Diploma Programme
Programme du diplôme
Programa del Diploma

Biology
Standard level
Paper 1

Thursday 9 May 2019 (afternoon)

45 minutes

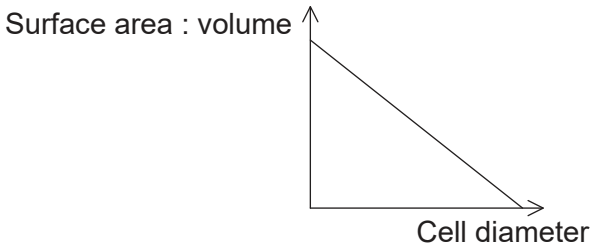
Instructions to candidates

- 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]**.

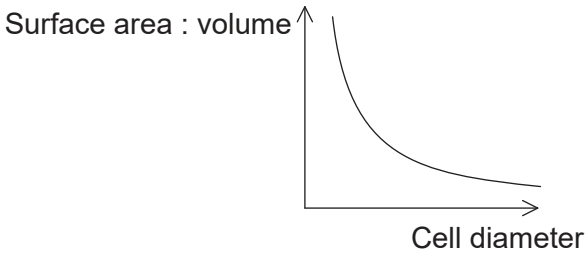
2219 – 6010

1. Which graph represents the change in cell surface area to volume ratio with increasing cell diameter?

A.



B.



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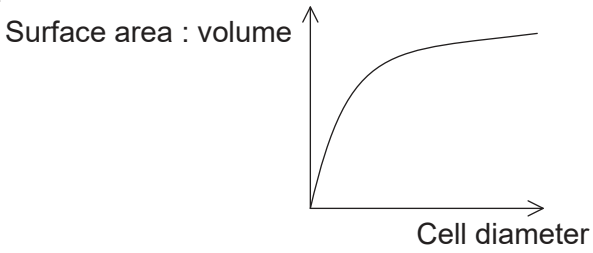
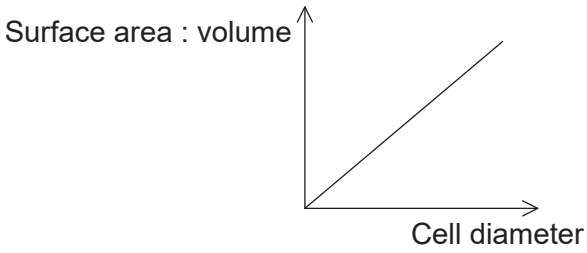
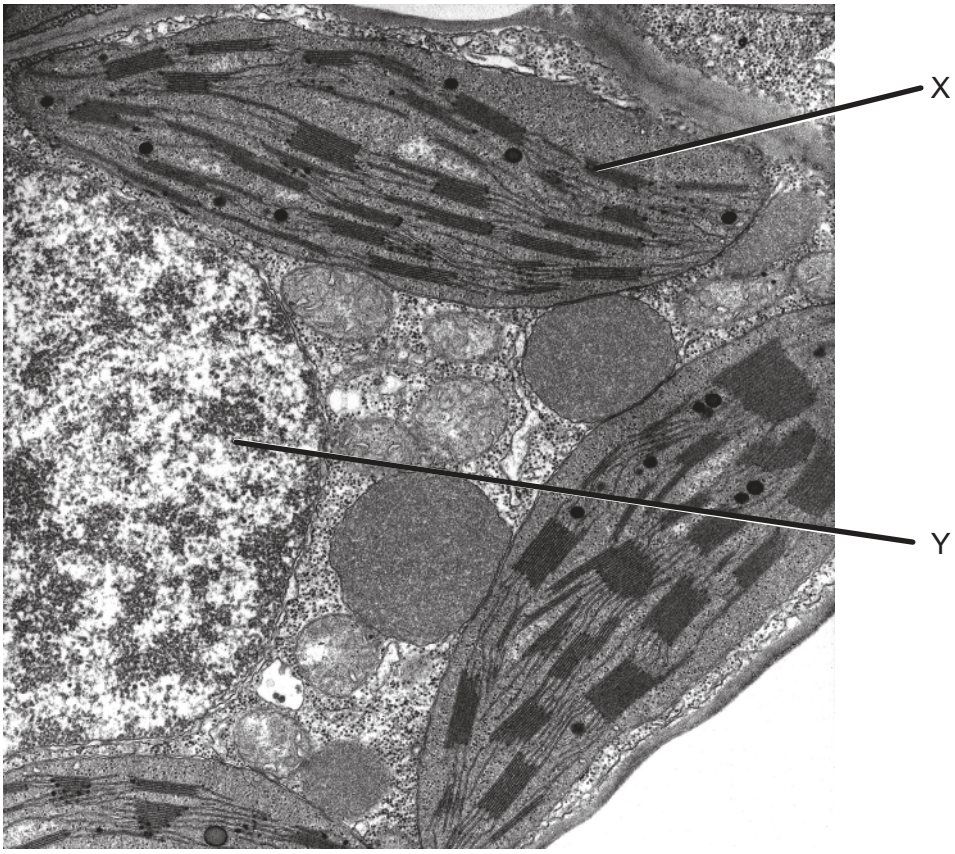


