



Biology Examination IAC Canadian Nationals 2026

Instructions – Mark your answers on the scantron provided. Correct answers are worth 2 points. Incorrect answers are worth –1 point. Questions left blank are worth 0 points. Write the answer to your tiebreaker question in the box at the top of your scantron.

1. What technique allows paleontologists to determine the absolute age of a fossil in years?
 - A. Relative dating
 - B. Biostratigraphy
 - C. Radiometric dating
 - D. Sediment analysis
2. What connects bone to bone?
 - A. Ligaments
 - B. Tendons
 - C. Muscles
 - D. Cartilage
3. Which mammal group lays eggs rather than giving birth to live young?
 - A. Marsupials
 - B. Placentals
 - C. Monotremes
 - D. Rodents
4. Which specific structure of a flower is the pollen-producing part of the stamen?
 - A. Stigma
 - B. Style
 - C. Anther
 - D. Ovary
5. Which type of microorganism is classified as a prokaryote?
 - A. Amoeba
 - B. Yeast
 - C. Bacteria
 - D. Mushroom
6. Which of the following lists the levels of ecological organization from least complex to most complex?
 - A. Population → Community → Ecosystem → Organism
 - B. Organism → Community → Population → Ecosystem
 - C. Community → Population → Ecosystem → Organism
 - D. Organism → Population → Community → Ecosystem
7. What is the function of the cell membrane?
 - A. Act as a selectively permeable barrier
 - B. Synthesize protein
 - C. Store genetic information
 - D. Produce energy
8. In genetics, what does a "carrier" refer to?
 - A. An individual who has a dominant disease
 - B. An individual who has no genes for a trait
 - C. An individual who carries only one chromosome
 - D. An individual who is heterozygous for a recessive disorder
9. In the immune system, what is the specific function of a helper T-cell?
 - A. To produce antibodies
 - B. To engulf pathogens via phagocytosis
 - C. To activate B-cells and killer T-cells
 - D. To produce histamine
10. Which era is commonly known as the "Age of the Dinosaurs"?
 - A. Paleozoic
 - B. Mesozoic
 - C. Cenozoic
 - D. Precambrian
11. The maintenance of a stable internal environment is called:
 - A. Homeostasis
 - B. Metabolism
 - C. Self-renewal
 - D. Equilibrium
12. What is the primary role of a "keystone species" in an ecosystem?
 - A. It is the largest predator.
 - B. It is the most abundant species.
 - C. It is the primary producer.
 - D. It has a disproportionately large effect on its environment relative to its abundance.

13. In vascular plants, which tissue is specifically responsible for the transport of organic nutrients, such as sucrose, from the leaves to the rest of the plant?

- A. Xylem
- B. Phloem
- C. Cambium
- D. Epidermis

14. What is the primary purpose of flagella in bacteria?

- A. Movement
- B. Protecting against antibiotics
- C. Protein synthesis
- D. Reproduction

15. In a forest ecosystem, which of the following is an abiotic factor?

- A. The bacteria in the soil
- B. The rate of decomposition
- C. The amount of sunlight reaching the forest floor
- D. The population of rabbits

16. Which process occurs in the nucleus and results in the production of mRNA?

- A. Translation
- B. Replication
- C. Mutation
- D. Transcription

17. If a plant with purple flowers (Pp) is self-pollinated, what is the expected genotypic ratio of the offspring (PP : Pp : pp)?

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

18. What type of pathogen is responsible for causing malaria?

- A. A bacteria
- B. A virus
- C. A fungus
- D. A protozoan parasite

19. Which type of rock is most likely to contain fossils?

- A. Igneous
- B. Metamorphic
- C. Sedimentary
- D. Volcanic

20. Which tissue type is specialized for covering body surfaces and lining hollow organs?

- A. Epithelial
- B. Connective
- C. Muscle
- D. Nervous

21. What is the correct sequence of its life stages of an insect that undergoes complete metamorphosis?

- A. Egg → Larva → Pupa → Adult
- B. Egg → Pupa → Larva → Adult
- C. Egg → Nymph → Adult
- D. Larva → Egg → Pupa → Adult

22. What is the term for the process by which plants release excess water vapor into the atmosphere through small pores in their leaves?

