

Biology
Higher level
Paper 1

Monday 14 May 2018 (afternoon)

1 hour

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 **[40 marks]**.

1. Common pesticides used by gardeners contain neonicotinoids.

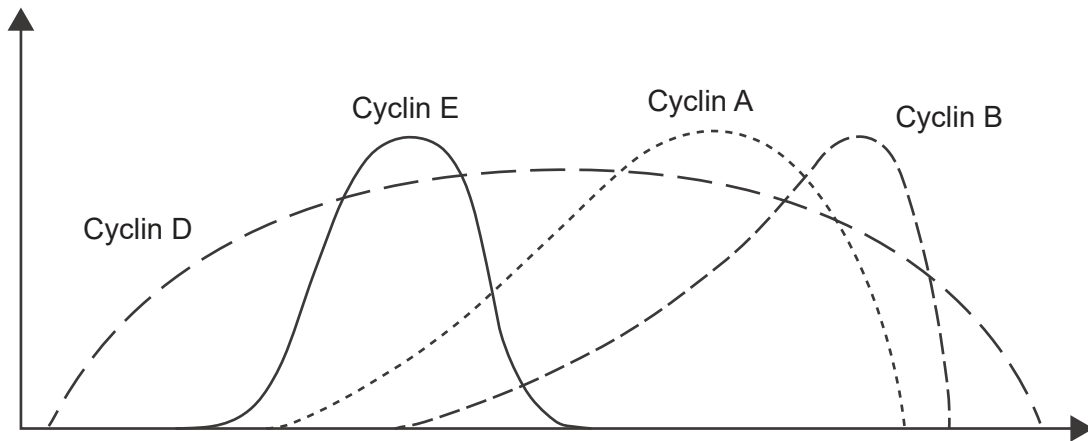


[Source: © International Baccalaureate Organization 2018]

What is the effect of a neonicotinoid pesticide on the transmission of a nerve impulse between neurons in an insect?

- A. It prevents the release of acetylcholine from the presynaptic membrane.
 - B. It widens the synaptic cleft so diffusion of acetylcholine across the gap is slower.
 - C. It irreversibly binds with acetylcholine receptors on the postsynaptic membrane.
 - D. It interferes with the enzymatic breakdown of acetylcholine by acetylcholinesterase.
2. How does potassium move across the membrane of a neuron during repolarization?
- A. Simple diffusion
 - B. Facilitated diffusion
 - C. Endocytosis
 - D. Active transport
3. Which organelle provides evidence that eukaryotic cells originated when large prokaryotes engulfed small free-living prokaryotes?
- A. Chloroplast
 - B. Nucleoid
 - C. 80S ribosome
 - D. Vacuole

