

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

Monday 14 May 2018 (afternoon)

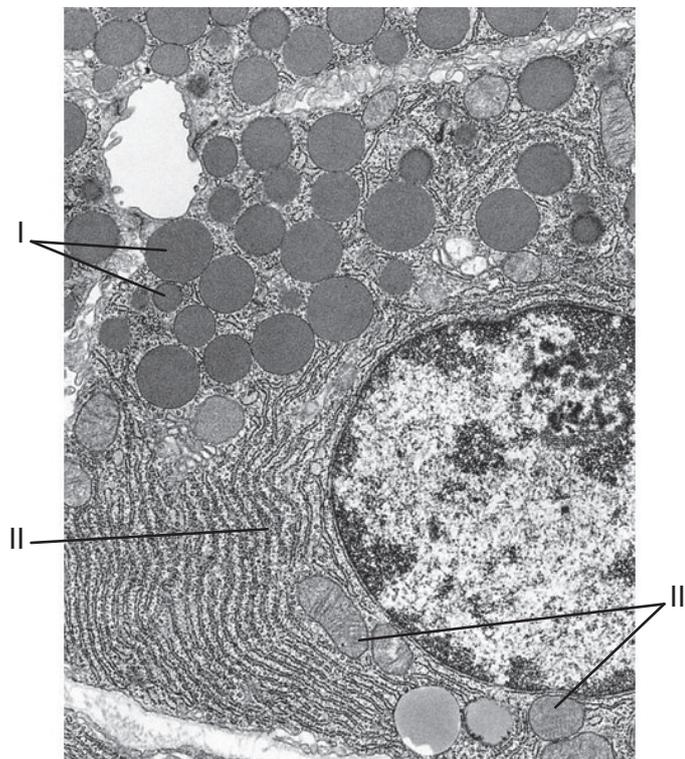
45 minutes

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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. When compared to other body cells, which characteristic of stem cells is the most important for therapeutic uses?
  - A. Less differentiation
  - B. Less excretion
  - C. Lower rate of reproduction
  - D. Lower rate of metabolism
  
2. The image shows an electron micrograph of a cell.

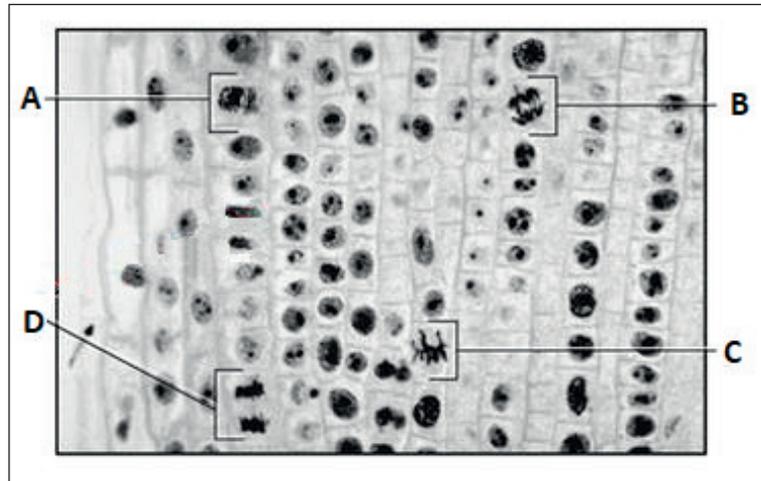


[Source: *Junqueira's Basic Histology*, 15th edition, by Anthony L. Mescher, McGraw-Hill publisher.]

Which organelles correspond to the labels in the electron micrograph of this cell?

