

Biology
Standard level
Paper 1

Monday 1 May 2017 (afternoon)

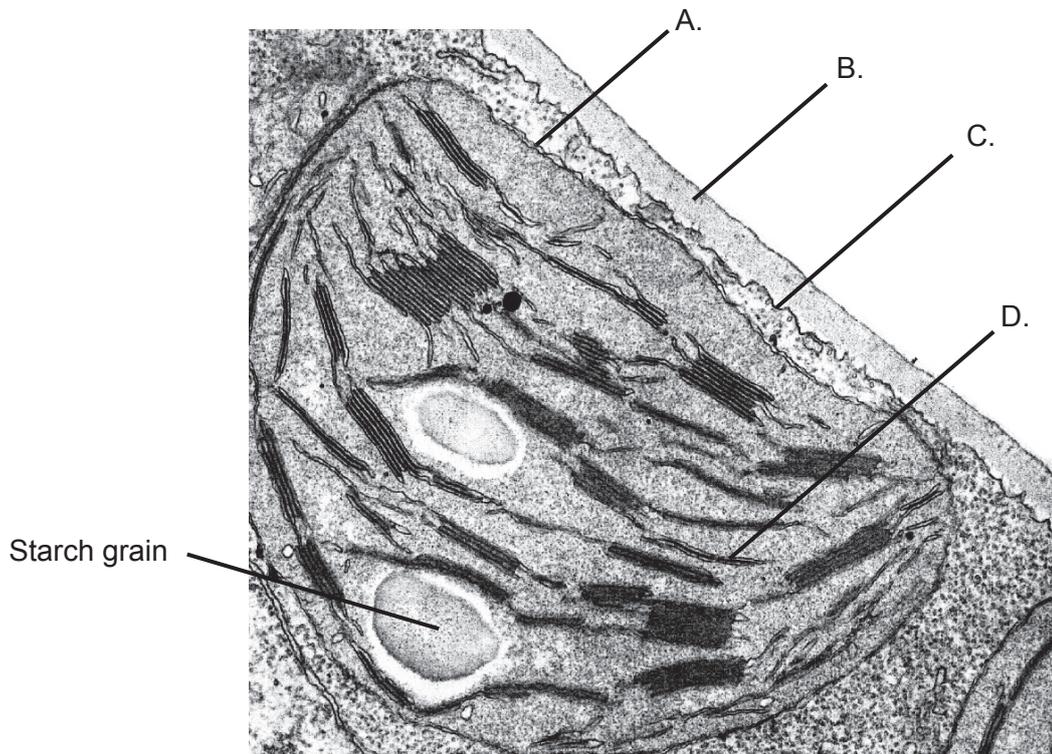
45 minutes

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]**.

1. Which structure found in eukaryotes has a single membrane?
 - A. Nucleus
 - B. Lysosome
 - C. Chloroplast
 - D. Mitochondrion

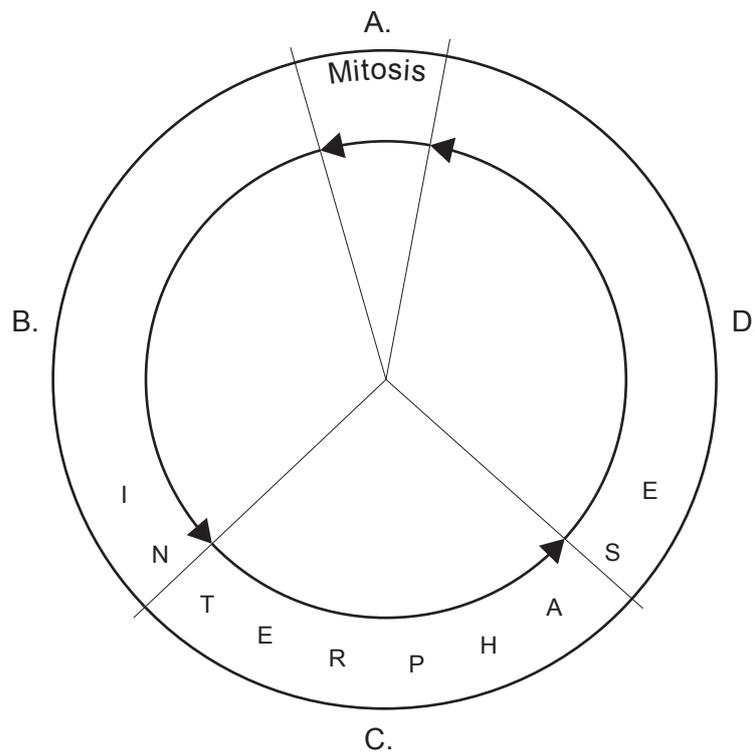
2. The following electron micrograph shows part of a palisade mesophyll cell. Which of the labelled structures controls the exchange of substances to and from the cell?