D.



2. The image shows an electron micrograph of part of a cell.



[Source: Dr. Eldon Newcomb – Emeritis Professor at The University of Wisconsin – Madison.]

Which features do the two structures labelled X and Y have in common?

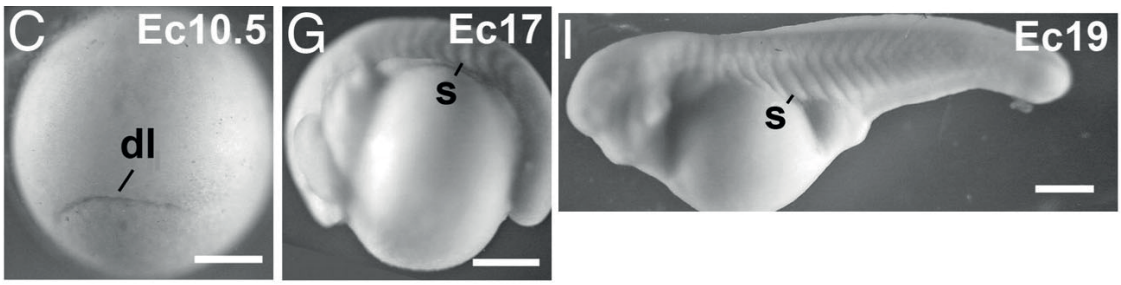
A. They are surrounded by a double membrane.

B. They contain 70S ribosomes.

C. They contain naked DNA.

D. They are only found in leaf cells.

3. The images show a sequence of changes in an organism.



[Source: Copyright (2007) National Academy of Sciences, U.S.A. 'A comparative analysis of frog early development'. Eugenia M. del Pino, Michael Venegas-Ferrín, Andrés Romero-Carvajal, Paola Montenegro-Larrea, Natalia Sáenz-Ponce, Iván M. Moya, Ingrid Alarcón, Norihiro Sudou, Shinji Yamamoto, and Masanori Taira, *PNAS* July 17, 2007 **104** (29) 11882–11888; https://doi.org/10.1073/pnas.0705092104]

What is the change and which process is necessary for it to occur?

	Change occurring	Process necessary
A.	egg production	meiosis
B.	embryonic development	cell differentiation
C.	excretion	exocytosis
D.	feeding	phagocytosis