	I	II	III
A.	secretory vesicles	Golgi apparatus	mitochondria
B.	mitochondria	Golgi apparatus	secretory vesicles
C.	secretory vesicles	rough endoplasmic reticulum	mitochondria
D.	mitochondria	rough endoplasmic reticulum	secretory vesicles

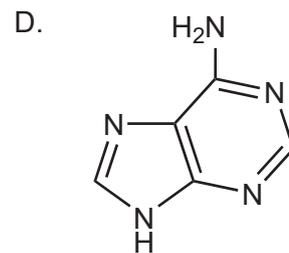
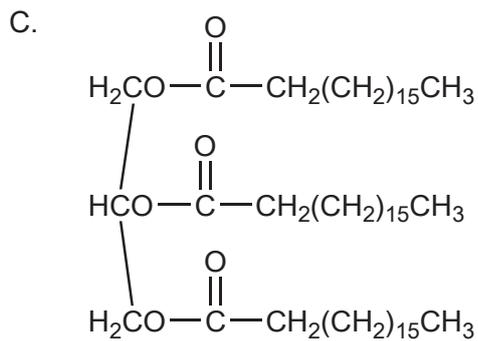
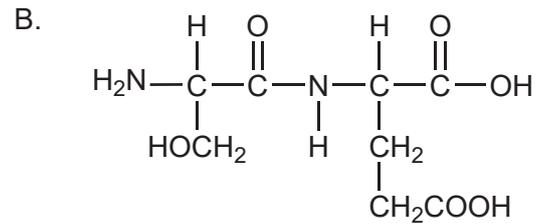
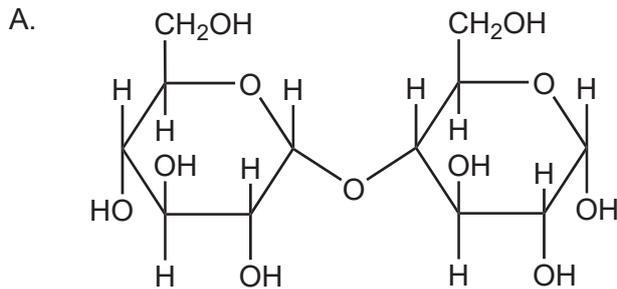
3. Which molecule regulates the fluidity of cell membranes?
- A. Phospholipid
  - B. Cholesterol
  - C. Glycoprotein
  - D. Peripheral protein
4. Pasteur carried out a series of experiments that provided strong evidence against a widely supported theory. What was this theory?
- A. Endosymbiosis
  - B. Spontaneous generation
  - C. Conservative replication of DNA
  - D. Evolution
5. The image shows cells in the different stages of mitosis. Which cell is in telophase?



[Source: © The Trustees of Indiana University]

6. Which reaction is an example of catabolism?
- Photolysis of water
  - Denaturation of a protein by a change in pH
  - Production of maltose from amylose by amylase
  - Condensation of glucose to form starch

7. Which molecule represents a lipid?



[Source: © International Baccalaureate Organization 2018]

8. At room temperature, water is a liquid and methane is a gas. Which molecular property explains this difference?
- Higher molecular mass of water
  - Dipolarity of water
  - Presence of more hydrogen in methane
  - Higher boiling point of methane

9. The relationship between body mass index (BMI) and total blood cholesterol was investigated in children with Smith–Magenis Syndrome, a rare genetic disorder which may lead to high blood cholesterol levels.

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What can be deduced from the graph?

- A. High BMI causes high blood cholesterol.
  - B. High BMI correlates with high blood cholesterol.
  - C. Low BMI is always associated with low blood cholesterol.
  - D. Low BMI is caused by low blood cholesterol.
10. Which description matches the protein?

	<b>Protein</b>	<b>Description</b>
A.	collagen	most common structural protein in mammals
B.	rhodopsin	enzyme for carboxylation of RuBP
C.	insulin	raises blood glucose concentration
D.	immunoglobulins	extremely sensitive to light

11. Levels of catalase activity were measured in tree seedlings exposed for varying lengths of time to a constant low-level gamma radiation.

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Which conclusion is supported by the data?

- A. Exposure to low-level gamma radiation reduces catalase activity.
  - B. There is a positive relationship between exposure time and catalase activity.
  - C. Gamma radiation heats up the seedlings, denaturing the enzymes.
  - D. Catalase activity is only affected by long exposure to low-level gamma radiation.
12. Some yeast genes can be replaced by human genes that then continue to produce the same human proteins in the yeast cells. Which statement helps to explain this evidence?
- A. The DNA of yeast and humans is identical.
  - B. Yeast and humans have the same number of chromosomes.
  - C. The genetic code is universal.
  - D. Yeast and humans are both eukaryotes.
13. What determines the genomic size of a species?
- A. The total amount of DNA
  - B. The total number of genes
  - C. The total number of alleles
  - D. The total number of chromosomes

