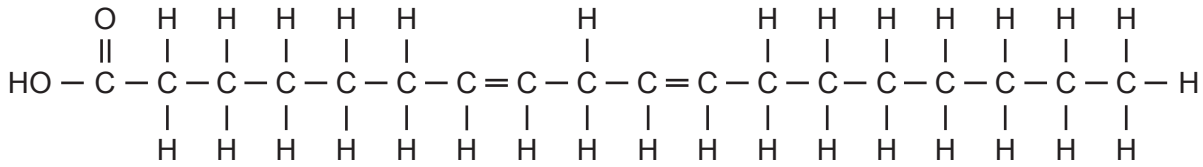
C. Vegans can convert some amino acids into other types of amino acid.

D. Amino acids all have the same R-group.

4. The diagrams show the structure of two fatty acids.



Stearic acid



Linoleic acid

Which statement about the two fatty acids is correct?

A. Linoleic acid will have a lower melting point than stearic acid.

B. Stearic acid is more likely to be a component of plant lipids than linoleic acid.

C. Linoleic acid is useful as a thermal insulator in endotherms.

D. Triglycerides containing a stearic acid molecule will always be saturated.

5. How do substrates and enzymes interact to allow induced-fit binding?

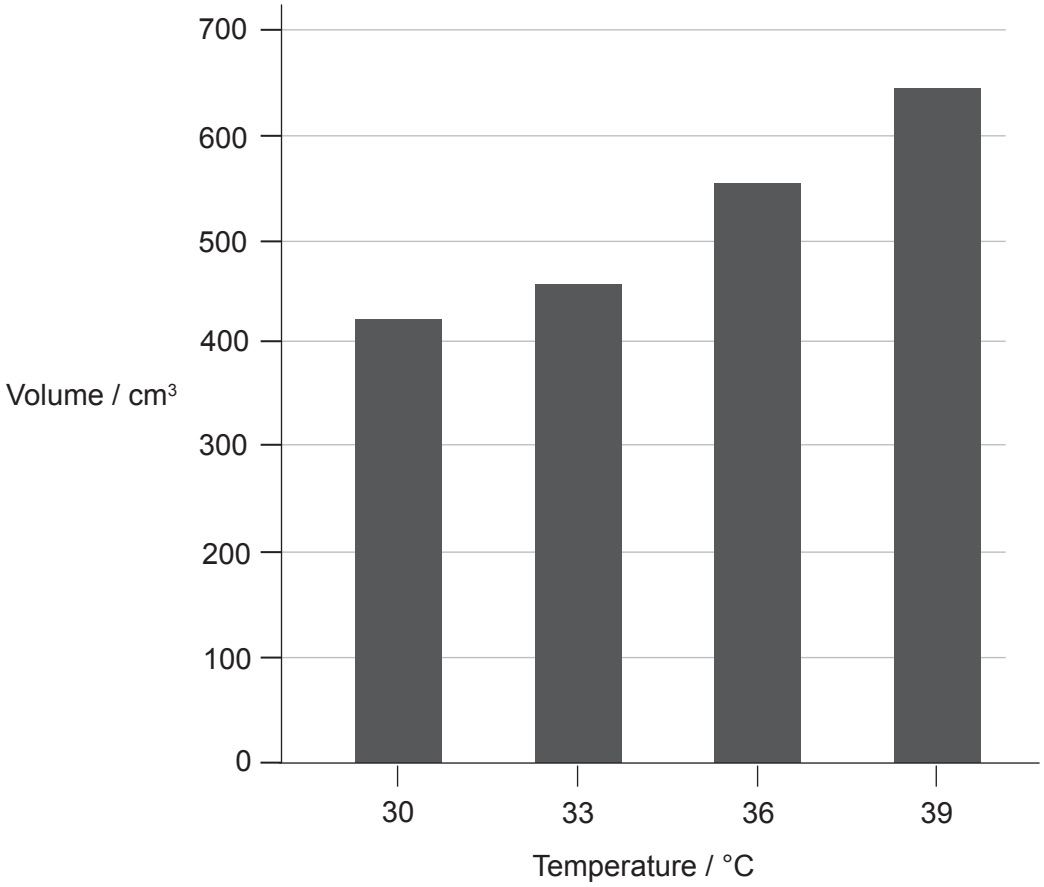
A. Substrates attach to allosteric sites, changing the shape of the active site.

B. Substrate and enzyme change shape, which allows binding.

C. Substrates have an active site that can fit many enzymes.

D. Substrate molecules are immobilized, allowing the enzymes to bind.

6. A mixture of bread dough and yeast was divided into four equal parts of 360 g and left for one hour to rise at different temperatures. The chart shows the volume of the dough after one hour.



What is a valid conclusion from the chart?

