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**Biology**  
**Standard level**  
**Paper 1**

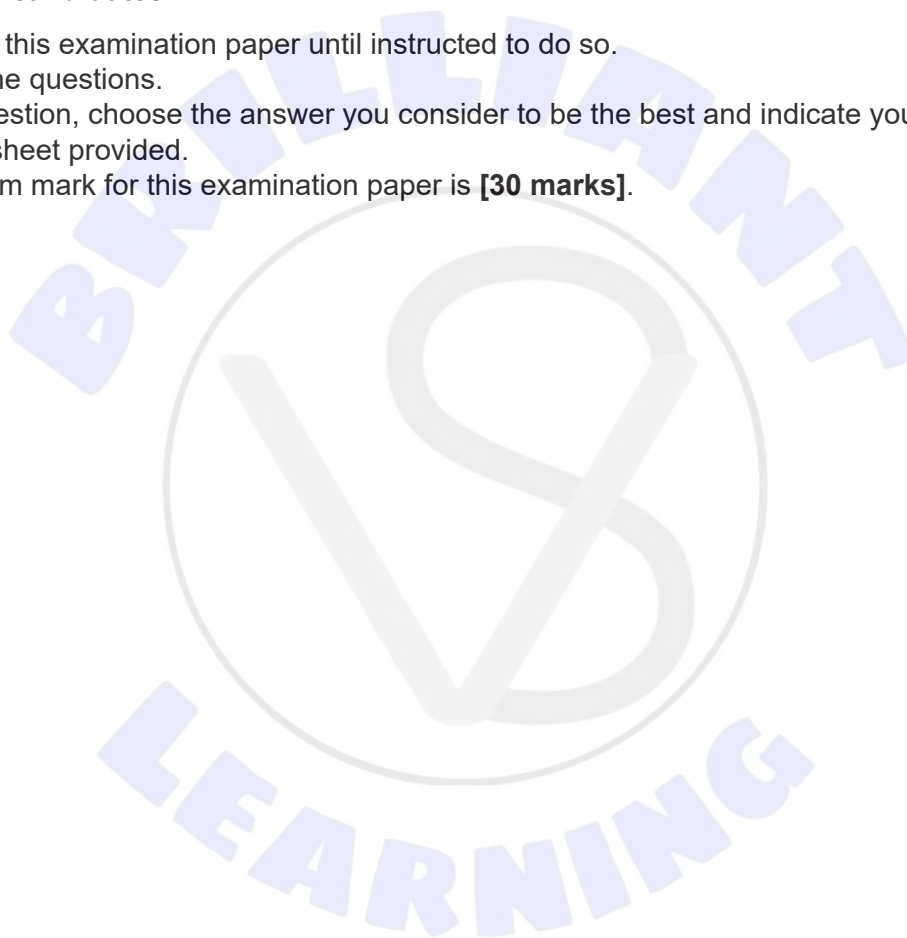
Wednesday 20 November 2019 (afternoon)

45 minutes

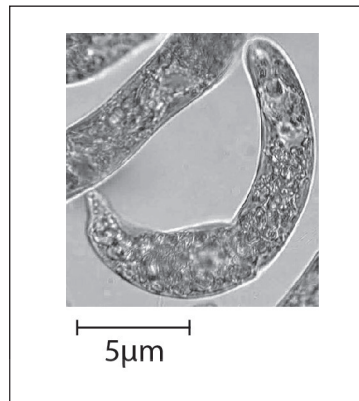
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**Instructions to candidates**