14. What happens during meiosis I and meiosis II?

	<b>Meiosis I</b>	<b>Meiosis II</b>
A.	chromosome number remains diploid	chromosome number reduced from diploid to haploid
B.	homologous chromosomes pair randomly in metaphase I	sister chromatids separate in metaphase II
C.	homologous chromosomes separate in anaphase I	sister chromatids separate in anaphase II
D.	homologous chromosomes separate in anaphase I	crossing over occurs in prophase II

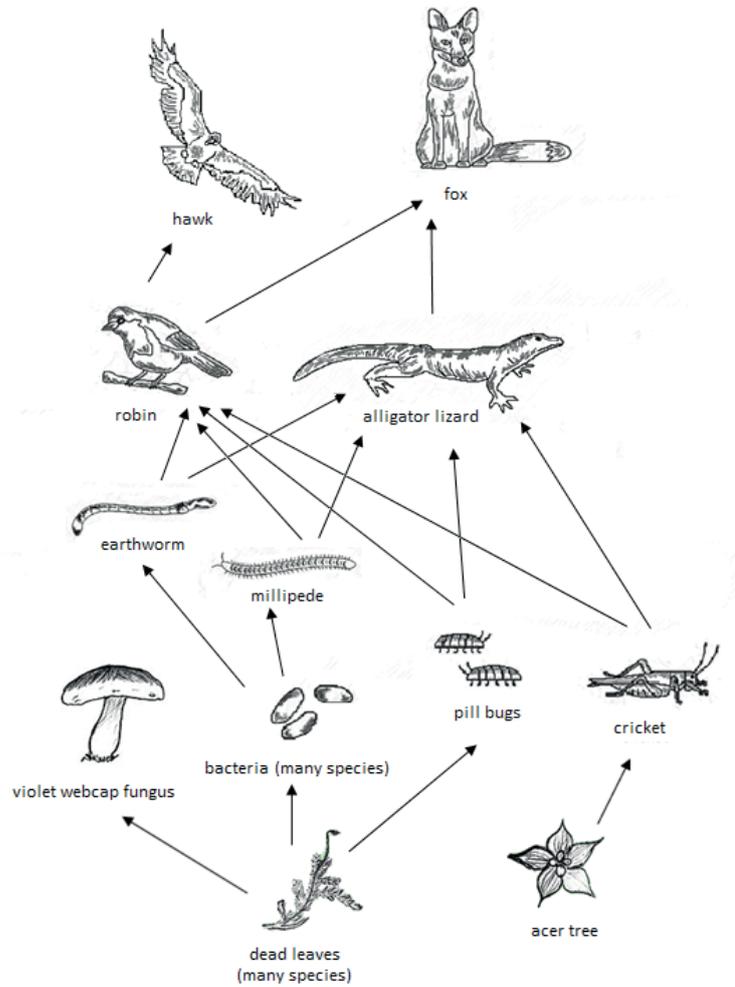
15. What is the percentage risk of a child inheriting Huntington’s disease if only one parent has the disease?

- A. 0%
- B. 25%
- C. 50%
- D. 100%

16. Which technique is used to amplify very small samples of DNA?

- A. Cloning
- B. Gel electrophoresis
- C. PCR
- D. DNA profiling

17. The image shows a food web.

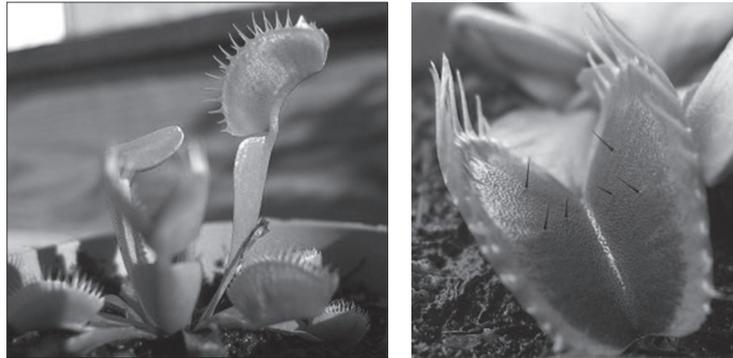


[Source: Adapted from Thompsma/Wikipedia]

Which organism in the food web is assigned to its method of nutrition?