4. Which process(es) occur(s) by osmosis?

I. Uptake of water by cells in the wall of the intestine

II. Loss of water from a plant cell in a hypertonic environment

III. Evaporation of water from sweat on the skin surface

A. I only

B. I and II only

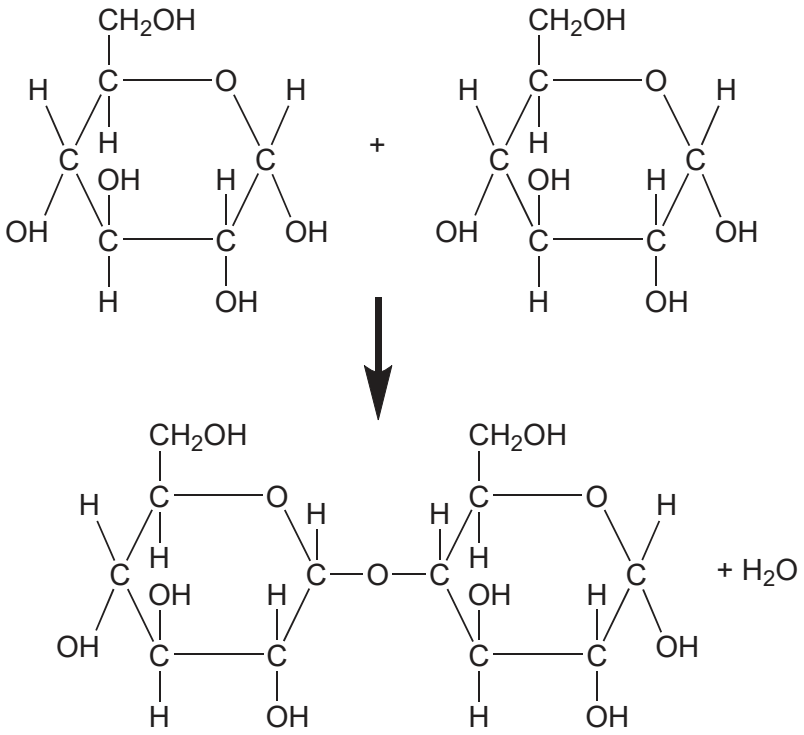
C. II and III only

D. I, II and III

5. The table shows the number of cells in various stages of the cell cycle in four samples of ovarian tissue from different patients. Which tissue sample A, B, C or D has the highest mitotic index?

	Number of cells					
	Interphase	**Prophase**	**Metaphase**	**Anaphase**	**Telophase**	**Total**
A.	46	1	1	1	1	50
B.	96	0	1	2	1	100
C.	21	2	0	1	1	25
D.	72	0	1	1	1	75