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



1. The electron micrograph shows a thin section through a plant mesophyll cell.

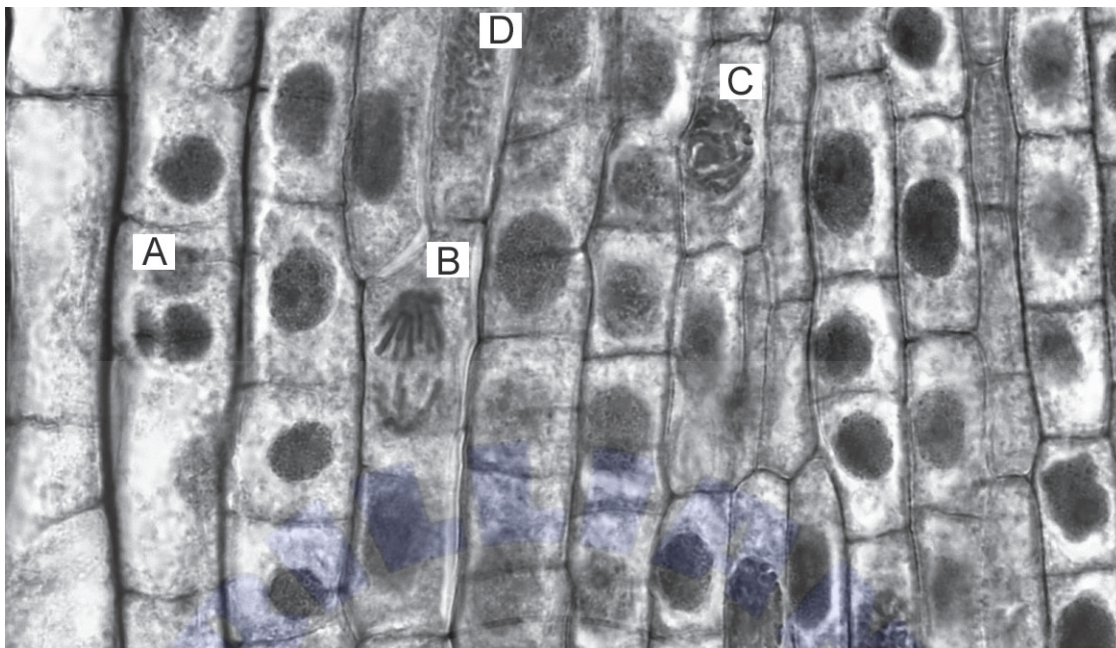


[Source: [https://commons.wikimedia.org/wiki/File:Euglena\\_sp.jpg](https://commons.wikimedia.org/wiki/File:Euglena_sp.jpg), by Deuterostome  
<https://creativecommons.org/licenses/by-sa/3.0/legalcode>]

What is the magnification of the image?

- A.  $\times 75$
  - B.  $\times 300$
  - C.  $\times 3000$
  - D.  $\times 7500$
2. By which process do potassium ions move through potassium channels in axons?
- A. Active transport
  - B. Exocytosis
  - C. Facilitated diffusion
  - D. Simple diffusion
3. Which statement provides evidence for endosymbiosis?
- A. Early prokaryotes contributed to a large increase in oxygen in the atmosphere.
  - B. Eukaryotic mitochondria and chloroplasts have their own circular DNA.
  - C. Certain groups of ancient prokaryotes developed mechanisms to carry out aerobic respiration.
  - D. Experiments by Miller and Urey produced simple organic molecules in abiotic conditions.

4. In the micrograph, which letter points to a cell in anaphase?



[Source: Berkshire Community College Bioscience Image Library, [https://commons.wikimedia.org/wiki/File:Mitotic\\_Stages\\_in\\_Apical\\_Meristem\\_of\\_Allium\\_Root\\_Tip\\_\(36762516673\).jpg](https://commons.wikimedia.org/wiki/File:Mitotic_Stages_in_Apical_Meristem_of_Allium_Root_Tip_(36762516673).jpg), licensed under Creative Commons CC0 1.0 Universal Public Domain Dedication]

5. Students examined micrographs and counted cells in the different stages of mitosis as well as those cells with no visible chromosomes. The table shows their results.

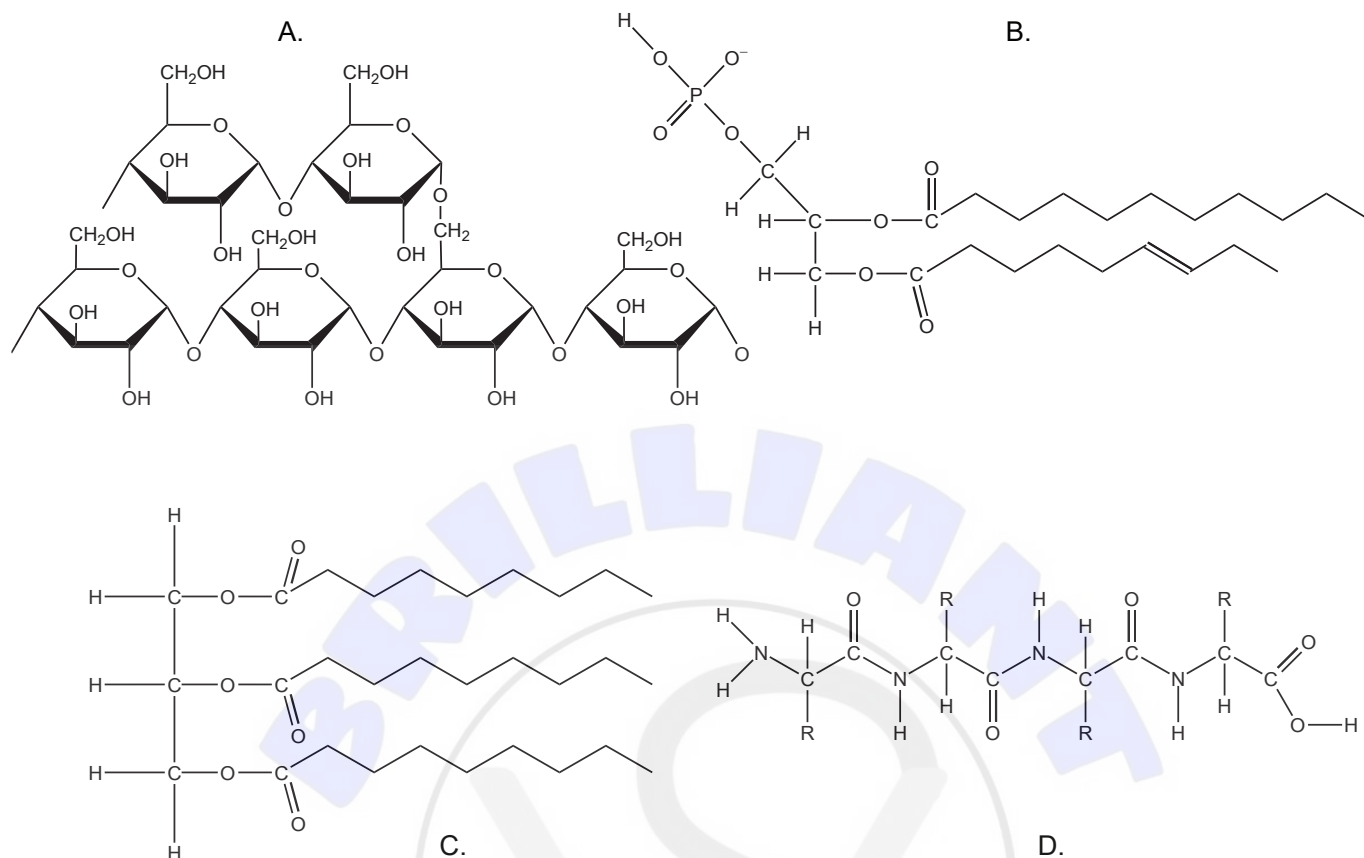
Stage	Prophase	Metaphase	Anaphase	Telophase	Interphase
Number of cells	10	3	2	5	30