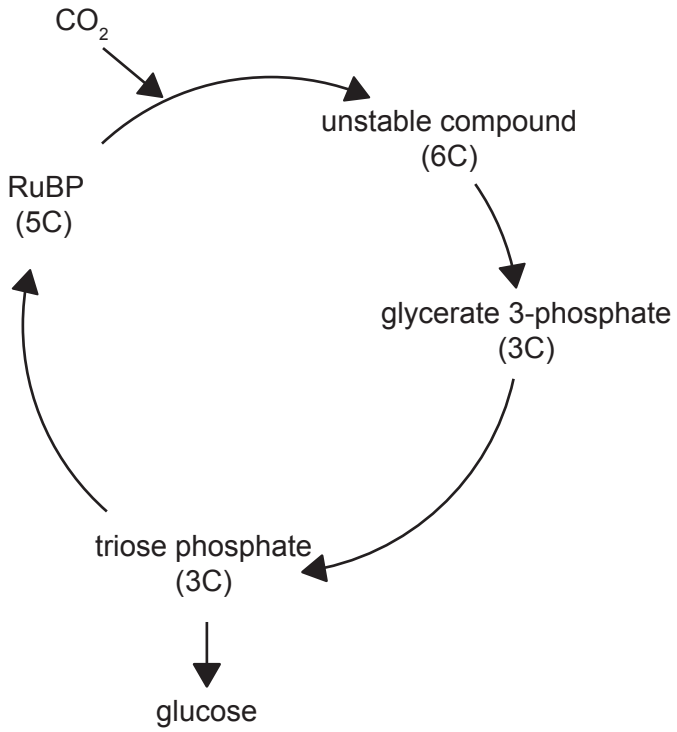
A. There is an indirect relationship between respiration in yeast and temperature.

B. Production of waste products of anaerobic respiration increases from 30 to 39 °C.

C. All enzymes in yeast are most reactive at 39 °C.

D. Less lactic acid is produced by anaerobic respiration at lower temperatures.

7. The diagram is a simplified interpretation of the Calvin cycle.



How many molecules of glycerate 3-phosphate are required to produce one glucose molecule and regenerate RuBP?

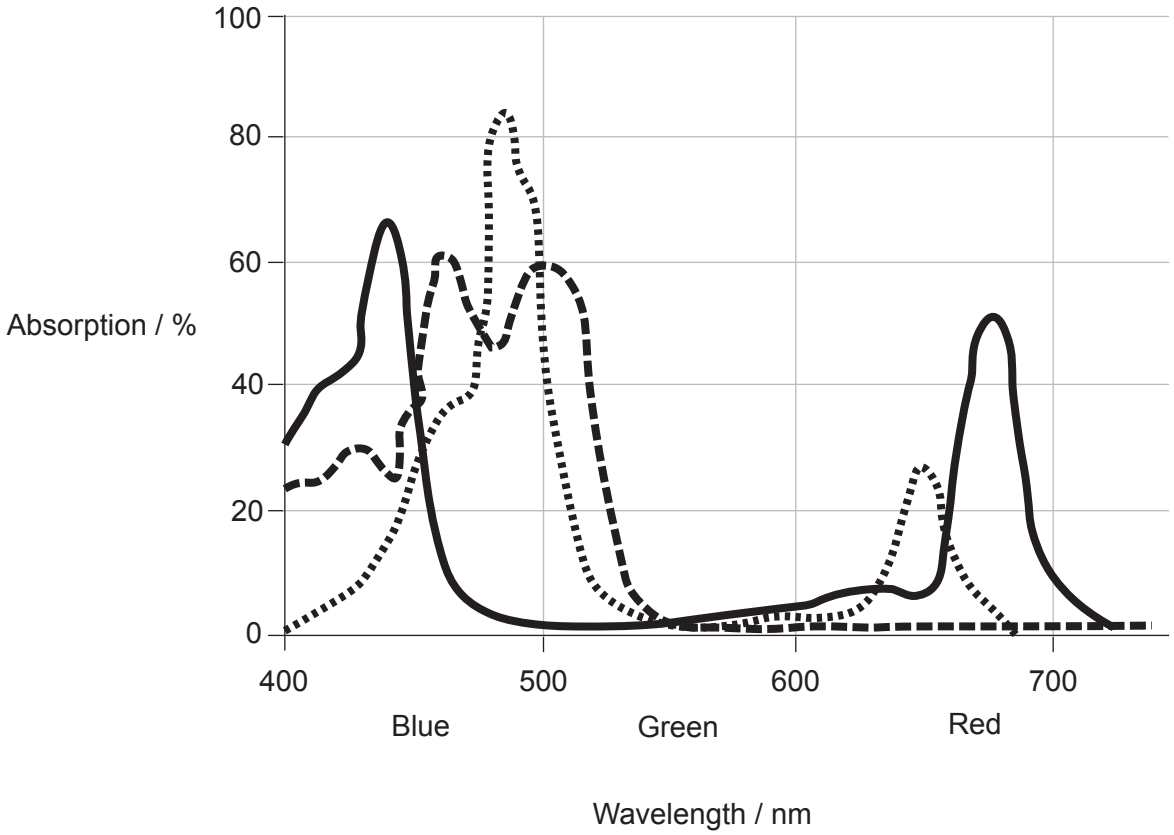
A. 2

B. 4

C. 6

D. 12

8. The graph shows the absorption spectra for three photosynthetic pigments found in a green plant.



What can be deduced from the graph?