4. The concentrations of cyclins rise and fall in cells at certain times.



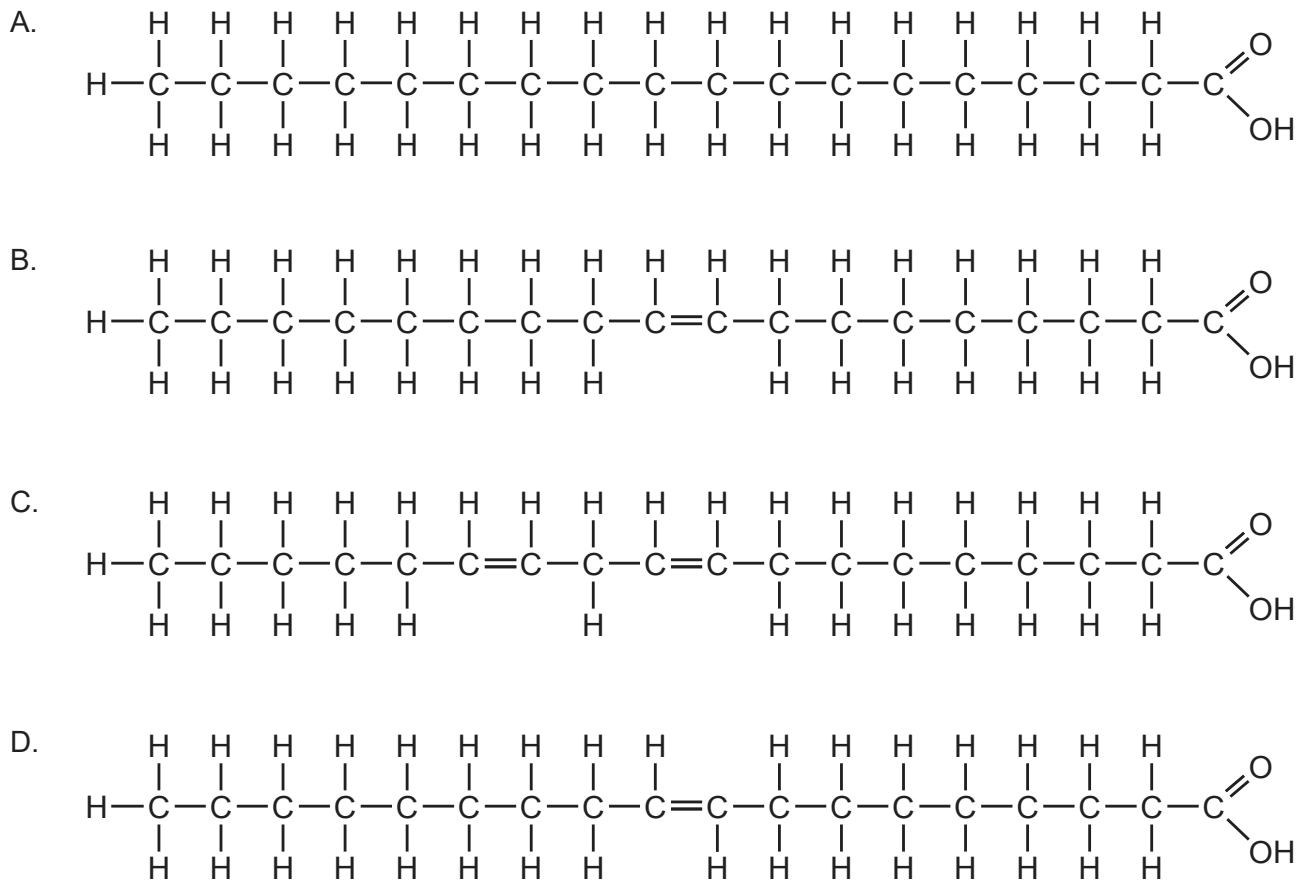
[Source: https://en.wikipedia.org/wiki/Cyclin#/media/File:Cyclin_Expression.svg]

What times are these?

- A. Day and night
 - B. Seasons of the year
 - C. Stages of mitosis and interphase
 - D. Developmental stages in the life cycle
5. What feature of carbon makes it most suitable as a basis for life?
- A. Its abundance in nature
 - B. Its bonding properties
 - C. Its reactivity to light
 - D. Its presence in the early atmosphere of the Earth
6. How are fats and cholesterol transported in the blood?
- A. As groups of molecules inside vesicles
 - B. As individual molecules coated in phospholipids
 - C. As individual molecules bound to a protein
 - D. As groups of molecules in lipoprotein complexes

Turn over

7. Which fatty acid would occur in a trans fat?



[Source: © International Baccalaureate Organization 2018]

8. Which protein has the highest tensile strength (ability to resist breaking when stretched)?

- A. Cellulose
- B. Actin
- C. Spider silk
- D. Albumin

9. What do DNA replication, transcription and translation have in common?

- A. Take place in cell nucleus
- B. Require free nucleotides
- C. Catalysed by polymerase
- D. Complementary base pairing

