

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

Monday 1 May 2017 (afternoon)

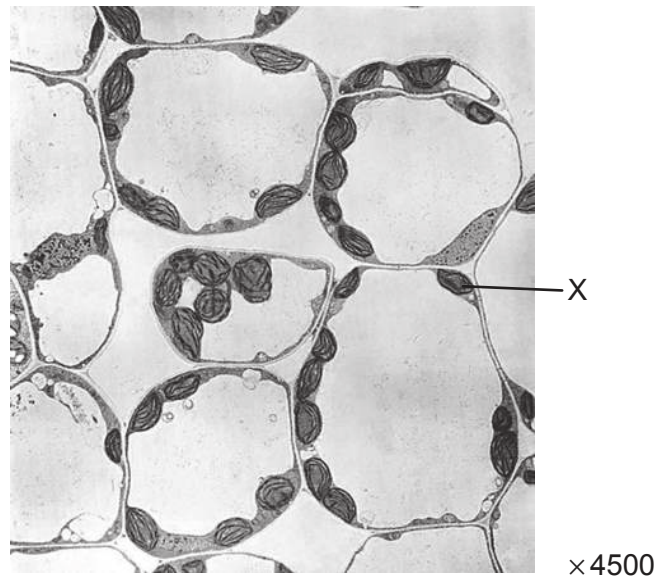
45 minutes

---

**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. The giant alga *Acetabularia* has a feature that suggests it is an exception to the cell theory. What feature is this?
  - A. It lacks a nucleus.
  - B. It lacks a cell wall.
  - C. It has only one mitochondrion.
  - D. It lacks subdivision into separate cells.
2. The image shows an electron micrograph of mesophyll cells.

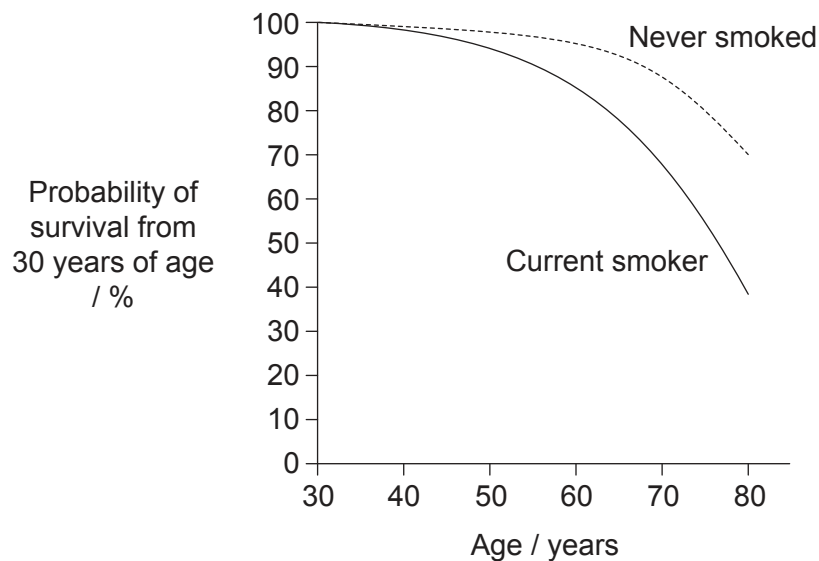


[Source: BIOPHOTO ASSOCIATES/SCIENCE PHOTO LIBRARY]

What is the name of the structure labelled X?

- A. Cytoplasm
- B. Mitochondrion
- C. Nucleus
- D. Chloroplast

3. What is a role of cholesterol in animal cells?
- A. It increases body fat.
  - B. It controls membrane fluidity.
  - C. It lines the inner wall of capillaries.
  - D. It is a constituent of bile.
4. What is evidence for the endosymbiotic theory?
- A. RNA can catalyse metabolic reactions.
  - B. Meteorites contain organic molecules.
  - C. Amino acids can be synthesized from inorganic compounds.
  - D. Mitochondria possess their own DNA.
5. The graph shows the survival probabilities for current smokers and for those who never smoked among women 30 to 80 years of age.