What is the mitotic index?

- A. 0.2
  - B. 0.4
  - C. 0.6
  - D. 0.7
6. In which processes are macromolecules broken down into monomers?
- A. Anabolism and catabolism
  - B. Catabolism and hydrolysis
  - C. Hydrolysis and reduction
  - D. Reduction and anabolism

Turn over

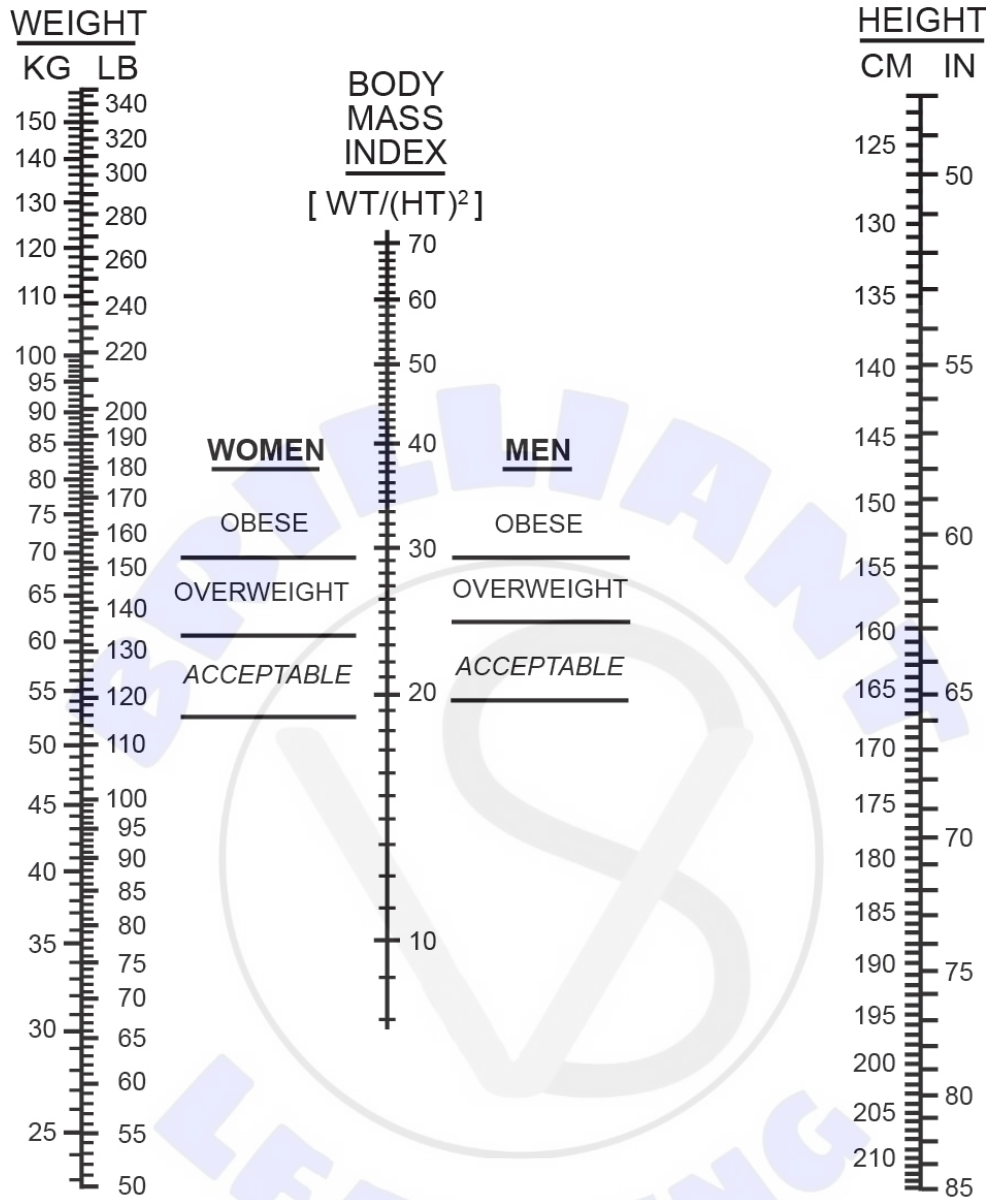
7. Which of the molecules shown would be most suitable for long-term energy storage in humans?