6. What type of molecule is formed by the chemical reaction shown in the diagram?



A. Dipeptide

B. Disaccharide

C. Diglyceride

D. Cellulose

7. Which substance must be transported in the blood by lipoprotein complexes?

A. Cholesterol

B. Oxygen

C. Sodium chloride

D. Amino acids

8. What is found in insulin molecules?

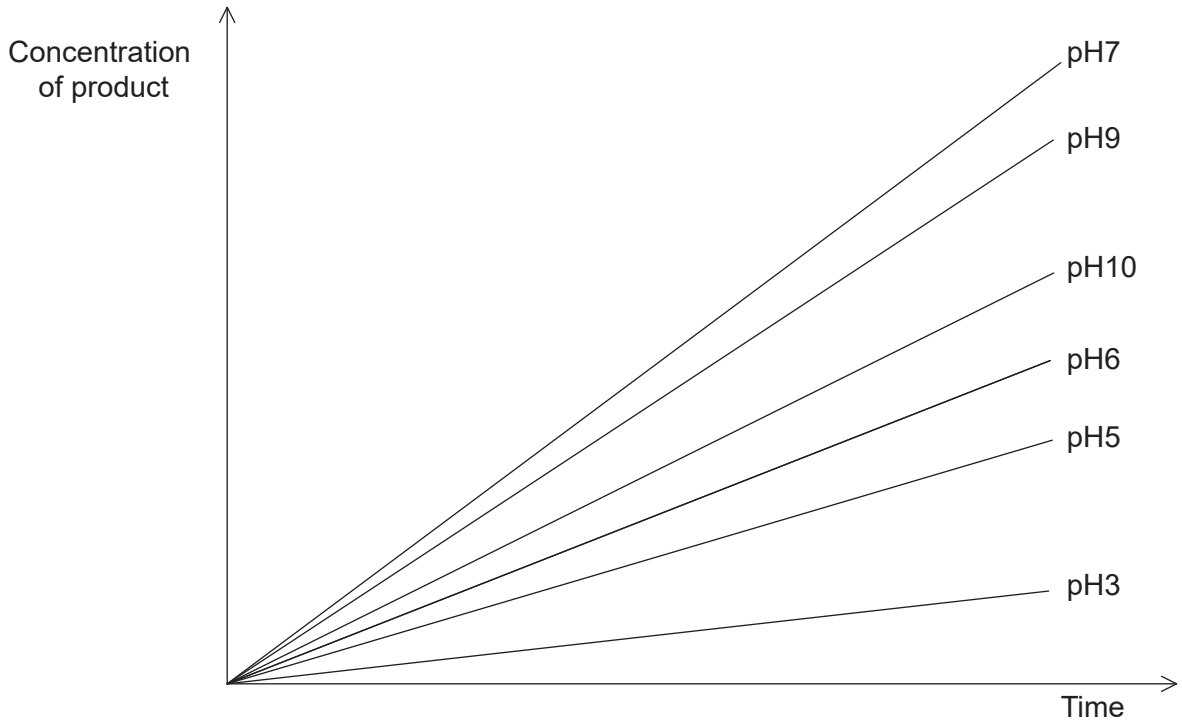
A. Phosphates

B. Nucleotides

C. Peptide bonds

D. Glycerol

9. The graph shows the results of an investigation into the activity of turnip peroxidase. The accumulation of the product of the reaction catalysed by the enzyme is shown at different pH values.



[Source: © International Baccalaureate Organization 2019]

Based on the data in the graph, what is most probably the optimum pH for turnip peroxidase?

A. Between 3 and 5

B. Between 10 and 11

C. Between 7 and 8

D. Between 9 and 10

10. The gene that codes for a particular polypeptide includes the base sequence shown.

GAGTACCCT

What is the base sequence of the mRNA molecule which is complementary to this sequence?

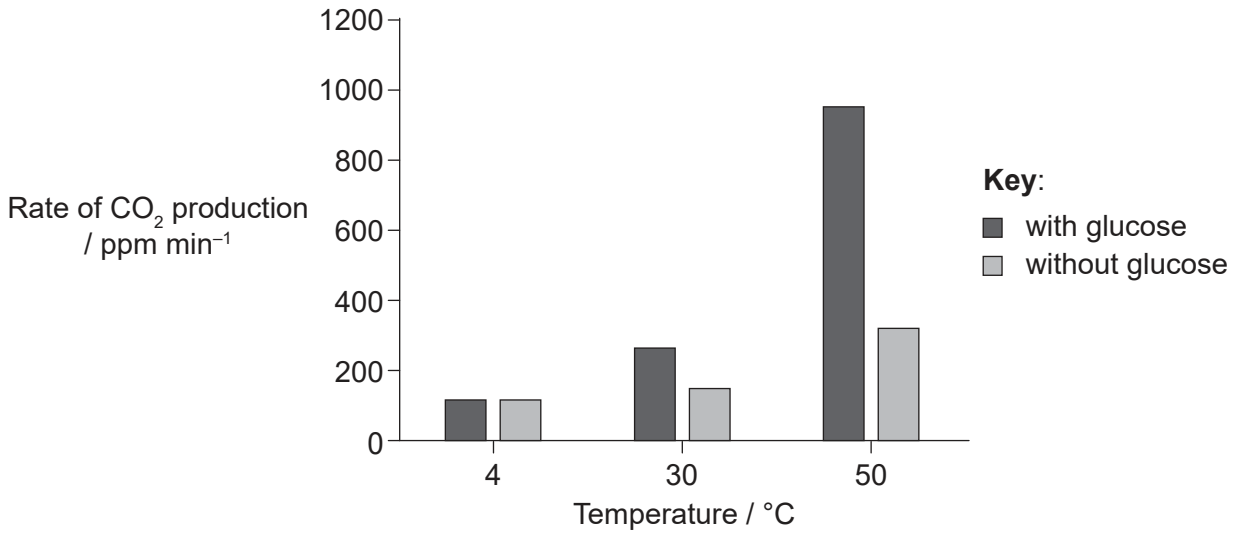
A. GAGTACCCT

B. CTCATGGGA

C. GUGTUCCCT

D. CUCAUGGGA

11. Yeast cells, *Saccharomyces cerevisiae*, were incubated with and without glucose at three different temperatures for a period of four minutes, during which the rate of CO_2 production was measured with a CO_2 sensor.