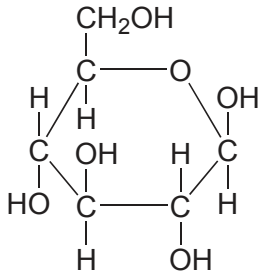
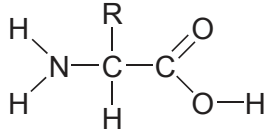
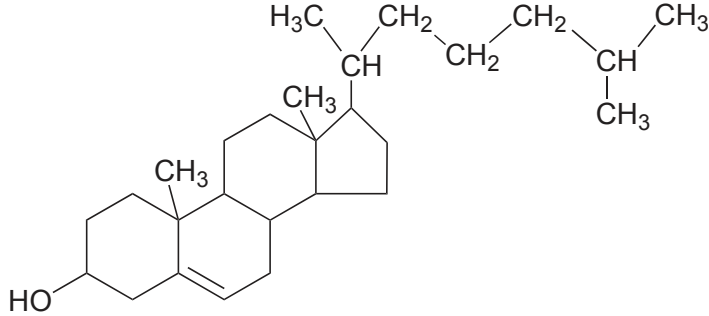
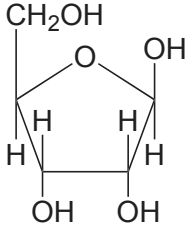
[Source: adapted from J Prabhat *et al.* (2013) *The New England Journal of Medicine*, 368 (4), page 347. Copyright ©2013 Massachusetts Medical Society. Reprinted with permission]

What can be deduced from this graph?

- A. There is a correlation between smoking and cancer.
- B. Smoking reduces life expectancy.
- C. Smoking causes cancer.
- D. 70% of smokers survive to 80 years old.

Turn over

6. Which molecule diagram corresponds to the name?

Name	Molecule diagram
A. D-ribose	
B. Amino acid	
C. Phospholipid	
D. Beta-D-glucose	

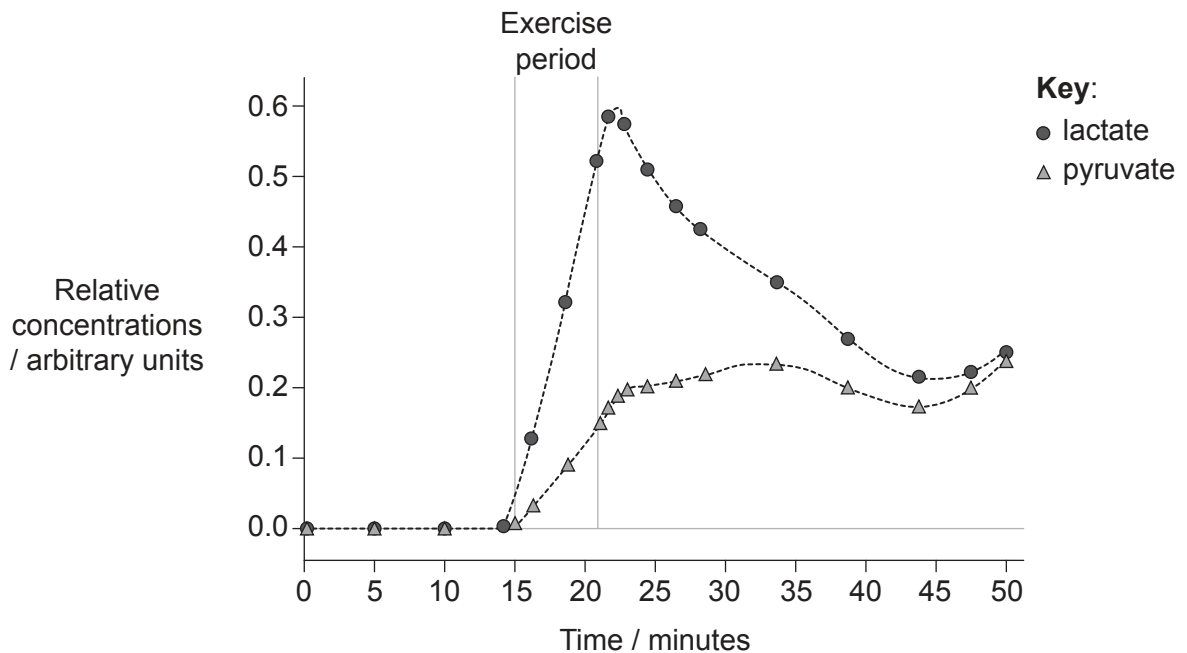


9. Which are necessary to make DNA replication semi-conservative?

- I. Separation of the strands by RNA polymerase
- II. Complementary base pairing
- III. Use of a pre-existing strand as a template

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

10. The graph shows the changes in lactate and pyruvate measured in an athlete's blood during and following a mild exercise period as compared to the period before the exercise.