- A. A violet webcap fungus is both an autotroph and a heterotroph.
- B. A pillbug is a secondary consumer.
- C. Bacteria are saprotrophs.
- D. A violet webcap fungus is a detritivore.

18. The Venus flytrap (*Dionaea muscipula*) is a photosynthetic plant. It obtains nitrogen but not energy by digesting captured insects.

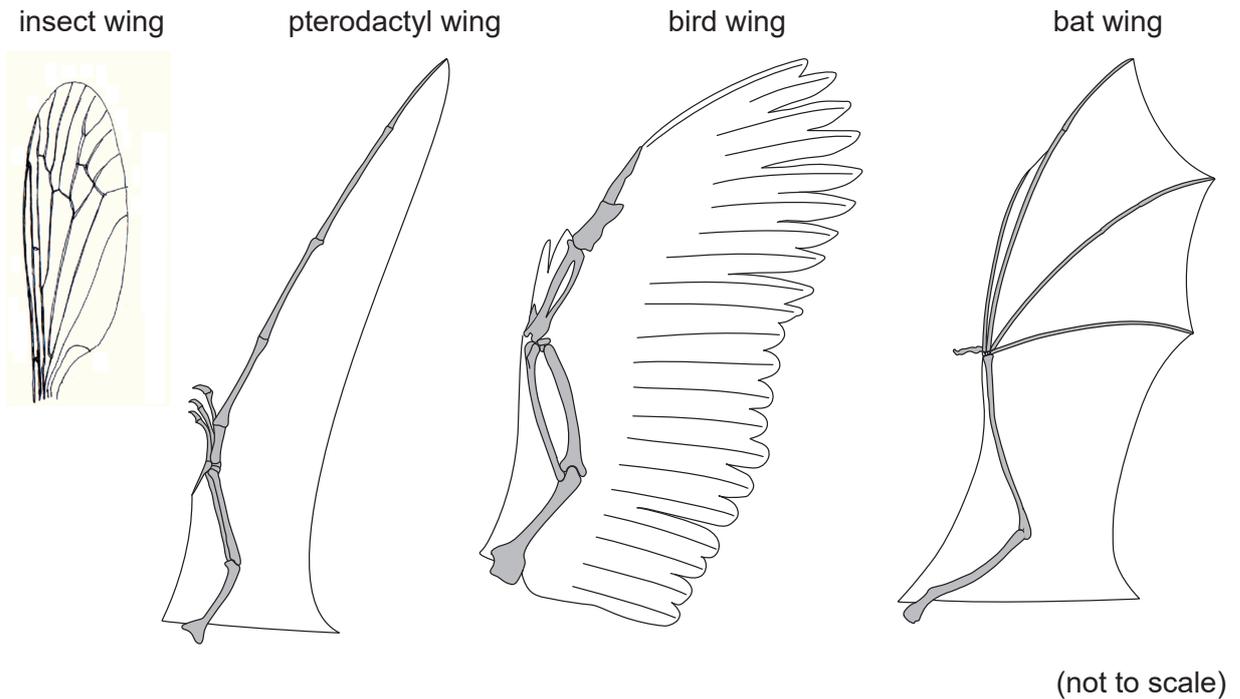


[Source: adapted from [www.flytrapcare.com](http://www.flytrapcare.com)]

Which term describes this plant?

- A. Secondary consumer
  - B. Autotroph
  - C. Primary consumer
  - D. Saprotroph
19. What describes a possible cause of a negative carbon flux in the atmosphere due to processes occurring in a forest ecosystem?
- A. The trees grew more so fixed more carbon dioxide.
  - B. There was more respiration by soil organisms.
  - C. There was more burning of forests.
  - D. There was more decomposition of leaf litter.