[Source: © International Baccalaureate Organization 2019]

What conclusion can be drawn from the results of this experiment?

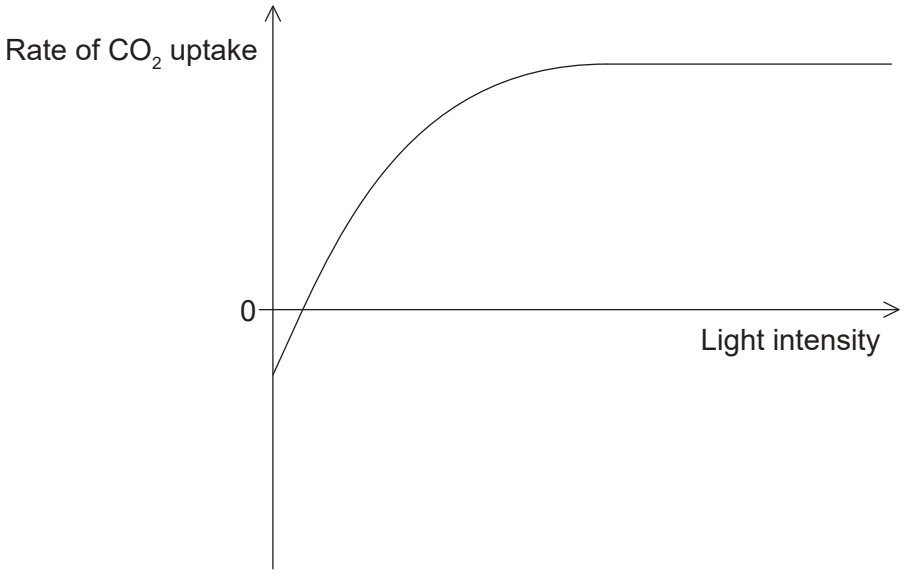
A. Yeast uses lipids rather than glucose in respiration at low temperatures.

B. Addition of glucose has a greater impact on rates of cell respiration at lower temperatures.

C. Rates of cell respiration increase with temperature.

D. More glucose is produced at higher temperatures.

12. The graph shows the effect of increasing light intensity on the rate of CO_2 uptake by a species of green plant maintained in conditions of constant temperature and CO_2 concentration.



[Source: © International Baccalaureate Organization 2019]

Which statement is consistent with the graph?

A. Photosynthesis stops at high light intensity.

B. Rates of photosynthesis increase with temperature.

C. Cell respiration leads to net production of CO_2 at low light intensity.

D. There is a negative correlation between CO_2 uptake and light intensity.

13. The system of sex determination in chimpanzees (*Pan troglodytes*) is the same as in other mammals. A chimpanzee has 48 chromosomes in the nuclei of its body cells. What can be deduced from this information?

A. The sex of the chimpanzee

B. The number of genes in each chromosome

C. Whether non-disjunction has occurred

D. The number of autosomes in a diploid cell

14. At which stage of meiosis are bivalents formed?

A. Interphase

B. Prophase I

C. Prophase II

D. Metaphase II

15. Creeper in chickens is a condition in which the chickens are born with very short legs. The creeper allele (C) is dominant over the normal allele (c). Embryos which are homozygous for the dominant allele fail to develop into viable chickens and die before they hatch. What phenotypic ratio would you expect in the live offspring of a cross between two creeper chickens?

A. All creeper

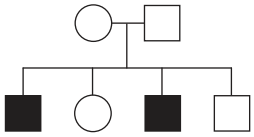
B. 1 creeper; 2 normal

C. 2 creeper; 1 normal

D. 3 creeper; 1 normal

16. Which pedigree chart is consistent with the inheritance of red-green colour blindness?

A.