[Source: W. E. Huckabee (1958) *The Journal of Clinical Investigation*, 37 (2), page 257.]

What do these curves suggest?

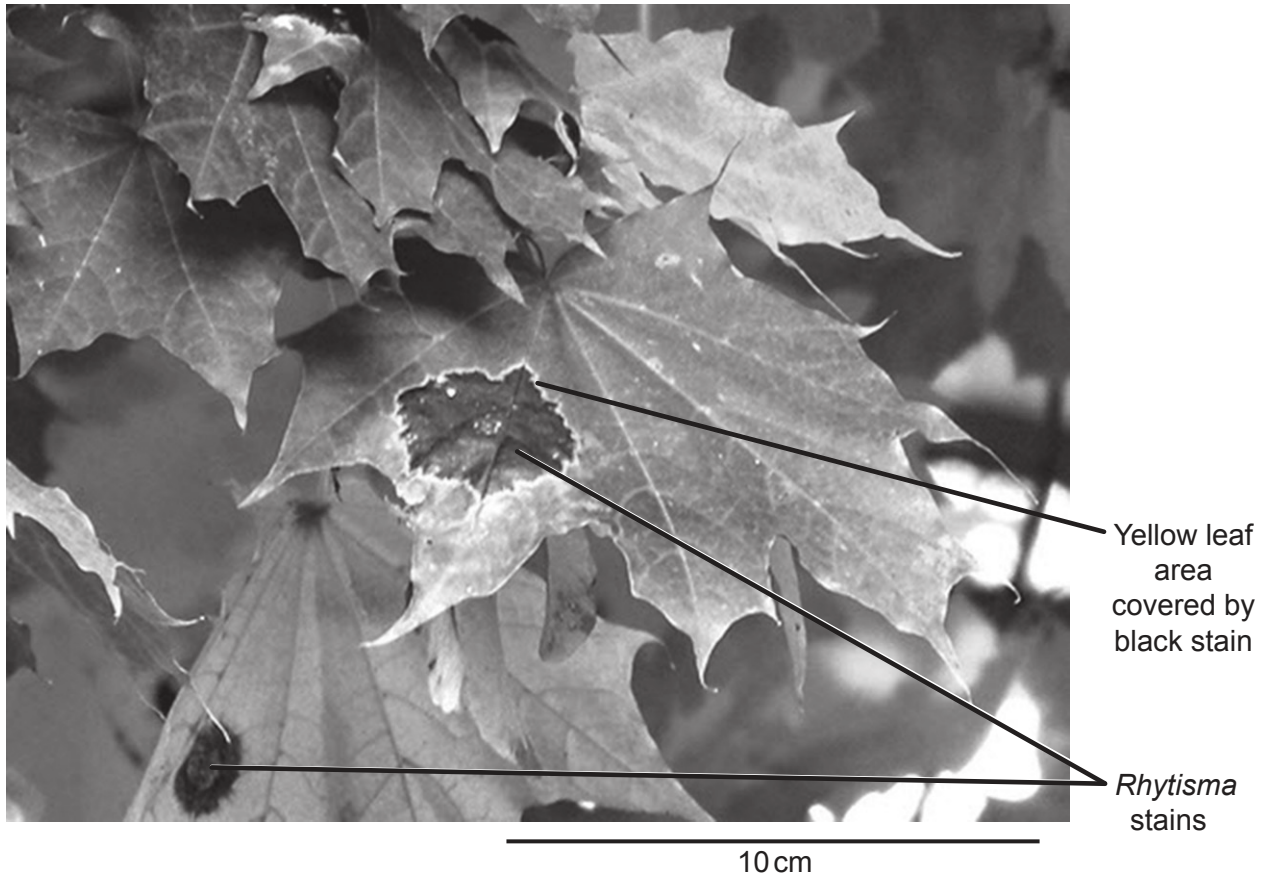
- A. Before the exercise, there was no pyruvate produced because there was no cell respiration.
- B. During the exercise, there was not enough oxygen available for cell respiration, so the process was partly anaerobic.
- C. During the exercise, the level of lactate increased due to aerobic respiration.
- D. After the exercise, the level of lactate decreased because there was enough pyruvate to be used for anaerobic cell respiration.