8. What is a property of water?

- A. Water has a low specific heat capacity so large increases in heat energy cause a small temperature change.
- B. Water is an excellent solvent for non-polar substances.
- C. Covalent bonds between adjacent water molecules are responsible for its unique properties.
- D. Water molecules are highly cohesive which is important for transport in xylem.

9. Using the nomogram, what is the minimum mass at which a woman of height 165 cm would be considered overweight?



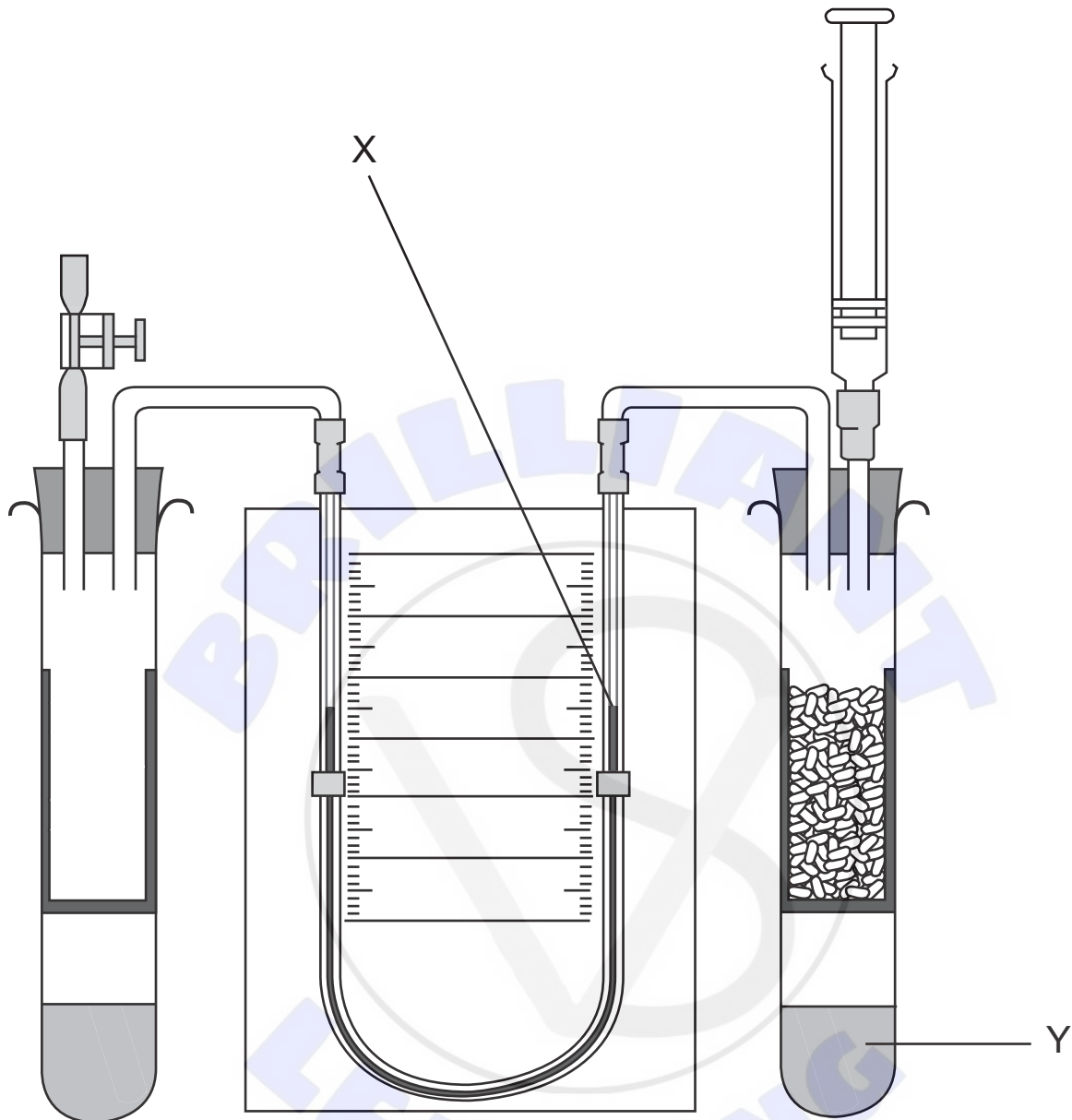
[Source: Copyright 1978, George A. Bray. Used by permission]