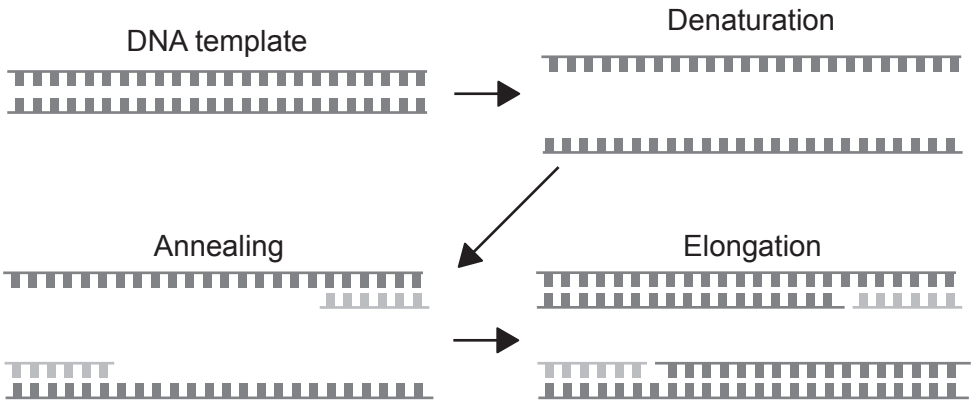
A. Green light is best for photosynthesis, as it is not absorbed by the plant.

B. Shining a red light on the plant would cause it to release oxygen.

C. The action spectrum will have a peak around 550 nm.

D. The release of carbon dioxide will be greatest when blue light is shone on the plant.

9. The diagram shows the stages in a single cycle of the polymerase chain reaction (PCR).



What occurs during the PCR?

A. During elongation, primers are added to DNA.

B. During annealing, *Taq* polymerase amplifies the DNA.

C. The temperature is raised after annealing for elongation.

D. Denaturation requires a temperature of around 55 °C.

10. Which diagram shows mRNA after post-transcriptional modification?

A. 5′ G Exon Exon Exon AAAAA 3′

B. 3′ G Exon Exon Exon AAAAA 5′

C. 5′ G Intron Intron AAAAA 3′

D. 3′ G Intron Intron AAAAA 5′

11. What is the function of Cas9 in CRISPR technology?

A. To sequence the DNA genome

B. To replicate the lagging strand of DNA

C. To cut strands of DNA at a specific location

D. To obtain fragments for DNA profiling

12. What is the reason that viruses are considered to be non-living?

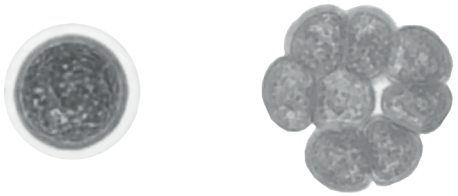
A. They cannot reproduce.

B. They have no genetic material.

C. They have no metabolism.

D. They cannot evolve.

13. The images show one species of unicellular green alga forming a multicellular group.



Unicellular alga Multicellular group

Which statements are correct?

I. Multicellularity allows cells to differentiate to specialized functions.

II. Multicellularity allows a larger body size.

III. Multicellularity of green alga is an example of mutualism.

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

14. Which piece of evidence led scientists to believe that the last universal common ancestor (LUCA) evolved in the vicinity of hydrothermal vents?

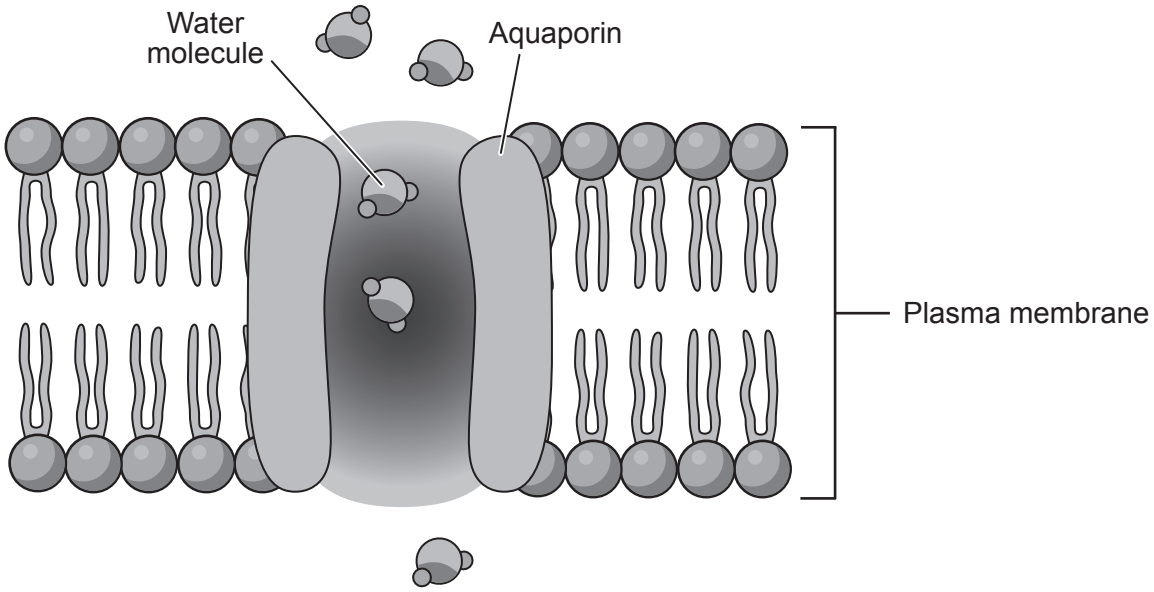
A. Proteins, necessary for forming enzymes, are present.