[Source: adapted from Eldon Newcomb, <http://botit.botany.wisc.edu/about.html>]

3. Which organism has DNA located in three organelles?
 - A. A sponge
 - B. A fern
 - C. A flatworm
 - D. A bacterium

4. Which organelle is involved in generating vesicles destined for the cell membrane?
- A. Golgi apparatus
 - B. Smooth endoplasmic reticulum
 - C. Rough endoplasmic reticulum
 - D. Lysosome
5. When during the cell cycle does DNA replication take place?

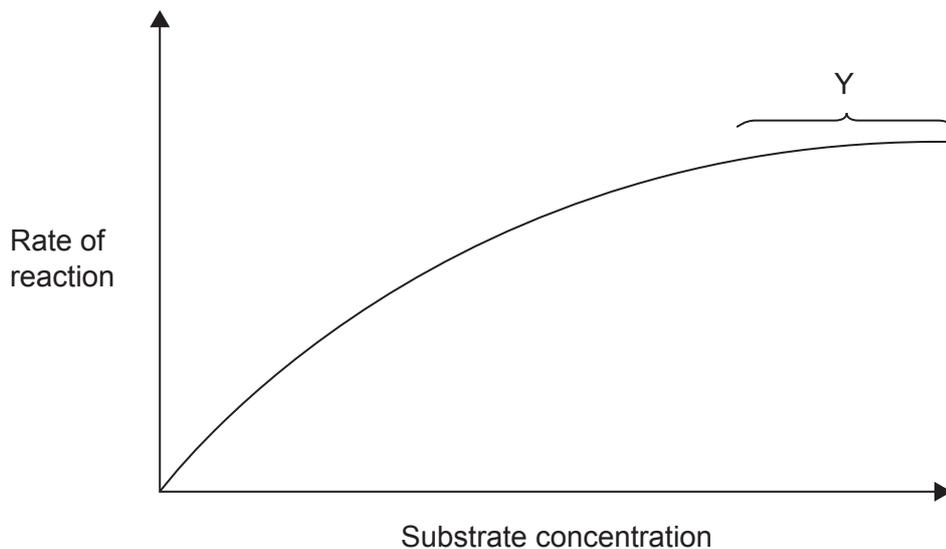


[Source: © International Baccalaureate Organization 2017]

6. A polymer of alpha-D-glucose found in plants has mostly 1,4 linkages and some 1,6 linkages. Which molecule fits this description?
- A. Glycogen
 - B. Cellulose
 - C. Amylose
 - D. Amylopectin

7. In an experiment the effect of changing pH on an enzymatic reaction is tested. Which could be a dependent variable in this kind of experiment?
- A. Changing substrate concentration
 - B. Rate of formation of product
 - C. Variation in temperature
 - D. Change in pH
8. Meselson and Stahl conducted experiments using the isotopes ^{14}N and ^{15}N which showed that DNA replication is semi-conservative. What would they have observed about the distribution of isotopes in the DNA after one round of replication if DNA replication was conservative rather than semi-conservative?
- A. Only ^{14}N DNA
 - B. Only ^{15}N DNA
 - C. All DNA half ^{14}N and half ^{15}N
 - D. Half the DNA with only ^{14}N and half with only ^{15}N
9. The most abundant structural protein in the human body is found in ligaments and skin. What is the name of this protein?
- A. Collagen
 - B. Hemoglobin
 - C. Myoglobin
 - D. Immunoglobulin

10. The graph shows the effect of increasing the substrate concentration on the rate of an enzyme-catalysed reaction. What is occurring during the phase indicated by section Y of the graph?