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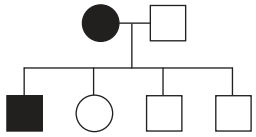
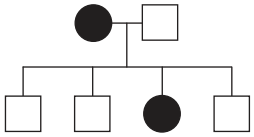
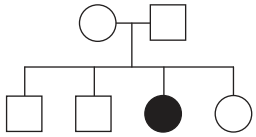


C.



D.



Key:

normal-vision female

normal-vision male

colour-blind female

colour-blind male

[Source: © International Baccalaureate Organization 2019]

17. Which organism can best be described as a saprotroph?

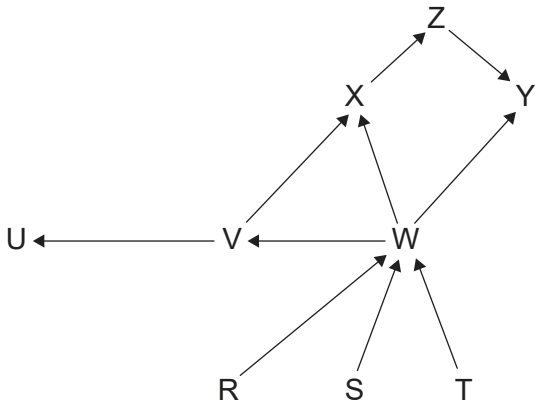
A. A fungus that digests its food externally and absorbs the products of digestion

B. A beetle that feeds by ingesting the dung of other animal species and digesting its food internally

C. A single-celled eukaryote that is able to photosynthesize and consumes smaller organisms by endocytosis

D. A giraffe that feeds by ingesting leaves from an acacia tree

18. The diagram shows the food web for an aquatic ecosystem in which letters R–Z represent individual species.



[Source: © International Baccalaureate Organization 2019]

Which organism is a tertiary consumer?

A. Organism T

B. Organism U

C. Organism W

D. Organism Y

19. Which organisms produce methane in anaerobic environments such as waterlogged soils?

A. Archaea

B. Fungi

C. Eukaryotes

D. Eubacteria

20. Which are examples of homologous structures?

A. The wings of bats and butterflies

B. The fins of fish and whales

C. The hindlimbs of frogs and grasshoppers

D. The forelimbs of primates and penguins

21. Which is an example of natural selection?

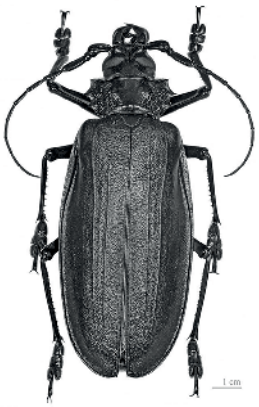
A. A giraffe stretching its neck to reach higher leaves

B. A juvenile bird learning to sing

C. Development of antibiotic resistance in bacteria

D. Selective breeding of tail-less cats

22. The image shows an organism belonging to the Kingdom Animalia.



[Source: Titan beetle male. Locality: “RK4,5 route Cacao”, French Guiana
© 2011, Didier Descouens https://creativecommons.org/licenses/by-sa/4.0/]

What feature does this organism have in common with all members of the phylum chordata?

A. Legs and wings

B. Mouth but no anus

C. Bilateral symmetry

D. Chitinous exoskeleton

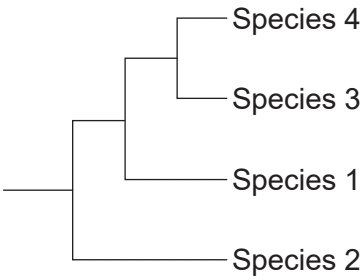
23. The DNA base sequences in a gene coding for a particular protein in four different species are shown. Locations where mutations have occurred resulting in changes to the base sequences are outlined in boxes.

Species 1	T	A	T	A	G	C	T	A	C	G	G	A	T	G	G	C	T
Species 2	T	A	T	A	C	A	T	C	C	G	G	T	A	A	G	C	T
Species 3	T	A	T	A	C	C	T	C	C	G	G	T	A	A	G	C	T
Species 4	T	A	T	A	G	A	T	C	C	G	G	T	A	G	G	C	T

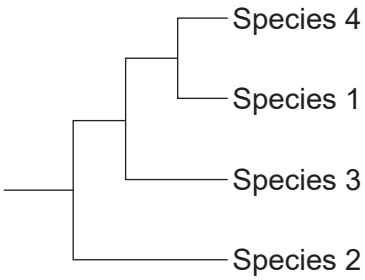
[Source: © International Baccalaureate Organization 2019]

Which cladogram shows the most likely phylogenetic relationship between the four species, based on the data provided?