10. What is always passed to the next generation as a result of sexual reproduction?
- A. Homologous chromosomes from the mother
 - B. A chromatid from every chromosome of the father
 - C. A haploid set of chromosomes from the mother
 - D. All alleles from each parent
11. When do splitting of centromeres, random assortment of chromosomes or reduction division of chromosomes take place?
- A. Interphase and meiosis I
 - B. Meiosis I only
 - C. Meiosis I and meiosis II
 - D. Meiosis II only
12. Which genotype would be seen in a person suffering from Huntington’s disease?
- A. Hh
 - B. hh
 - C. X^HY
 - D. X^hY
13. For what purpose are restriction endonucleases used in the laboratory?
- A. To limit the length of DNA molecules in the nucleus
 - B. To cut specific base sequences to open DNA molecules
 - C. To prevent release of DNA from the nucleus
 - D. To protect viral DNA from digestion by bacterial enzymes

Turn over

14. The three-toed sloth, *Bradypus variegatus*, lives in tree tops where it feeds on leaves. It also feeds on algae and fungi which live in its fur.



[Source: Image from https://commons.wikimedia.org/wiki/File:Bradypus_variegatus.jpg. Christian Mehlführer. Licensed under CC by 2.5 <https://creativecommons.org/licenses/by/2.5/deed.en>]

In which trophic group should the three-toed sloth be classified?

- A. Autotroph
 - B. Consumer
 - C. Detritivore
 - D. Saprotroph
15. Animals in the highest trophic level of a food chain will often be the largest in body size but will be few in numbers. What accounts for the small numbers?
- A. Food eaten by animals at the highest trophic level has a lower energy content per gram
 - B. Energy losses through the food chain
 - C. Conversion of heat energy into chemical energy
 - D. Biomass of producers is small
16. Which conditions favour peat formation?

A.	Dry	Aerobic	Acidic
B.	Wet	Anaerobic	Acidic
C.	Dry	Anaerobic	Basic
D.	Wet	Aerobic	Acidic

17. Balkan green lizards, *Lacerta trilineata*, living in mainland Greece eat mostly insects but also small amounts of plants. The same species living on Greek islands (where insects are scarce) show a greater percentage of those physical traits useful for eating plants than the mainland lizards.



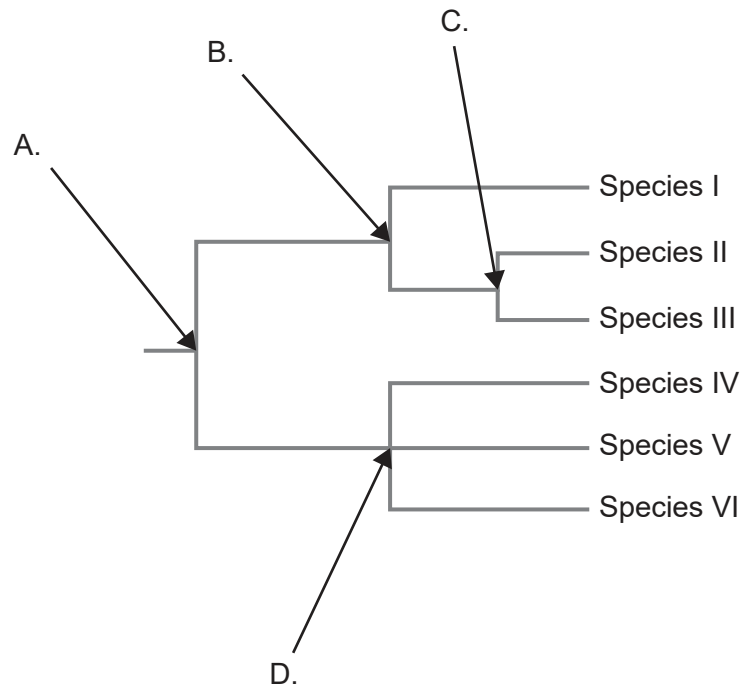
[Source: Penny Turner/Wikimedia file licensed under CC BY-SA 4.0
<https://creativecommons.org/licenses/by-sa/4.0/deed.en>]

What is the biological explanation for these observations?

- A. Variation in each lizard population allowed adaptation to occur.
 - B. Lizards migrated to areas where they were better adapted.
 - C. Lizards on the islands diverged due to lack of interbreeding with the mainland population.
 - D. Homologous structures have prevented separate species from evolving.
18. Which phylum shows radial symmetry?
- A. Annelida
 - B. Cnidaria
 - C. Platyhelmintha
 - D. Porifera

Turn over

19. The cladogram was constructed using DNA base sequences from six species. Which node indicates the greatest difference in base sequences?