- A. The active site of the enzyme is saturated.
 - B. The enzyme becomes denatured.
 - C. The substrate concentration has risen too high.
 - D. The optimum rate is reached.
11. A short sequence of nucleotides reads GGACAGAGCGCAGACGA. In which type of molecule could this sequence be found?
- A. DNA molecule only
 - B. RNA molecule only
 - C. Both in a DNA and an RNA molecule
 - D. In double-stranded DNA only

12. The table shows the genetic code.

		Second letter				
		U	C	A	G	
First letter	U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Tyr STOP STOP	Cys Cys STOP Trp	U C A G
	C	Leu Leu Leu Leu	Pro Pro Pro Pro	His His Gln Gln	Arg Arg Arg Arg	U C A G
	A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G
	G	Val Val Val Val	Ala Ala Ala Ala	Asp Asp Glu Glu	Gly Gly Gly Gly	U C A G
						Third letter

Which mRNA could code for the sequence Met-Ser-Leu-Arg-Phe?

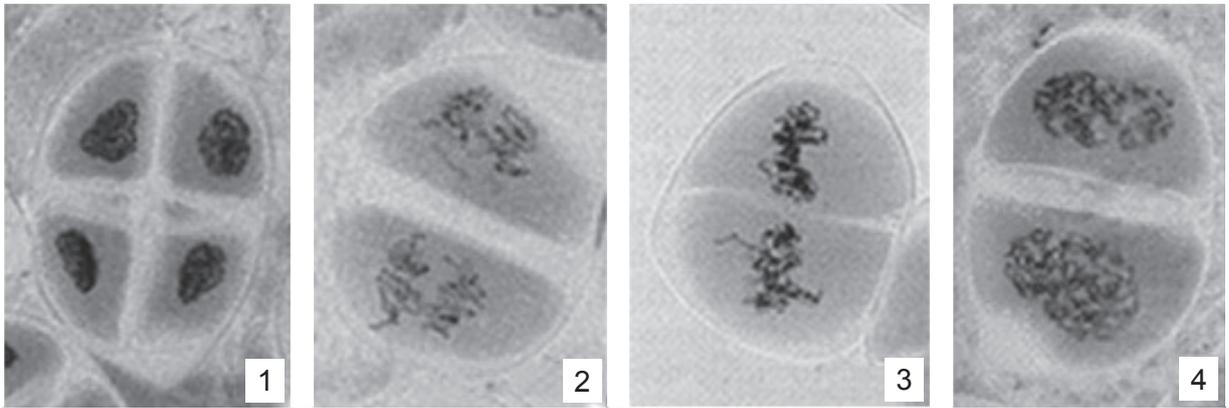
- A. AUG UCA UCG UGG UUU
- B. AUG UCC ACC AGA UUC
- C. AUG UCU CCC AGA UUU
- D. AUG UCG CUG AGG UUC

13. A child has blood group A. The father of the child has blood group B. What are the possible genotypes of the mother?

- I. $I^A I^A$
- II. $I^A I^B$
- III. $I^A i$

- A. I only
- B. I and II only
- C. II and III only
- D. I, II and III

14. The micrographs show four different phases from meiosis II. What is the correct order?



[Source: <http://biologyforhighschool.net>]