- A. 72
- B. 67
- C. 64
- D. 61

Turn over

10. What effect do changes in pH have on enzymes?
- A. All enzymes increase in activity as pH increases.
  - B. The activity of all enzymes is reduced by a pH below or above 7.
  - C. Low pH causes reversible denaturation in all enzymes.
  - D. Extreme pH can alter the active site of all enzymes.
11. For what did Meselson and Stahl's work provide evidence?
- A. The abiotic origin of organic molecules
  - B. The cell theory
  - C. The fluid mosaic model of membrane structure
  - D. The semi-conservative replication of DNA
12. Which compound is a waste product of anaerobic respiration in humans?
- A. Carbon dioxide
  - B. Ethanol
  - C. Lactate
  - D. Pyruvate

13. The diagram shows a respirometer used to measure respiration rate in germinating seeds.



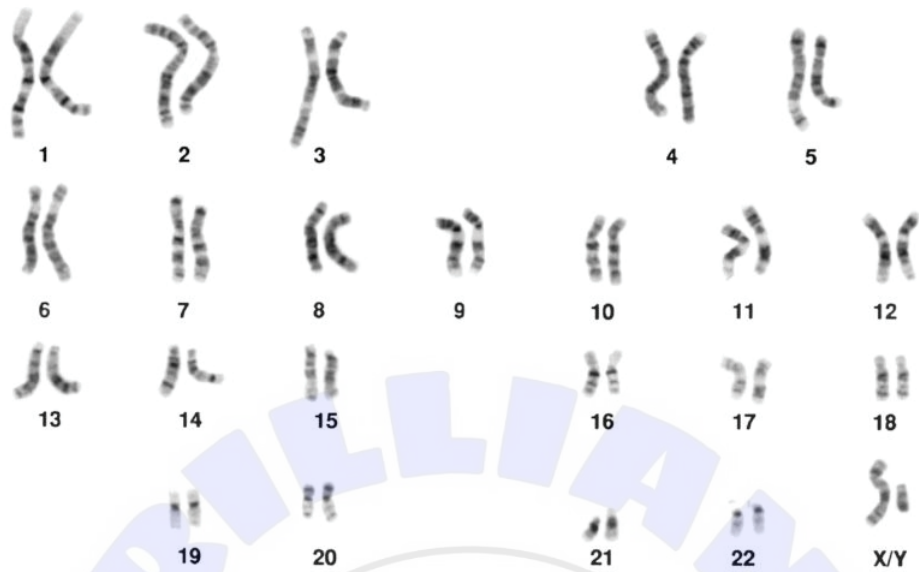
[Source: used with the kind permission of the Nuffield Foundation and the Royal Society of Biology]

What is the expected direction of movement of the fluid at X and the function of the fluid at Y?

	<b>Movement of fluid at X</b>	<b>Function of fluid at Y</b>
A.	Down	Absorb CO <sub>2</sub>
B.	Down	Produce O <sub>2</sub>
C.	Up	Absorb CO <sub>2</sub>
D.	Up	Produce O <sub>2</sub>

Turn over

14. A pregnant woman had fetal cells removed by chorionic villus sampling and tested. The following karyogram was produced.



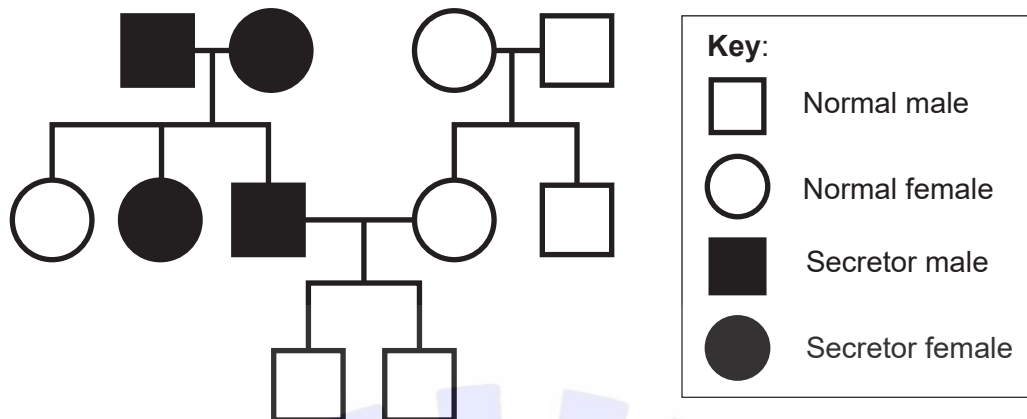
[Source: Mediscan / Alamy Stock Photo]

What does this show?

- A. The child is female with Down syndrome.
  - B. The child is female without Down syndrome.
  - C. The child is male with Down syndrome.
  - D. The child is male without Down syndrome.
15. A variety of *Pelargonium* has yellow leaves. When plants of this variety are crossed, the resulting seeds produce green, yellow and white seedlings in the ratio 1 : 2 : 1. If plants with yellow leaves are crossed with plants with green leaves, what would the expected ratio of phenotypes in the offspring be?