[Source: © International Baccalaureate Organization 2018]

20. Bacteria from chicken feces can cause a loss of intestinal villi in small children who happen to eat dirt in rural villages. Which effect could be expected from such a loss of villi?

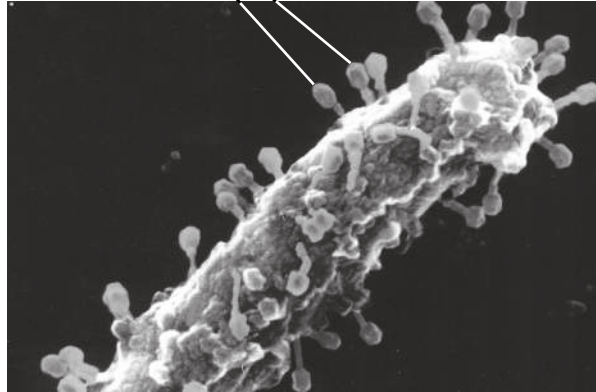
- A. Insufficient absorption of starch
- B. Failure to digest dietary fibre
- C. Malnutrition
- D. An increase in microvilli

21. When intense physical activity is anticipated, which factor in the blood will increase the frequency of sinoatrial signals to heart muscle?

- A. pH
- B. Oxygen level
- C. Thyroxin
- D. Epinephrine

22. Mucus traps pathogenic bacteria. Mucus also attracts viruses that attack pathogenic bacteria.

Virus particles



[Source: EYE OF SCIENCE/SCIENCE PHOTO LIBRARY]

What part of the immune system do these viruses resemble in their function?

- A. Antigens
 - B. Antibodies
 - C. Memory cells
 - D. Antibiotics
23. How are the insides of alveoli prevented from sticking together?

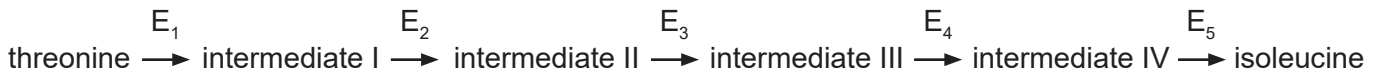
	Method of prevention	Produced by
A.	Surfactant	Type I pneumocytes
B.	Surfactant	Type II pneumocytes
C.	Pressure	Mixture of O ₂ and CO ₂ within alveoli
D.	Pressure	CO ₂ concentration gradient inside capillaries

Turn over

- 24.** Neural pathways in living brains can now be mapped by tracking the movement of water molecules inside axons. What keeps water molecules inside axons?
- A. Plasma membrane
 - B. Hydrogen bonding
 - C. Pump proteins
 - D. Synapse
- 25.** What releases leptin?
- A. Thyroid gland
 - B. Hypothalamus
 - C. Pineal gland
 - D. Adipose tissue
- 26.** Which information about DNA structure was deduced from the X-ray diffraction patterns obtained by Rosalind Franklin?
- A. Presence of purines and pyrimidines
 - B. Helical shape
 - C. Antiparallel strand arrangement
 - D. Deoxyribose backbone
- 27.** What does eukaryotic DNA have that is missing from prokaryotic DNA?
- A. Uracil
 - B. Promoter DNA
 - C. Introns
 - D. Coding sequences

28. What are polysomes?
- A. Strings of amino acids
 - B. Packages of eight histones with DNA
 - C. Many ribosomes joined to one mRNA
 - D. Complexes of tRNA with amino acids

29. Isoleucine will inhibit the reaction pathway shown below when the concentration of isoleucine exceeds the cell requirements.



Which enzyme does isoleucine inhibit?