- A. 3-4-2-1
- B. 2-3-4-1
- C. 4-3-2-1
- D. 4-2-3-1

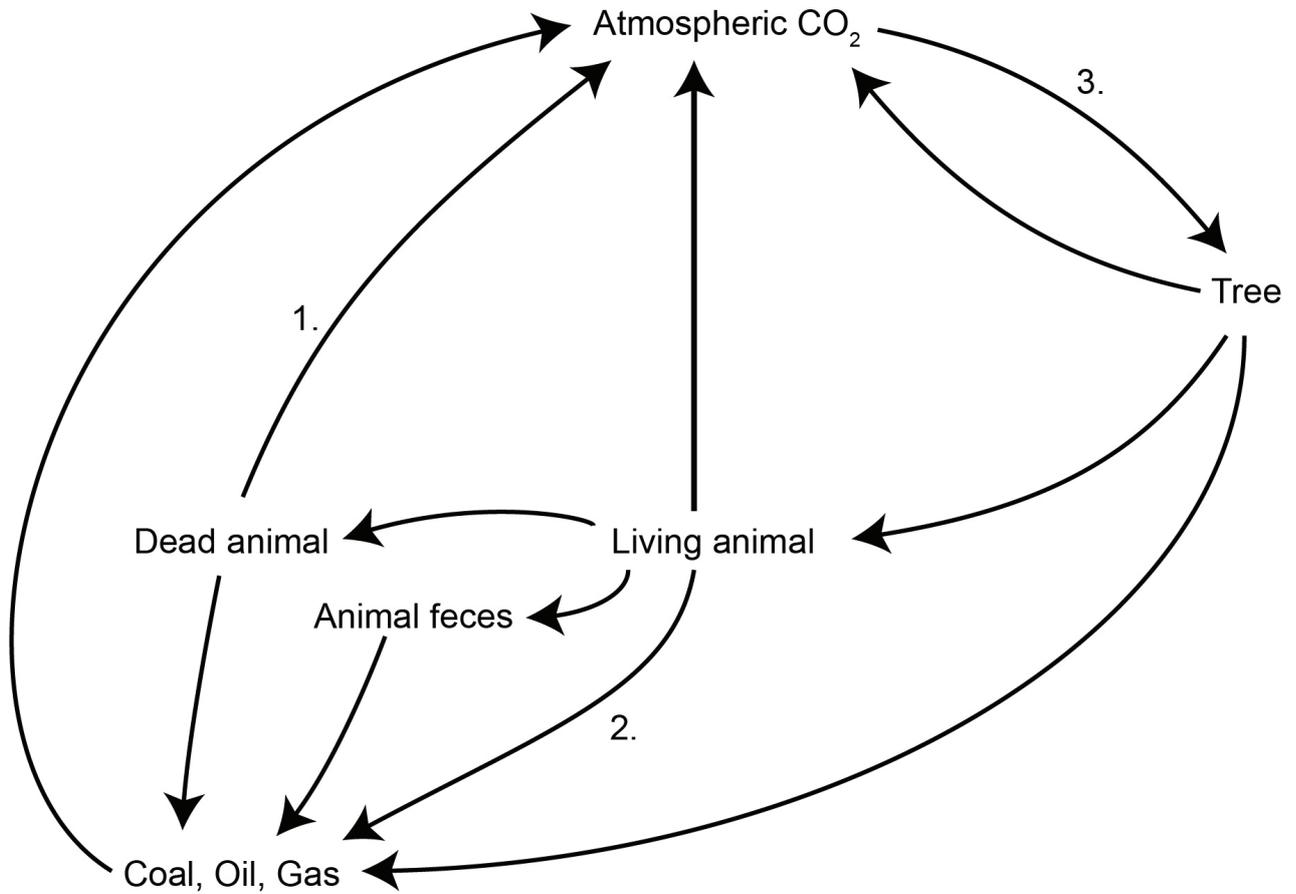
15. How does the proteome of a species contain a larger number of proteins than genes that code for these proteins?
- A. Some proteins have more than one polypeptide chain.
 - B. There are genes that code for several proteins.
 - C. Not all proteins are coded for by the genome.
 - D. Some proteins are coded for by other proteins.