	Green	Yellow	White
A.	1	2	1
B.	3	1	0
C.	2	2	0
D.	2	1	1

16. A pair of alleles controls the secretion of antigens corresponding to blood group in saliva. Examine the pedigree chart.



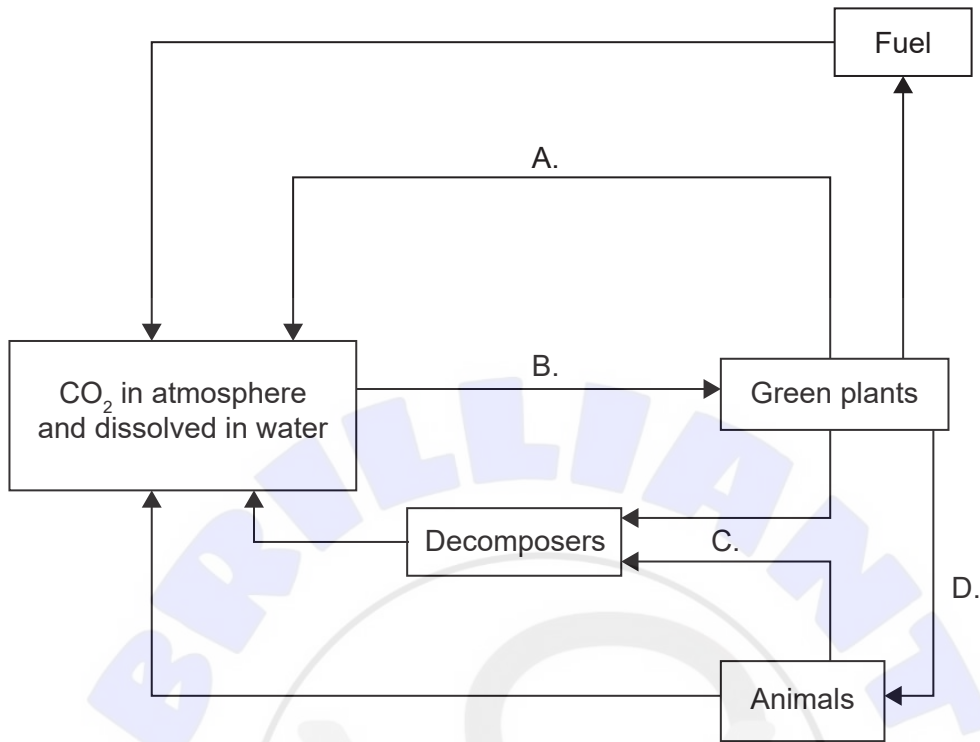
[Source: © International Baccalaureate Organization 2019]

Based on this pedigree chart, which best describes the allele conferring antigen secretion in saliva?

- A. Dominant
  - B. Recessive
  - C. Sex-linked
  - D. Co-dominant
17. What is PCR used for?
- A. Separate fragments of DNA by size
  - B. Amplify small amounts of DNA
  - C. Compare DNA samples
  - D. Genetically modify organisms' DNA
18. What is the ecological term for a group of different types of organisms that live together and interact with each other?
- A. Community
  - B. Domain
  - C. Ecosystem
  - D. Population

Turn over

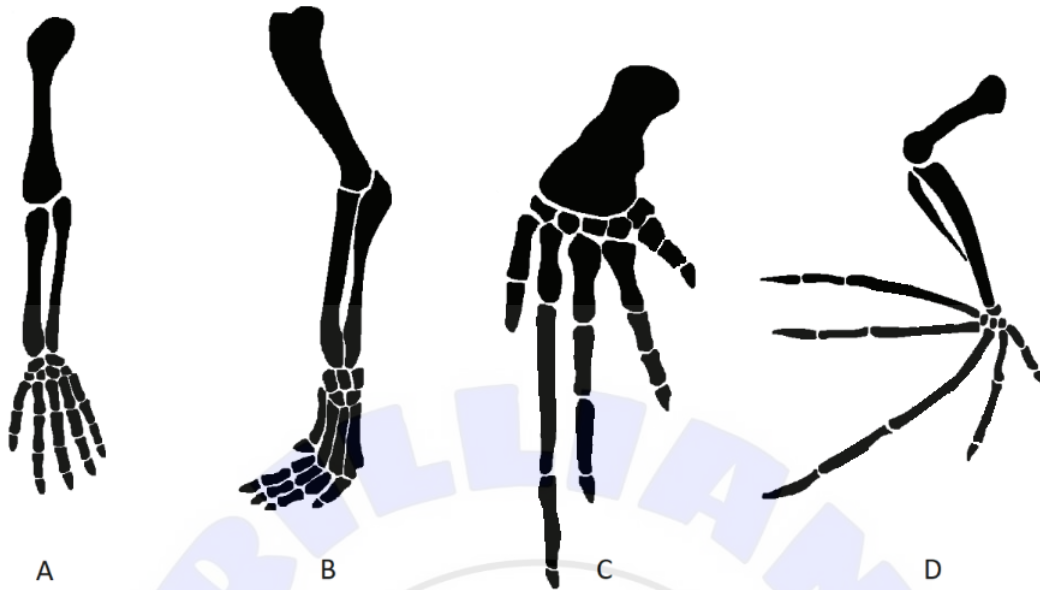
19. In the diagram, which of the processes labelled A to D transfers the largest mass of carbon per year in a woodland ecosystem?