B. Scientists recently found LUCA organisms in hydrothermal vents.

C. Seawater surrounding the hydrothermal vents contains dissolved oxygen for cell respiration.

D. Different species of prokaryotes living near the hydrothermal vents have similar gene sequences.

15. The diagram shows water molecules passing through an aquaporin in the plasma membrane.



What describes aquaporins?

A. They are peripheral proteins that assist in removal of water from a cell.

B. They allow water to diffuse against the concentration gradient.

C. They have channels through which water passes by osmosis.

D. They use ATP to actively transport water across the membrane.

16. What is a characteristic of embryonic pluripotent stem cells?

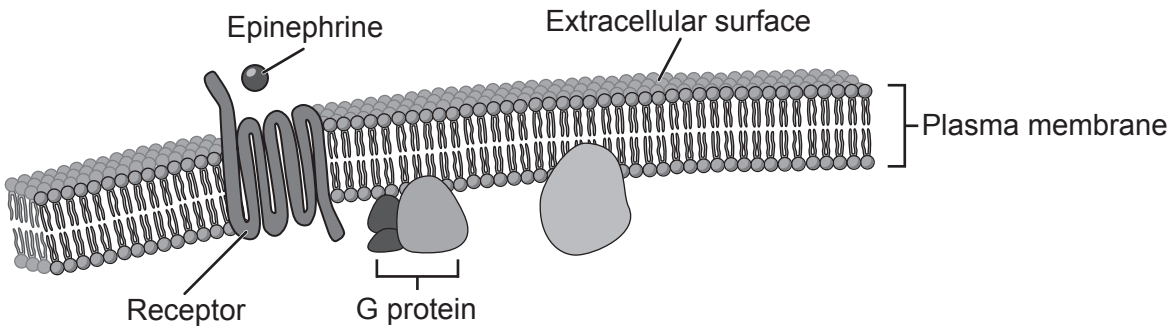
A. They can form from adult bone marrow cells.

B. They can divide to become totipotent stem cells.

C. They are fully differentiated to repair damaged tissue when required.

D. They can develop into a wide range of cells in the body.

17. The diagram shows a resting G protein-coupled receptor in the plasma membrane of a heart muscle cell.



Which steps occur after epinephrine (adrenaline) binds to the receptor, resulting in a response by the cell?

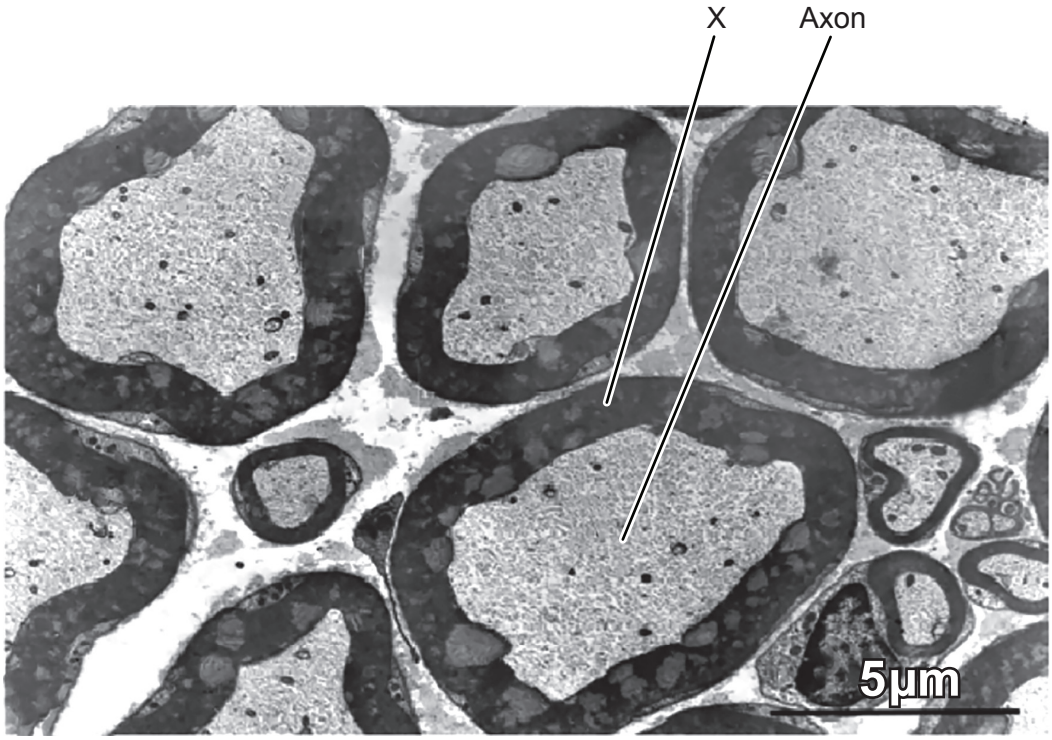
A. Epinephrine passes into the cell and stimulates the G protein.

B. The G protein stimulates the receptor to activate the epinephrine.

C. Epinephrine stimulates the receptor to increase ATP production by the G protein.

D. The G protein is stimulated by the receptor, leading to the production of cAMP.

18. The image shows a transverse section through the sciatic nerve as viewed under an electron microscope.



What is the function of the structure labelled X?