11. What is the relative wavelength in the visible spectrum of red light and blue light and are these colours absorbed or reflected by chlorophyll?

	<b>Red light</b>		<b>Blue light</b>	
A.	longest wavelength	absorbed	shortest wavelength	absorbed
B.	shortest wavelength	reflected	longest wavelength	reflected
C.	longest wavelength	absorbed	shortest wavelength	reflected
D.	shortest wavelength	absorbed	longest wavelength	absorbed

Turn over

12. The fungus *Rhytisma* grows on the leaves of certain trees, causing a yellow leaf area in which chlorophyll is no longer present. A black, tar-like stain later spreads out.



[Source: © International Baccalaureate Organization 2017]

What happens in the leaf when *Rhytisma* is present?

- I. An increase in the intake of carbon dioxide
  - II. A reduction in the production of oxygen
  - III. An increase in the loss of water
- A. I only
  - B. II only
  - C. II and III only
  - D. I, II and III



13. What distinguishes an allele from a gene?
- A. An allele is made of RNA.
  - B. An allele is shorter.
  - C. An allele is a variety of a gene.
  - D. An allele cannot be transferred during genetic modification.
14. Which is a characteristic of the pairs of sister chromatids that are visible during meiosis?
- A. They result from the replication of DNA before meiosis.
  - B. They are only present in meiosis I.
  - C. They split apart during metaphase I in meiosis.
  - D. They are only present in meiosis II.
15. Some breeds of dogs are characterized by the presence of a melanistic mask, which is a darkening of the fur near the nose, as shown by the arrow in this photograph.



Melanistic mask

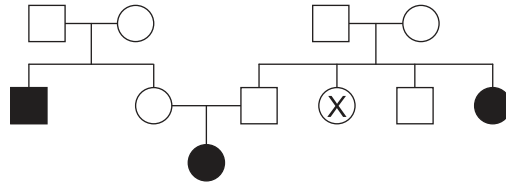
[Source: [https://commons.wikimedia.org/wiki/File:French\\_bulldog\\_on\\_the\\_grass.jpg](https://commons.wikimedia.org/wiki/File:French_bulldog_on_the_grass.jpg)]

Which outcome is matched with a valid conclusion if dogs that were pure breeding for melanistic masks were crossed with dogs without melanistic masks?

- A. If 0% of the puppies have a mask, the character is recessive.
- B. If 25% of the puppies have a mask, the character is dominant.
- C. If 75% of the puppies have a mask, the character is dominant.
- D. If 100% of the puppies have a mask, the character is recessive.

Turn over

16. The diagram shows a pedigree of cystic fibrosis, in which the black colour indicates the presence of cystic fibrosis.



What is the probability that the individual labelled X is a carrier of cystic fibrosis?

- A. 1.00
  - B. 0.50
  - C. 0.25
  - D. 0.00
17. What is lost between trophic levels in ecosystems and cannot be recycled?
- A. Heat
  - B. Nitrogen
  - C. Carbon compounds
  - D. Biomass
18. What favours the production of peat?
- I. Presence of organic matter
  - II. Anaerobic conditions
  - III. Acidic conditions
- A. I and II only
  - B. I and III only
  - C. II and III only
  - D. I, II and III

19. By which mechanism do greenhouse gases contribute to global warming?
- A. Their higher concentration absorbs more long wave radiation coming from the Sun.
  - B. Short wave radiation emitted from the Earth's surface increases with their concentration.
  - C. They absorb higher amounts of long wave radiation emitted from the Earth's surface as their concentration increases.
  - D. They absorb higher amounts of short wave radiation caused by increased combustion of fossilized organic matter.
20. The graph shows the song duration of birds from the genus *Phylloscopus* sampled from west to east throughout Northern Europe and Northern Asia.