16. During which phase of the first division of meiosis can non-disjunction take place and what structure is affected by the non-disjunction?

	Meiotic phase	Structure
A.	Anaphase	chromosomes
B.	Anaphase	chromatids
C.	Metaphase	chromosomes
D.	Metaphase	chromatids

17. *Euglena* is a unicellular organism that feeds on bacteria and uses CO₂ as a carbon source. Which describes the nutrition of this organism?
- A. Autotrophic only
 - B. Heterotrophic only
 - C. Saprotrophic only
 - D. Autotrophic and heterotrophic

18. The diagram shows a version of the carbon cycle. What is indicated by the numbers?

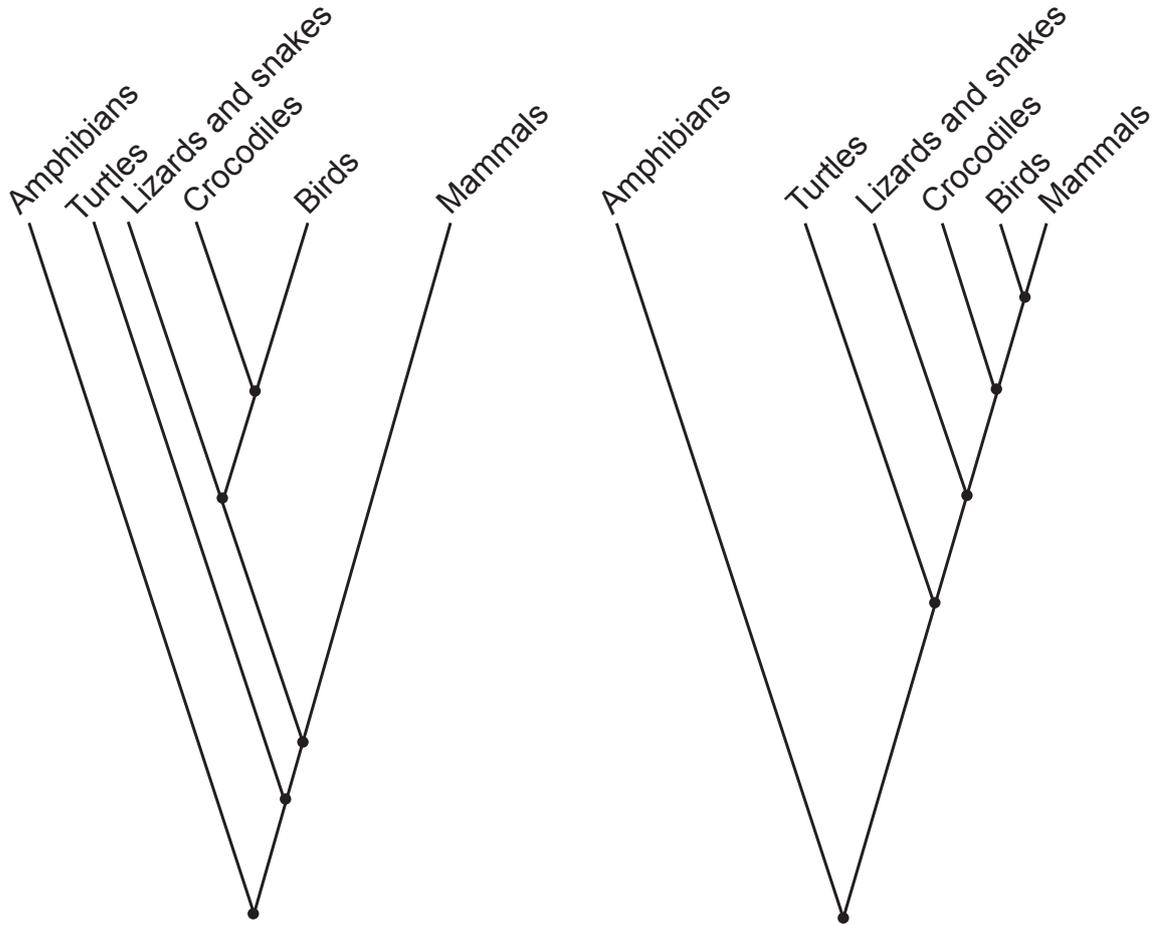


[Source: © International Baccalaureate Organization 2017]