A. It allows for rapid transmission of impulses along nerve fibres.

B. It initiates an action potential and triggers a nerve impulse.

C. It forms a synapse with surrounding neurones.

D. It pumps sodium and potassium ions across the plasma membrane.

19. What process is common to both mitosis and meiosis in eukaryotes?

A. Condensation of DNA by histone molecules

B. Reduction in the number of chromosomes

C. Homologous chromosomes being pulled apart by microtubules

D. DNA replication during prophase

20. What would happen to red blood cells placed in a hypertonic sucrose solution?

A. They would increase in mass as sucrose diffuses into the cell.

B. They would swell up by osmosis and burst.

C. They would decrease in mass as water passes out of the cell.

D. They would reach equilibrium, and no water would pass into, or out of, the cell.

21. What would be an advantage of using environmental DNA (eDNA) to measure the biodiversity of a pond?

A. It provides an accurate count of the population size of a species.

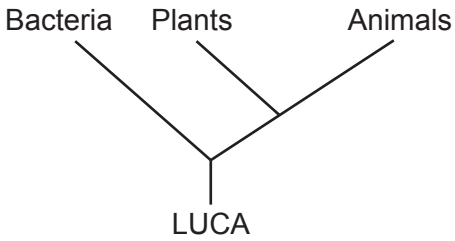
B. It measures both the richness and evenness of the habitat.

C. It allows rare species to be detected that cannot be observed visually.

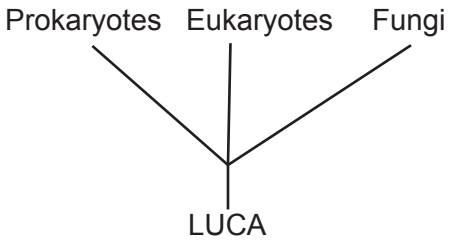
D. It provides information about the health of the species in the pond.

22. Which clade represents the classification of organisms into three domains using evidence from rRNA base sequences?

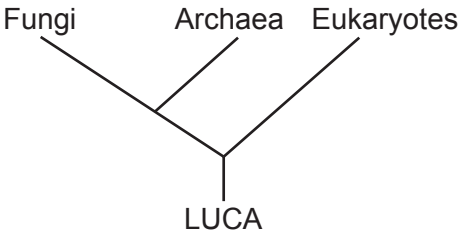
A.



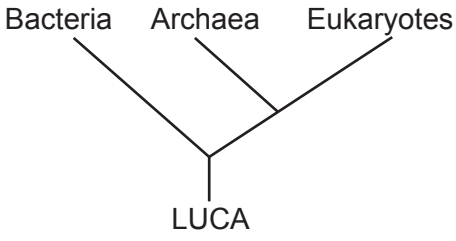
B.



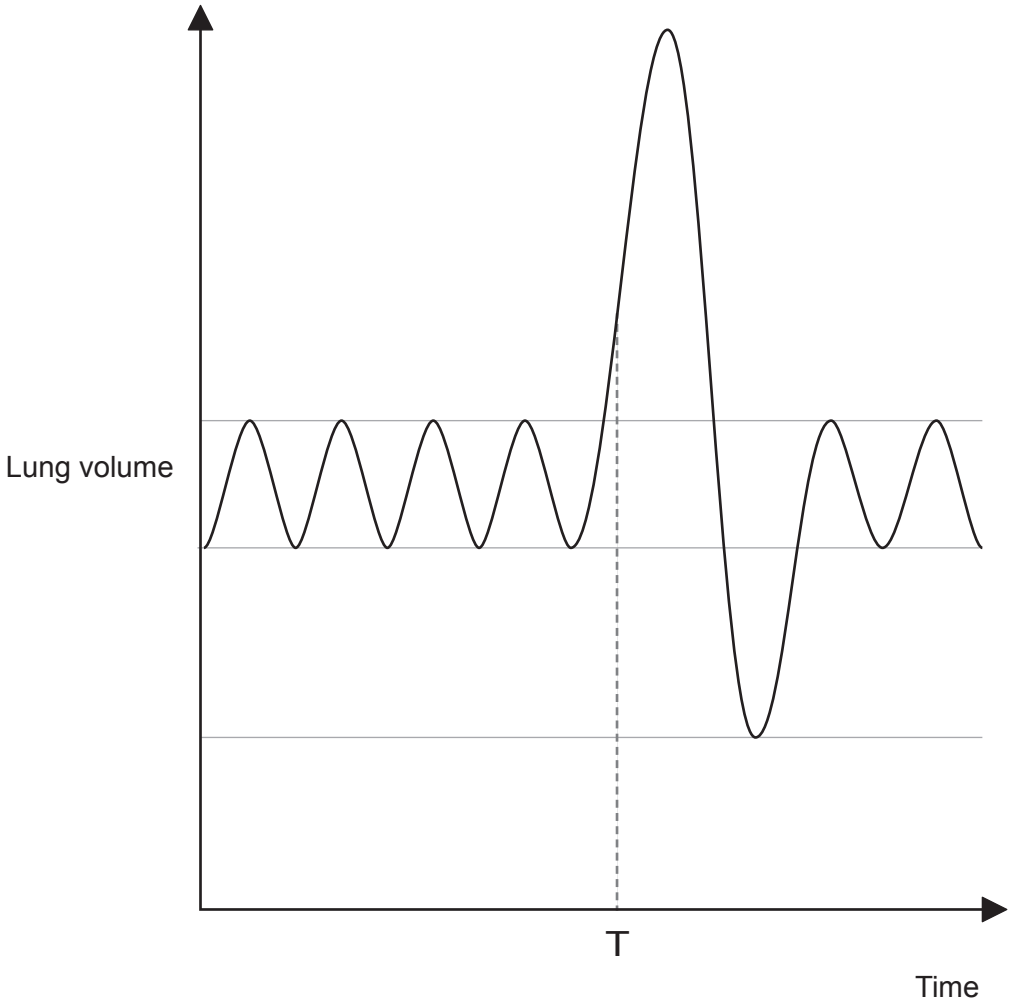
C.