20. The diagrams show various wings.

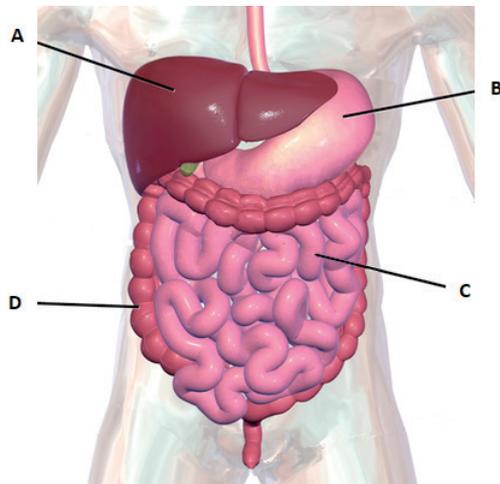


[Source: for pterodactyl, bird and bat wings:  
John W. Merck, University of Maryland, College Park, Department of Geology;  
for insect wing: Halvard Hatlen <https://upload.wikimedia.org/wikipedia/commons/0/0f/Dip-trichoceridae-wing.png>]

Which statement describes the relationship between the structures of the wings?

- A. The bat wing and the insect wing are homologous because they have the same function.
  - B. The limbs of the bird and bat wings are homologous due to convergent evolution.
  - C. The wings of the pterodactyl and the bat are analogous due to divergent evolution.
  - D. The bones of the wings of the pterodactyl, bird and bat are homologous as they have a common ancestor.
21. What reduces variation in a population?
- A. Meiosis
  - B. Mutation
  - C. Natural selection
  - D. Sexual reproduction

22. Which invertebrate phylum is characterized by a segmented body and bilateral symmetry?
- A. Arthropoda
  - B. Mollusca
  - C. Porifera
  - D. Cnidaria
23. The figwort family is a large one consisting of many flowering plants that look similar. For what reason have some members of the family been reclassified into a new family?
- A. Cladistic analysis shows the differences in flower structure to be fewer than the shared similarities.
  - B. DNA analysis shows the similarities in flower shape to be a product of convergent evolution.
  - C. DNA analysis shows some of the families to have suffered recent mutations in only one gene.
  - D. DNA analysis shows the similarities between the seed dispersal strategies to be a product of divergent evolution.
24. The diagram shows the human digestive system. Which organ is responsible for the majority of the absorption of digested food?



[Source: BruceBlaus/Wikimedia. File licensed under CC BY 3.0 (<https://creativecommons.org/licenses/by/3.0/>)]

25. The diagram shows changes in pressure in the chambers of the left side of the heart and the aorta during the cardiac cycle.

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Which statement explains the changes in pressure?

- A. The left atrium has low pressure during the cardiac cycle because very little blood flows into it.
  - B. The sinoatrial node stimulates the contraction of the aorta causing a pressure increase.
  - C. Pressure in the aorta increases when the semilunar valve opens and blood flows in from the left ventricle.
  - D. Epinephrine stimulates the relaxation of the left ventricle, decreasing the pressure.
26. The body has different defenses against infectious disease. Which cells provide non-specific immunity?
- A. Memory cells
  - B. Phagocytic white blood cells
  - C. Plasma cells
  - D. Hybridoma cells

27. Florey and Chain injected four mice with *Streptococcus* bacteria and then penicillin and all four mice recovered from the infection. What would be essential to show that penicillin caused their recovery?
- A. A control group that was infected but not treated with penicillin
  - B. Experiments to test for effects of penicillin on other bacteria
  - C. Experiments to test for effects of different dosages of penicillin in mice
  - D. Determination of the chemical structure of penicillin
28. What is the role of type II pneumocytes?
- A. To carry out gas exchange
  - B. To keep the alveoli moist
  - C. To increase surface tension
  - D. To maintain partial pressures of gases
29. What process is blocked by neonicotinoid pesticides in insects?
- A. Transmission of the nerve impulse in the presynaptic neuron
  - B. Formation of the synaptic vesicles
  - C. Release of the neurotransmitter
  - D. Binding of neurotransmitters to postsynaptic acetylcholine receptors
30. Which hormone is matched with its site of production and its role?

	<b>Hormone</b>	<b>Site of production</b>	<b>Role</b>
A.	thyroxin	thyroid gland	decreases metabolic rate
B.	glucagon	pancreatic $\beta$ cells	increases glycogen in liver
C.	leptin	adipose cells	increases sensation of hunger
D.	melatonin	pineal cells	controls biological clocks

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