	1	2	3
A.	Death of consumers	Cell respiration in saprotrophs	Cell respiration in producers
B.	Death of consumers	Incomplete decomposition	Photosynthesis in producers
C.	Cell respiration in saprotrophs	Incomplete decomposition	Photosynthesis in producers
D.	Cell respiration in consumers	Cell respiration in saprotrophs	Cell respiration in producers

- 19.** Which characteristic of water vapour classifies it as a greenhouse gas?
- A. It absorbs and then re-emits some of the long wave radiation emitted by the Earth's surface.
 - B. It prevents short wave radiation from reaching the Earth's surface.
 - C. It absorbs UV radiation but does not re-emit it.
 - D. It absorbs infra-red radiation but does not re-emit it.
- 20.** A bacterial population with no resistance to an antibiotic may develop into a bacterial population with some resistance to an antibiotic. Which event could lead to this?
- A. Antibiotic resistance was inherited from an ancestral population.
 - B. An antibiotic resistance plasmid is received from a bacterium in another population.
 - C. The enzyme needed for antibiotic resistance is received from a bacterium in another population.
 - D. The bacterial population mutated in response to antibiotics in the environment.

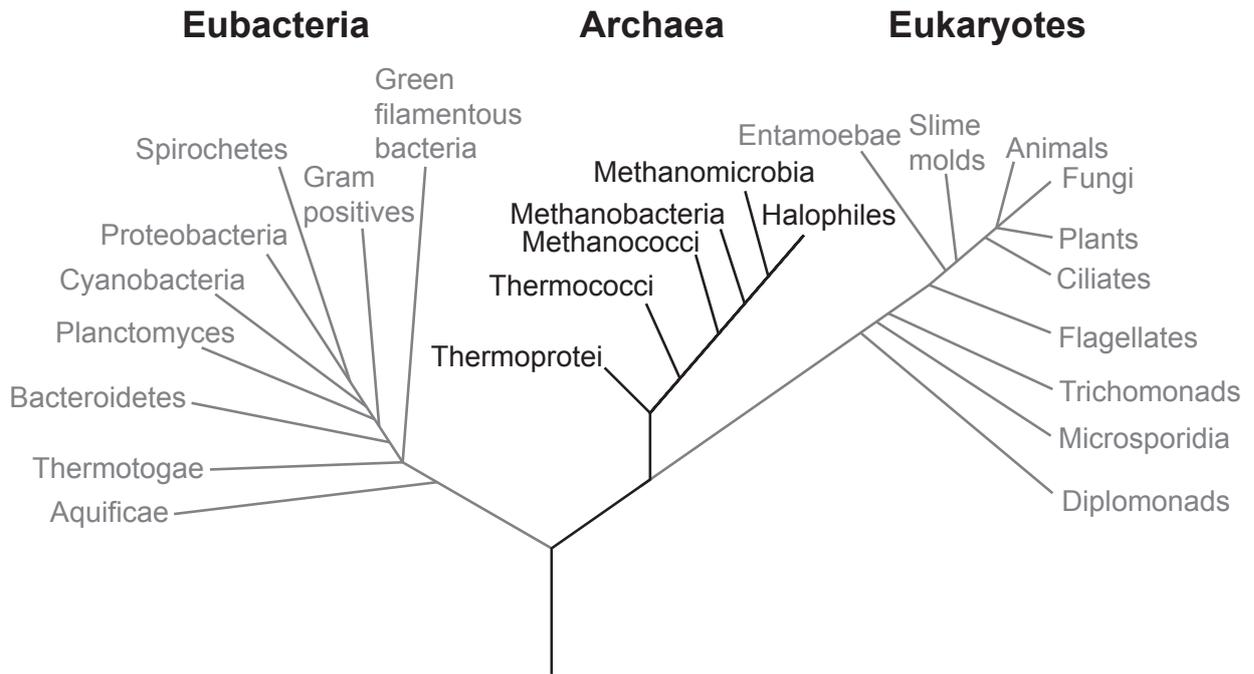
21. Cladograms can be created by comparing DNA or protein sequences. The cladogram on the left is based on DNA sequences and the cladogram on the right is based on comparing protein sequences.