D.



23. The graph shows changes in lung volume during ventilation.

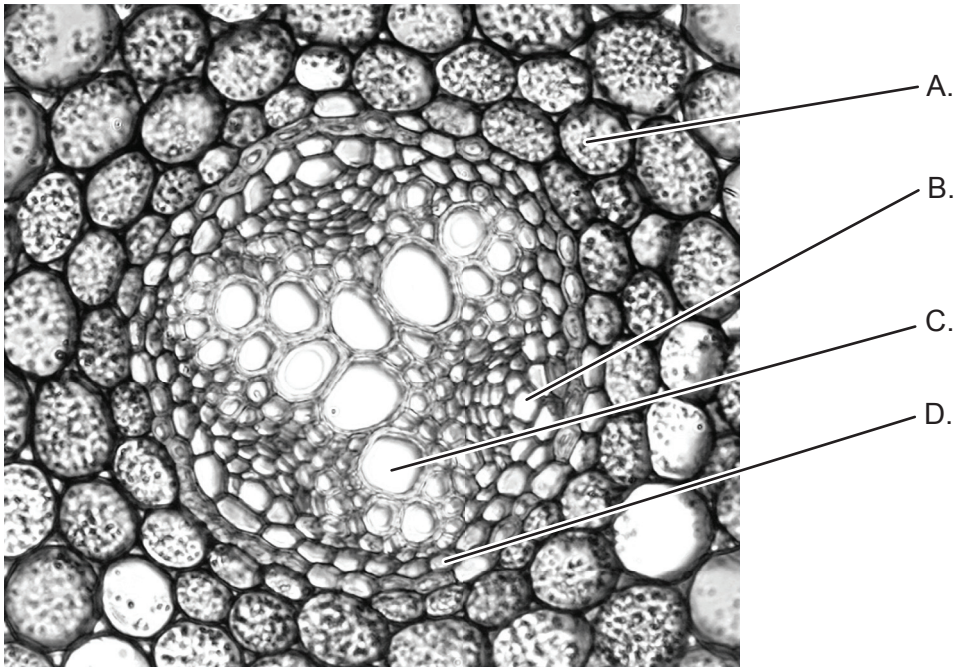


What occurs at time T?

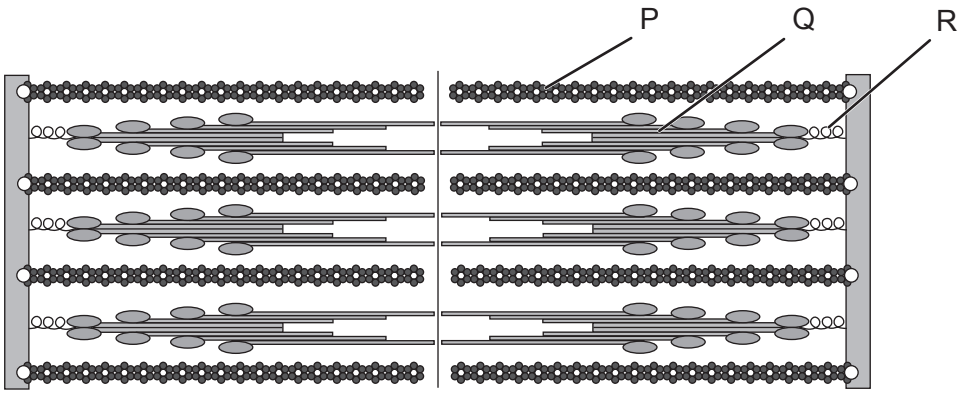
	Internal intercostal muscles	External intercostal muscles	Diaphragm
A.	relax	contract	contracts
B.	contract	relax	contracts
C.	relax	contract	relaxes
D.	contract	relax	relaxes

24. The photomicrograph shows the tissues in a transverse section of the root of buttercup (*Ranunculus repens*), a flowering dicotyledonous plant.

Which tissue is adapted for translocation of sap?



25. The diagram shows a sarcomere from a contracted muscle.



What are proteins P, Q and R?

	P	Q	R
A.	titin	myosin	actin
B.	actin	titin	myosin
C.	actin	myosin	titin
D.	myosin	actin	titin

26. Bananas placed next to avocados have been shown to increase the rate of ripening of the avocados.

What is the reason for this increased rate of ripening?

A. Auxins are passed to the avocado from the bananas, promoting cell growth.

B. Ethylene released by the bananas triggers metabolic processes in the avocado.

C. Carbon dioxide released by the bananas changes the pH and softens the avocado.

D. Oxygen released from the bananas causes physiological changes in the avocado.

27. What would be necessary for a population to achieve herd immunity during an outbreak of a viral disease such as the COVID-19 pandemic?