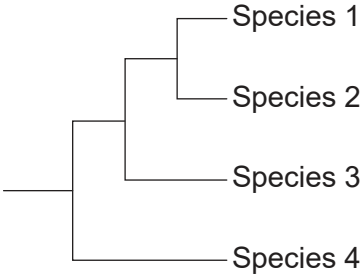
A.



B.



C.



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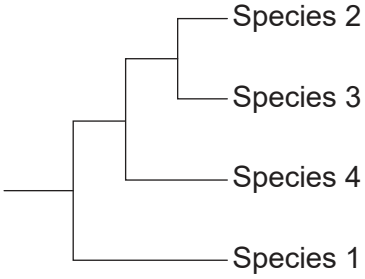


24. Where in the human body is lipase produced?

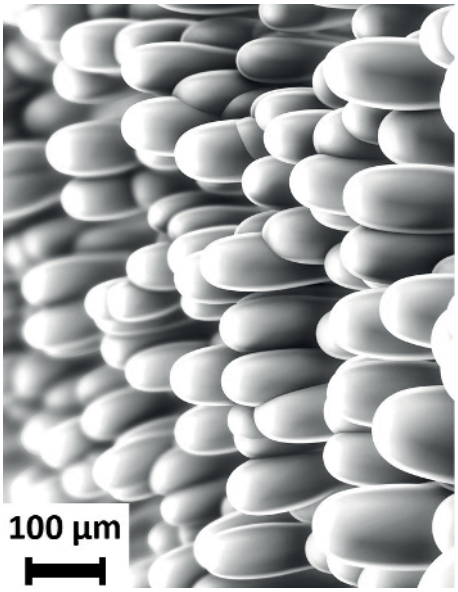
A. Stomach

B. Pancreas

C. Gall bladder

D. Liver

25. What are these structures?



[Source: Burgstedt | Dreamstime.com]

A. Fatty acids in the small intestine

B. Bacteria in the large intestine

C. Villi in the small intestine

D. Feces egested from the large intestine

26. Which feature of capillaries distinguishes them from arteries and veins?

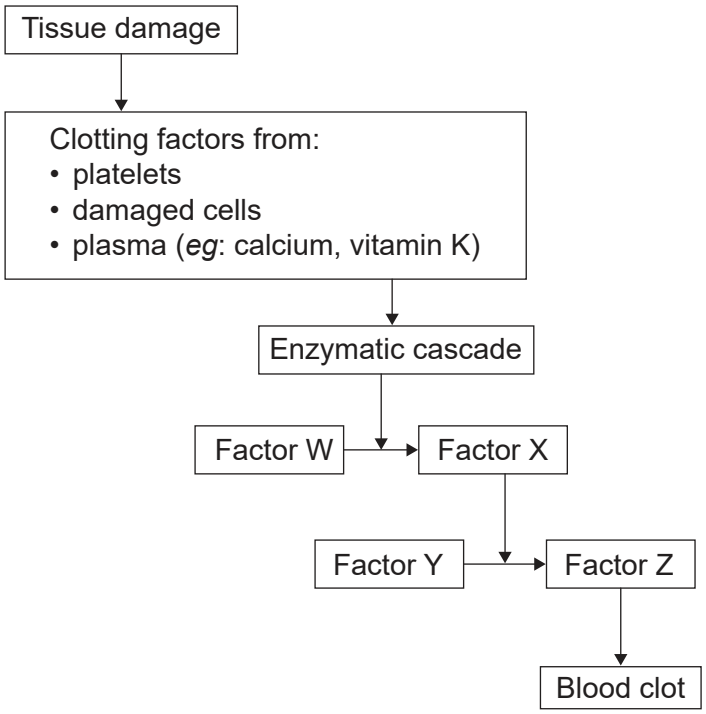
A. Narrow diameter

B. Valves to prevent backflow

C. Thick muscular walls

D. Elastic tissue

27. The diagram shows the major events involved in the formation of a blood clot.



[Source: © International Baccalaureate Organization 2019]

What is Factor Y?