What is the reason that cladograms based on DNA sequences are more reliable predictors of the phylogenetic relationship of species than cladograms based on protein sequences?

- A. Amino acids are not as chemically stable as DNA nucleotides.
- B. DNA mutates but amino acids do not.
- C. Several different triplets of bases can code for the same amino acid.
- D. There are 20 different amino acids but only 4 nucleotides.

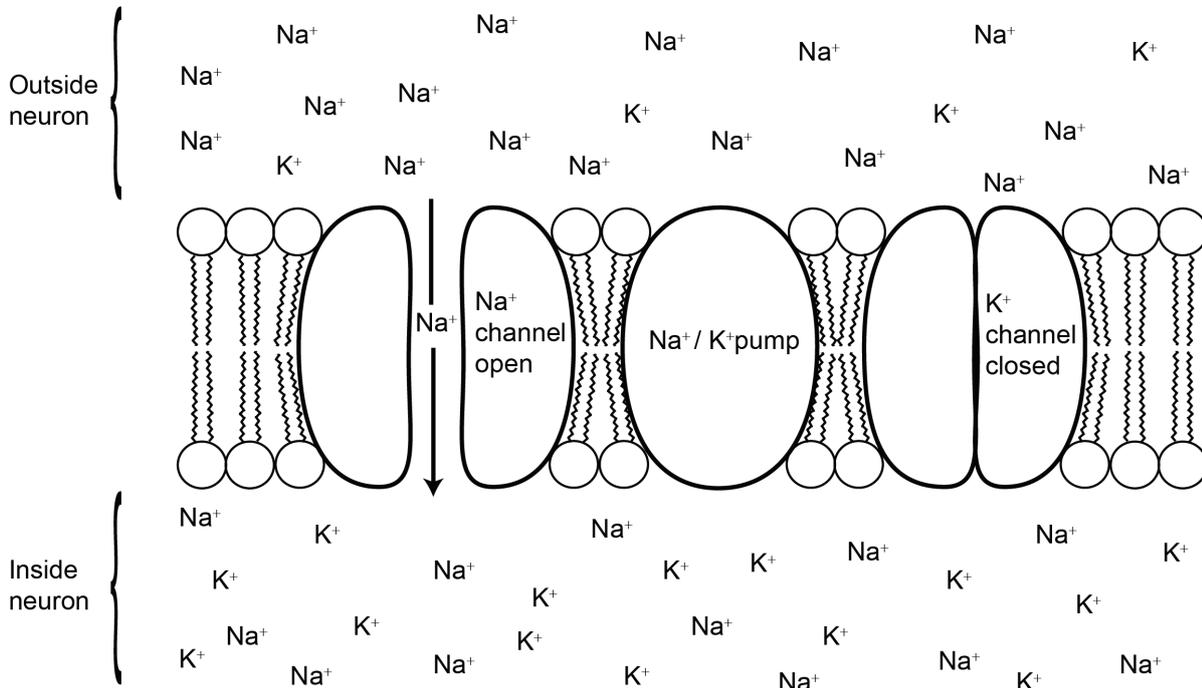
22. Below is a phylogenetic tree of the three domains.



There are important differences between the three domains. Which of these domains have organelles?