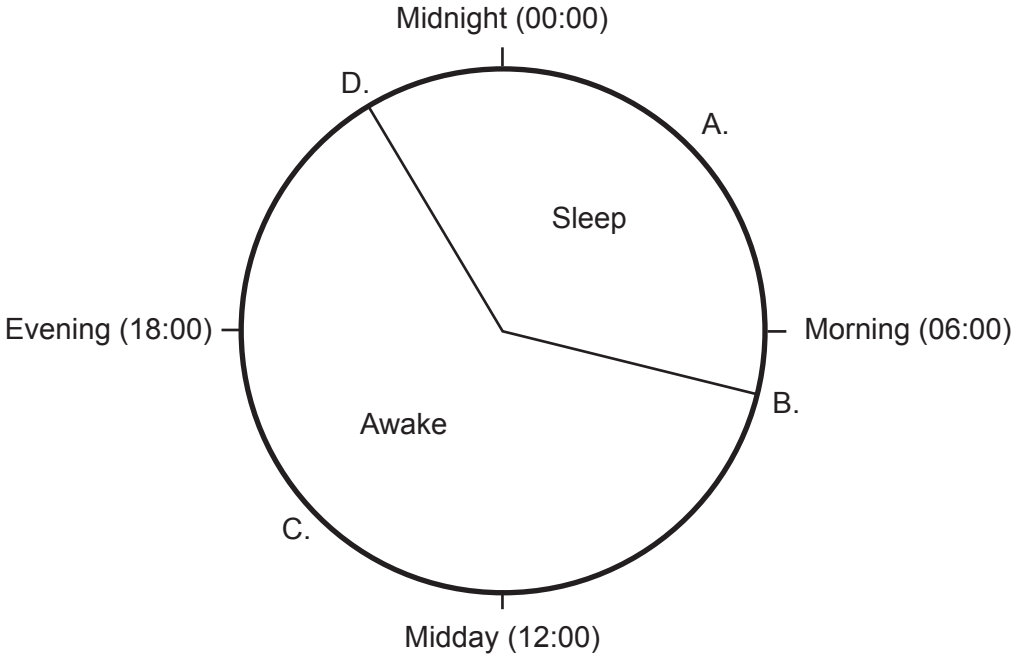
A. Provide the population with antibiotics

B. Vaccinate a high percentage of the population against the disease

C. Isolate those with the disease so it cannot spread

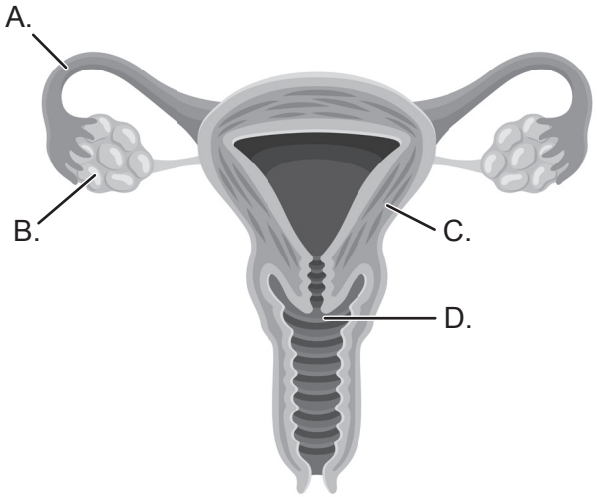
D. Use no vaccinations so the disease cannot spread

28. The diagram shows the circadian rhythm of a healthy adult woman. When would her melatonin levels be highest?

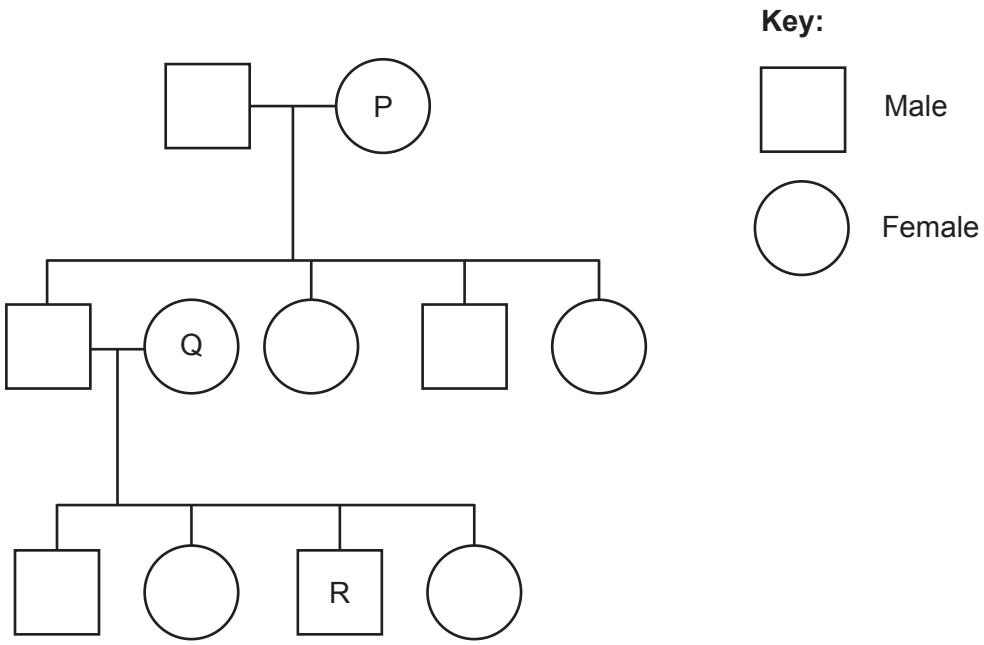


29. The image shows the human female reproductive system.

In which structure would mitosis normally occur to produce two diploid nuclei from the fertilized egg?