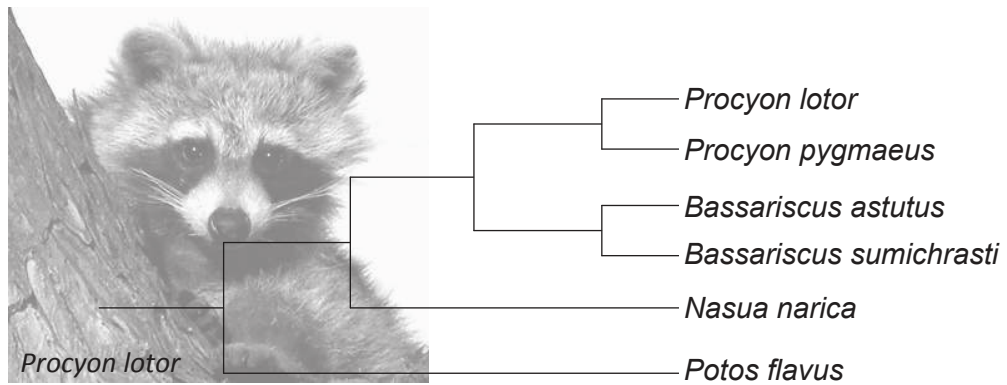
Removed for copyright reasons

What concept do these data illustrate?

- A. Gradual divergence
  - B. Adaptive radiation
  - C. Interbreeding populations
  - D. Punctuated equilibrium
21. What is a direct consequence of the overproduction of offspring?
- A. Individuals become more adapted to the environment.
  - B. They will be subject to intraspecific competition.
  - C. They will diverge to produce different species.
  - D. They will suffer mutations.

**Turn over**

22. The diagram represents a cladogram of the family Procyonidae.



[Source: © International Baccalaureate Organization 2017]

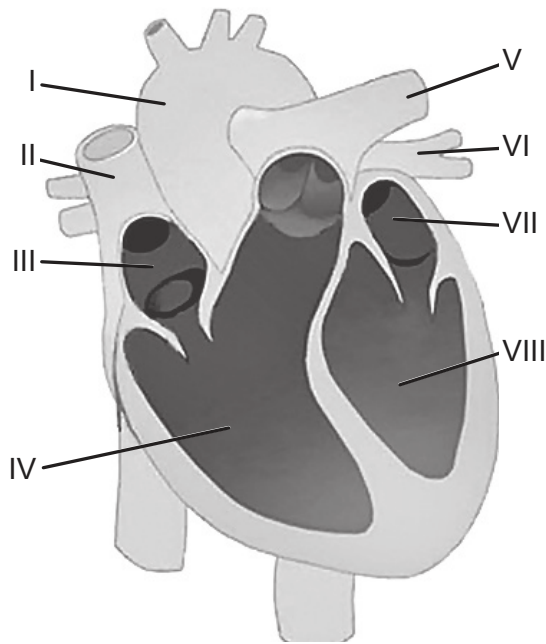
What would justify classifying these organisms into four different genera?

- A. They live in different habitats.
  - B. They do not share any common ancestors.
  - C. There are enough differences between them.
  - D. The number of times that the species have split.
23. Which is a characteristic of both bryophyta and filicinophyta?
- A. Vascular tissue
  - B. Membranous leaves
  - C. Release of spores
  - D. Evergreen spines
24. Which is a process occurring in the small intestine?

	<b>Substrate</b>	<b>Digesting enzyme</b>	<b>Final product absorbed</b>
A.	fatty acids	lipase from the liver	glycerol
B.	nucleic acids	endopeptidase from the pancreas	nucleotides
C.	maltose	glucagon from $\alpha$ cells of the pancreas	glucose
D.	starch	amylase from the pancreas	glucose

25. What is a feature of the left atrium?
- A. Epinephrine decreases its rate of contraction.
  - B. It contracts as the left ventricle contracts.
  - C. It receives blood from the left pulmonary artery.
  - D. Its pressure decreases as the left ventricle fills up.