- A. Eubacteria and archaea
 - B. Archaea only
 - C. Eukaryotes and archaea
 - D. Eukaryotes only
23. A plant has cambium in its vascular tissue and pollen is produced in male cones. The plant disperses seeds but does not produce fruit. In which phylum does this plant belong?
- A. Coniferophyta
 - B. Angiospermophyta
 - C. Filicinophyta
 - D. Bryophyta

24. The diagram below shows part of the membrane of a neuron. What stage of the action potential does it depict?



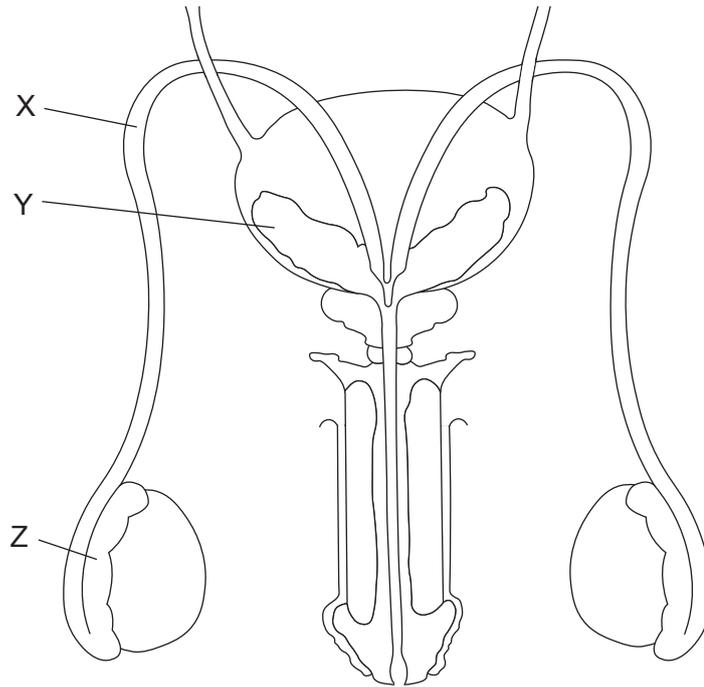
[Source: © International Baccalaureate Organization 2017]

- A. Depolarization
 - B. Repolarization
 - C. Resting potential
 - D. Hyperpolarization
25. Neurotransmitters are released into the synaptic cleft from the presynaptic neuron and travel to a receptor on the postsynaptic neuron membrane. Which processes are required for this to happen?

	Release into synaptic cleft	Travel to postsynaptic neuron membrane
A.	exocytosis	diffusion
B.	active transport	diffusion
C.	exocytosis	active transport
D.	active transport	active transport

26. In which blood vessel connected to the heart does blood have the lowest carbon dioxide concentration?
- A. Pulmonary vein
 - B. Vena cava
 - C. Pulmonary artery
 - D. Coronary vein
27. Which hormone promotes the thickening of the endometrium and also inhibits the hormone that promotes the development of the follicle wall into the corpus luteum?
- A. LH
 - B. Progesterone
 - C. FSH
 - D. Estrogen

28. The diagram shows the male reproductive organs in front view.



[Source: Generic diagram]

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

	X	Y	Z
A.	Sperm duct	Seminal vesicle	Epididymis
B.	Urethra	Prostate gland	Sperm duct
C.	Sperm duct	Prostate gland	Epididymis
D.	Urethra	Seminal vesicle	Sperm duct

29. What helps to keep blood flowing onwards away from the heart in an artery?

- A. Valves
- B. Elastic fibres
- C. Contraction of skeletal muscles
- D. Having a wide lumen

- 30.** Pancreatic gland cells produce and secrete large amounts of digestive enzymes. Which organelles would you expect to be present in higher than normal amounts in such cells?
- A. Free ribosomes and Golgi apparatus
 - B. Rough endoplasmic reticulum and lysosomes
 - C. Rough endoplasmic reticulum and Golgi apparatus
 - D. Free ribosomes and lysosomes
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