30. The diagram shows a pedigree chart. P is a carrier for haemophilia.



What is the probability that R has haemophilia, assuming that Q does **not** carry the gene for haemophilia?

A. 0%

B. 25%

C. 50%

D. 100%

31. How does the kidney prevent dehydration?

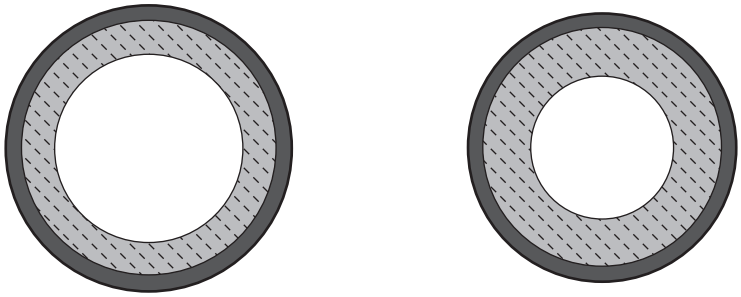
A. It signals the pituitary gland to decrease antidiuretic hormone secretion.

B. It accumulates sodium ions in the medulla region outside the loop of Henle.

C. It decreases ultrafiltration into Bowman's capsule from the glomerulus.

D. It increases active transport of water through aquaporins in the collecting ducts.

32. The diagram illustrates the diameter of the arterioles near the surface of the skin narrowing due to a change in environmental temperature.



Before After

Which other change could be taking place at the same time?

A. An increase in sweat released by the sweat glands

B. Relaxation of hair muscle cells so body hair lies flat

C. Shivering to generate metabolic energy

D. A decrease in thyroxin secretion

33. The wings of both birds and insects enable flight but have different evolutionary origins.

What describes the evolution of wings in both?

A. They are homologous structures, as they have a similar function.

B. They both have a pentadactyl structure, adapted from an ancestor.

C. They are analogous, as birds evolved from insects.

D. They show convergent evolution, as both adapted to similar environments.

34. Which condition is required for coral reef formation?

A. Water between 10 ºC and 15 ºC

B. Water containing dissolved salt

C. Water containing high concentrations of carbon dioxide

D. Water with a pH less than 7

35. The Kaibab squirrel became geographically separated from its closest relative, the Abert squirrel, when the Grand Canyon split about 10 000 years ago. Kaibab squirrels are found to the north and Abert squirrels to the south of the Grand Canyon.

Which type of speciation occurred, and what led to differences in the populations of squirrels in each habitat?

	Type of speciation	Reason for differences
A.	allopatric	environmental conditions differed in the north and south
B.	sympatric	the squirrels had different predators in each habitat
C.	allopatric	the original ancestors of the Kaibab were adapted to the north
D.	sympatric	mixing of alleles between the squirrels was not possible

36. What is a reason that the accumulation of carbon compounds by secondary production is less than primary production in an ecosystem?

A. Plants carry out less photosynthesis in winter.

B. Some biomes have a lower capacity to accumulate biomass.

C. Heterotrophs use carbon compounds as a source of energy.

D. Autotrophs do not carry out respiration.

37. A mycorrhiza forms when fungal hyphae penetrate the root cells of plants of the orchid family (Orchidaceae) and they receive food from the products of photosynthesis of the plant.

Which type of ecological interaction occurs between the species?

A. Parasitism, as the fungus takes food made by orchid plants

B. Mutualism, as both organisms benefit from the relationship

C. Interspecific competition, as both fungus and orchid are competing for food

D. Herbivory, as the fungus feeds on the products of photosynthesis of a green plant

38. What would promote natural selection?

I. Global warming increasing the temperature of the oceans

II. Moths of the same species having wings of different colours

III. Asexual reproduction

A. I and II only

B. I and III only

C. II and III only

D. I, II and III

39. In a population of 1000, the frequency of the homozygous recessive genotype (bb) for a disease is 36 %. Using the Hardy–Weinberg equation, $p^2 + 2pq + q^2 = 1$, how many people in the population are heterozygous for the disease?

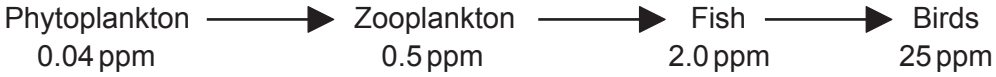
A. 160

B. 320

C. 480

D. 640

40. The diagram shows the concentration of DDT in the tissues of the organisms in an aquatic food chain. The concentration of DDT in the water is 0.000003 parts per million (ppm).



What can be concluded from the food chain?

A. Biomagnification of DDT occurs in the tissue of the phytoplankton.

B. Birds eat the most organisms in the food chain, so they accumulate most DDT.

C. Each fish, on average, consumes four zooplankton.

D. DDT is not excreted from the tissues of fish.

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References:

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