- A. Enzyme E₁
 - B. Enzyme E₂
 - C. Enzyme E₃
 - D. Enzyme E₅
30. What happens when pyruvate is converted to acetyl CoA in the link reaction?
- A. Decarboxylation
 - B. Phosphorylation
 - C. Hydrolysis
 - D. Reduction of pyruvate
31. ATP is needed to change products of the carboxylation of ribulose biphosphate into triose phosphate. What other substance is also needed?
- A. Rubisco
 - B. NADP
 - C. NAD
 - D. Reduced NADP

Turn over

32. How do water molecules enter root cells?

- A. Transpiration
- B. Tension
- C. Capillary action
- D. Osmosis

33. In a plant, what tissue(s) is/are specially adapted to transport sucrose?

	Cortex	Phloem	Xylem
A.			✓
B.	✓	✓	
C.	✓		
D.		✓	

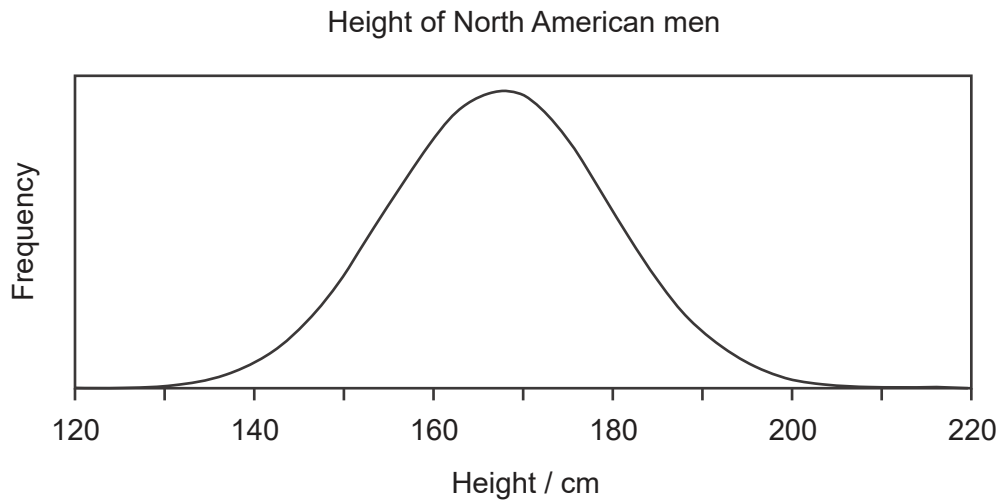
34. Fruit-eating bats living in protected Brazilian rainforests are attracted out of the forests to fly over adjacent cleared land. Which phase of plant life could the bats be assisting?

- A. Germination
- B. Flowering
- C. Pollination
- D. Seed dispersal

35. What forms when two different chromatids of the same homologous pair cross over?

- A. Daughter centromere
- B. Chiasma
- C. Chromosome mutation
- D. Telomere

36. What could account for this distribution of height in a population?



[Source: Graph adapted from Six Minutes <http://sixminutes.dlugan.com/good-public-speaker-average/>]

- A. Gene linkage
- B. Dominant alleles
- C. Independent assortment
- D. Multiple genes

Turn over

37. A vaccine against meningitis A, a deadly bacterial disease, has eradicated the disease in 16 African countries since 2010. However, meningitis A still exists in those countries where people are unvaccinated.

Removed for copyright reasons

What are the possible aims of epidemiological research such as this?

	Test vaccine effectiveness	Identify distribution of disease	Identify cause of disease
A.	✓	✓	
B.		✓	✓
C.	✓	✓	✓
D.	✓		✓

38. What movement occurs at the elbow and what is the state of the triceps when lifting an apple to take a bite from it?

	Movement of the elbow	State of the triceps
A.	extension	relaxed
B.	flexion	contracting
C.	extension	contracting
D.	flexion	relaxed

39. The presence of proteins such as albumin in a urine sample indicates kidney damage. Where in the kidney would the damage exist?

- A. Renal artery
- B. Cortex
- C. Medulla
- D. Pelvis

40. What contributes to the total DNA content of a zygote?

	Sperm		Egg	
	Nucleus	Mitochondria	Nucleus	Mitochondria
A.	✓	✓	✓	✓
B.	✓		✓	✓
C.	✓	✓	✓	
D.	✓		✓	