[Source: © International Baccalaureate Organization 2019]

20. What material is formed when organic matter is not fully decomposed in acidic waterlogged soils?
- A. Coal
  - B. Hydrogen
  - C. Oil
  - D. Peat

21. Which pentadactyl limb is adapted for flight?



[Source: adapted from Volkov Vladislav Petrovich, [https://en.wikipedia.org/wiki/Homology\\_\(biology\)#/media/File:Homology\\_vertebrates-en.svg](https://en.wikipedia.org/wiki/Homology_(biology)#/media/File:Homology_vertebrates-en.svg) and Zebra.element, [https://en.wikipedia.org/wiki/File:Bat\\_mouse\\_forelimbs.png](https://en.wikipedia.org/wiki/File:Bat_mouse_forelimbs.png)]

22. An organism has the following characteristics:

- single opening for ingestion and egestion
- radial symmetry
- tentacles with stinging cells.

In what phylum would it most likely be classified?

- A. Annelida
- B. Cnidaria
- C. Platyhelminthes
- D. Porifera

Turn over

23. Which organism is a member of the filicinophyta? (*Note that these are not drawn to scale*)



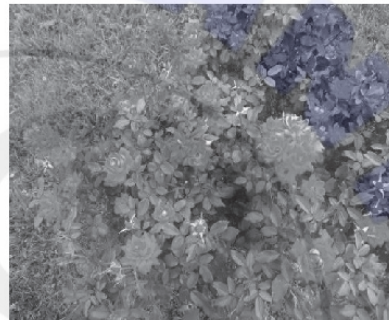
A



B



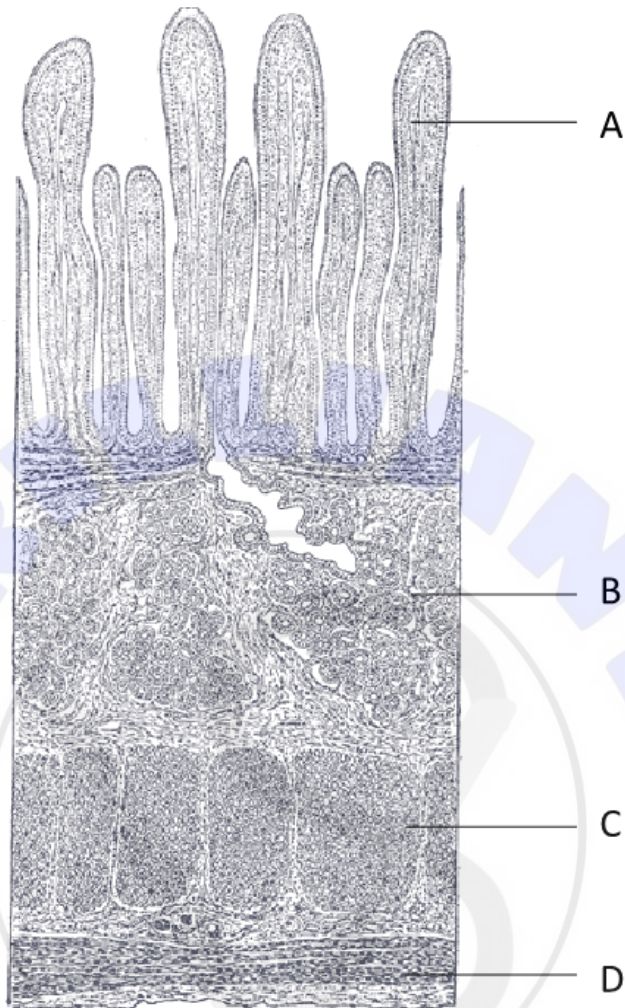
C



D

[Source: A: Sanjay ach/<https://creativecommons.org/licenses/by-sa/3.0/deed.en>  
B: Vaelta/<https://creativecommons.org/licenses/by-sa/3.0/deed.en>  
C: Andrey Zharkikh/<https://creativecommons.org/licenses/by/2.0/deed.en>  
D: courtesy of Caroline Needham]

24. The micrograph is of a longitudinal section through the small intestine. Which letter represents the circular muscle layer?