26. The diagram shows the human heart.



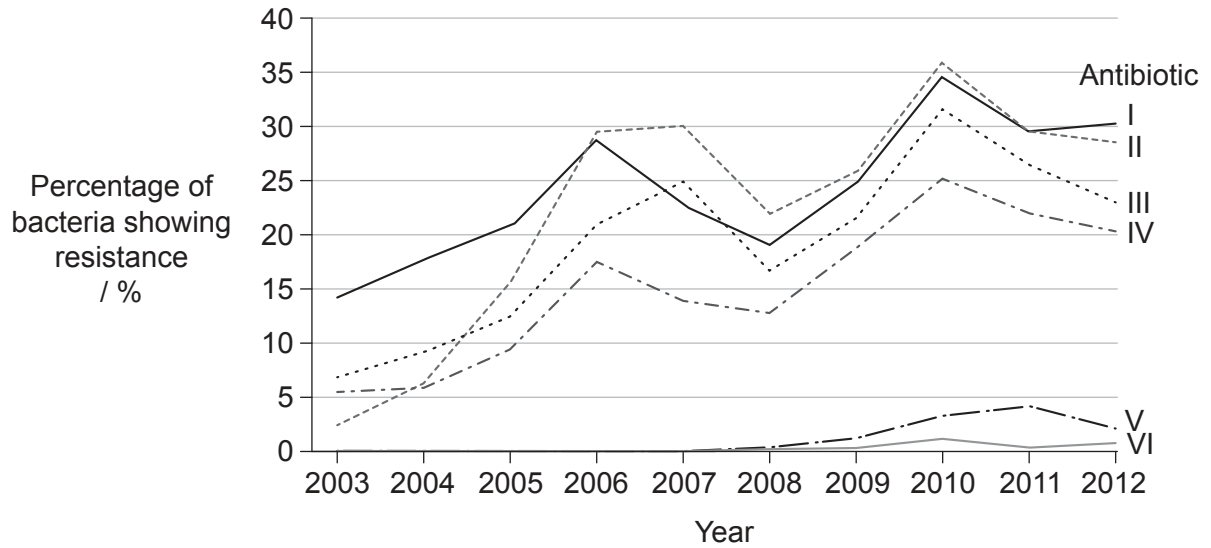
[Source: Reprinted by permission from Macmillan Publishers Ltd: *Nature*, 406, Bu *et al.*, page 116, copyright (2009).]

Which shows the sequence of blood flow in the heart?

- A. III → IV → I
- B. IV → III → II
- C. VII → VIII → I
- D. VIII → VII → VI

Turn over

27. The bacterium *Neisseria gonorrhoeae* causes infections related to the human reproductive system. The graph shows the percentage of samples in which this bacterium showed resistance to six antibiotics over a period of ten years.



[Source: © All rights reserved. National Surveillance of Antimicrobial Susceptibilities of *Neisseria gonorrhoeae* Annual Summary 2012. Public Health Agency of Canada, 2012. Translated, adapted and reproduced with permission from the Minister of Health, 2017.]

What is a possible explanation for the total percentage resistance being larger than 100% in 2010?

- A. People do not take the antibiotics as prescribed.
  - B. More people have been sampled in that year.
  - C. There was an epidemic of *Neisseria gonorrhoeae* in that year.
  - D. Some bacteria are resistant to more than one antibiotic.
28. Where does gas exchange occur in the lungs?
- A. In type I pneumocytes
  - B. In the bronchioles
  - C. In the veins surrounding the alveoli
  - D. In the surfactants

29. If schizophrenia is caused by an overabundance of the neurotransmitters dopamine and serotonin in the synapses of some areas of the brain, which drug action could work in treating the symptoms?
- A. Release of cholinesterase into the synaptic cleft
  - B. Increased re-uptake of dopamine and serotonin by presynaptic neurons
  - C. Increased permeability of the presynaptic neuron to sodium
  - D. Blockage of dopamine and serotonin receptors on presynaptic neurons
30. What helps to directly regulate body temperature in humans?
- A. Melatonin secreted by the pineal gland
  - B. Thyroxin secreted by the thyroid gland
  - C. Glucagon secreted by  $\alpha$  cells of the pancreas
  - D. Exocrine secretions by the pancreas
-