A. Fibrin

B. Prothrombin

C. Fibrinogen

D. Thrombin

28. Which statement applies to HIV?

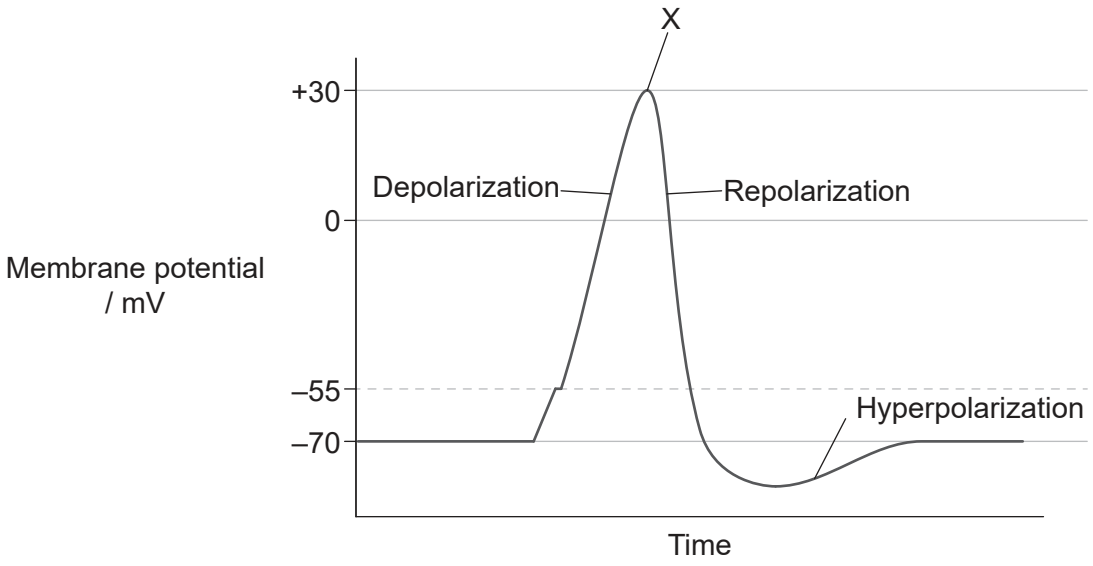
A. HIV infects red blood cells resulting in decreased production of hemoglobin.

B. HIV can be effectively treated using antibiotics.

C. HIV can only be transmitted by sexual intercourse.

D. HIV causes a reduction in production of antibodies.

29. The diagram shows a graph of an action potential.



[Source: https://www.ncbi.nlm.nih.gov/books/NBK538143/figure/article-17127.image.f1/?report=objectonly
Physiology, Action Potential by Michael H. Grider and Carolyn S. Glaubensklee.

What is happening at X?

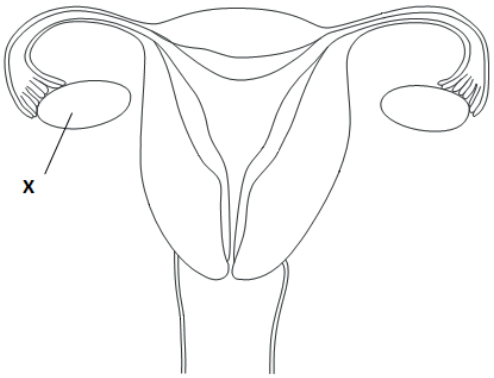
A. Sodium channels close.

B. Calcium channels open.

C. Sodium channels open.

D. Potassium channels close.

30. The diagram shows the human female reproductive system.



[Source: © International Baccalaureate Organization 2019]

What is produced by structure X?

A. FSH

B. X chromosomes

C. Fertilized eggs

D. Estrogen and progesterone