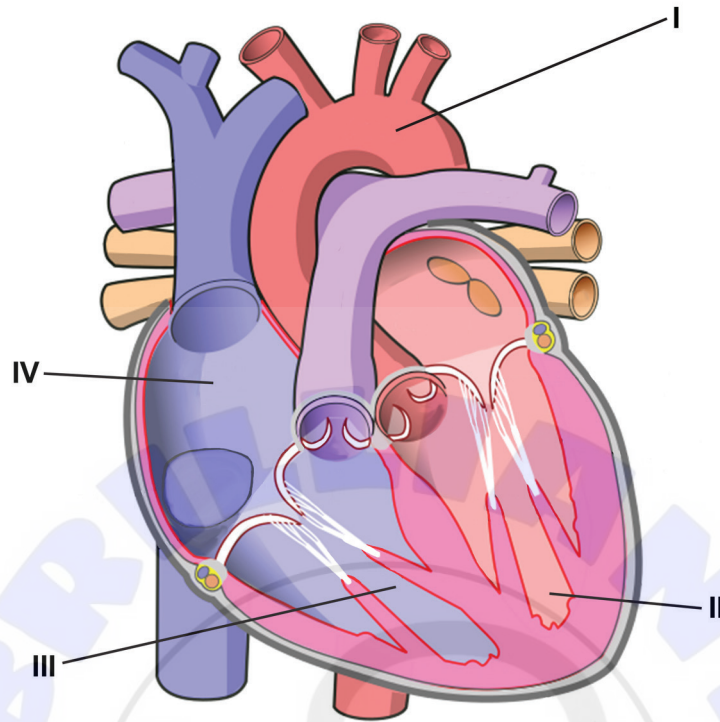


[Source: Henry Gray (1918) *Anatomy of the Human Body*]

25. Which part of the body secretes amylase, lipase and endopeptidase for use in the digestion of food?
- A. Mouth
  - B. Pancreas
  - C. Stomach
  - D. Small intestine

Turn over

26. The diagram shows the human heart.

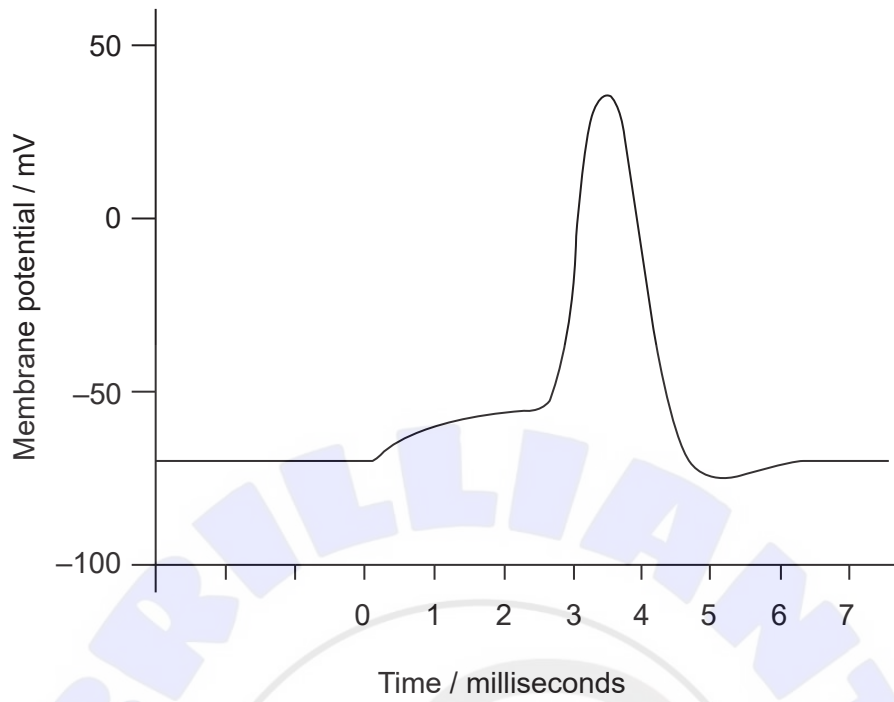


[Source: adapted to remove labels and arrows, recoloured and relabelled from Wapcaplet/  
[https://commons.wikimedia.org/wiki/File:Diagram\\_of\\_the\\_human\\_heart\\_\(cropped\).svg](https://commons.wikimedia.org/wiki/File:Diagram_of_the_human_heart_(cropped).svg)]

After a red blood cell picks up oxygen in the lungs, which sequence shows the path it could take when passing through the heart during its circuit of the body?

- A. I → II → III → IV
  - B. II → I → IV → III
  - C. IV → III → I → II
  - D. IV → III → II → I
27. What is non-specific immunity to disease?
- A. Blocking prokaryotic metabolism with antibiotics
  - B. Production of antibodies by lymphocytes
  - C. Endocytosis of pathogens by white blood cells
  - D. Production of cloned plasma cells

28. The graph shows an action potential.



What is the threshold potential for this cell?

- A. -80 mV
  - B. -70 mV
  - C. -55 mV
  - D. 40 mV
29. What is the role of the hormone leptin?
- A. To regulate the metabolic rate
  - B. To inhibit appetite
  - C. To control circadian rhythms
  - D. To increase blood sugar concentration

Turn over

30. On the graph, which curve represents the change in FSH levels during the menstrual cycle?