- A. Transpiration
- B. Respiration
- C. Osmosis
- D. Evaporation

23. What term is used to describe an organism that requires oxygen to survive and grow?

- A. Obligate anaerobe
- B. Obligate aerobe
- C. Facultative anaerobe
- D. Aerotolerant anaerobe

24. An organism's "niche" is best described as:

- A. The physical location where it lives
- B. Its role and position in its environment, including resource use
- C. The biome in which it is located
- D. The total number of individuals in its population

25. Which enzyme is responsible for "unzipping" the DNA double helix during replication?

- A. DNA Polymerase
- B. Ligase
- C. RNA Polymerase
- D. Helicase

26. During meiosis, the law of segregation states that...

- A. Genes for different traits separate independently
- B. Mutations occur at a constant rate
- C. Dominant alleles always mask recessive alleles
- D. Alleles for a single trait separate into different gametes

27. Which of the following best describes the mechanism of action of a vaccine?

- A. It directly kills bacteria present in the bloodstream
- B. It stimulates the immune system to produce memory cells
- C. It provides immediate antibodies to neutralize toxins
- D. It changes the host's DNA to become resistant to viruses

28. What is an index fossil?

- A. A fossil used to define and identify geologic periods
- B. A fossil that is found only in one specific mountain range
- C. A very large fossil that is easy to identify
- D. A fossil that shows the direct ancestor of humans

29. Which enzyme is responsible for breaking down starch in the mouth?

- A. Pepsin
- B. Lipase
- C. Amylase
- D. Trypsin

30. What unique respiratory adaptation do birds possess that allows for highly efficient oxygen exchange during flight.

- A. Gills
- B. Air sacs
- C. Tracheae
- D. Operculum

31. What type of vein pattern is most commonly observed when examining the leaf structure of a monocotyledon (monocot)?

- A. Reticulate venation
- B. Parallel venation
- C. Dendritic venation
- D. Concentric venation

32. What is the primary purpose of the Gram stain technique used in microbiology?

- A. To measure the total mass of a bacterial culture
- B. To identify the specific species of a virus
- C. To observe the movement of bacterial flagella
- D. To differentiate bacteria based on the structure of their cell walls

33. What is the primary source of energy for most ecosystems on Earth?

- A. Decomposers
- B. Chemical energy
- C. Sunlight
- D. Consumers

34. If a DNA strand has the sequence 5'-ATGCGT-3', what is the complementary DNA strand?

- A. 5'-TACGCA-3'
- B. 3'-TACGCA-5'
- C. 5'-ATGCGT-3'
- D. 3'-ATGCGT-5'

35. Which molecule carries the genetic code from the nucleus to the ribosome?

- A. tRNA
- B. rRNA
- C. mRNA
- D. DNA polymerase

36. What is the role of histamine in the immune response?

- A. To increase blood flow to an infected area
- B. To directly kill bacteria
- C. To create memory cells
- D. To stop the inflammatory response

37. What major event separates the Mesozoic Era from the Cenozoic Era?

- A. The Cambrian Explosion
- B. The formation of Pangaea
- C. The K-Pg (asteroid) extinction event
- D. The first appearance of plants

38. Which part of the brain controls balance and coordination?

- A. Cerebrum
- B. Cerebellum
- C. Brainstem
- D. Hypothalamus

39. Which of the following is NOT a feature shared by all arthropods?

- A. Jointed appendages
- B. Exoskeleton made of chitin
- C. Segmented bodies
- D. Closed circulatory system

40. Which of the following is an example of a fungal infection?

- A. Athlete's foot
- B. Strep throat
- C. Common cold
- D. Tetanus

41. In bacterial genetics, what are small, circular, extrachromosomal DNA molecules that often carry genes for antibiotic resistance?

- A. Nucleoids
- B. Ribosomes
- C. Plasmids
- D. Mesosomes

42. Approximately how much energy is transferred from one trophic level to the next higher level?

- A. 1%
- B. 10%
- C. 50%
- D. 90%

43. Which of the following best describes the structural reason why a phospholipid bilayer is fluid?

- A. Saturated fatty acid tails pack tightly together
- B. Hydrogen bonds form between polar heads
- C. Unsaturated fatty acid tails have "kinks" that prevent packing
- D. Integral proteins bind to the peripheral cytoskeleton

44. How many chromosomes are in a human gamete?

- A. 22
- B. 23
- C. 44
- D. 46

45. Which of the following is a classic example of a "fomite" in disease transmission?

- A. A mosquito
- B. A sneeze
- C. A contaminated doorknob
- D. Contaminated water

46. What is the definition of a "coprolite"?

- A. A petrified dinosaur bone
- B. A fossilized leaf impression
- C. A prehistoric shark tooth
- D. Fossilized feces

47. What is the function of the myelin sheath in the nervous system?

- A. To store neurotransmitters
- B. To protect the neuron cell body
- C. To increase the speed of impulse transmission
- D. To clean up cell debris

48. What is the primary function of cnidocytes in organisms like jellyfish and anemones?

- A. Digestion of food
- B. Locomotion
- C. Respiration
- D. Capturing prey and defense

49. In a C4 plant, where does the Calvin cycle occur?

- A. Mesophyll cells
- B. Stomata
- C. Epidermal cells
- D. Bundle sheath cells

50. Which of the following best describes the process of "conjugation" in bacteria?

- A. The movement of bacteria toward a chemical stimulus
- B. The transfer of genetic material between two bacterial cells via a pilus
- C. The destruction of a bacterial cell by a bacteriophage
- D. The process of a bacterium forming a new cell wall

51. What happens to a population when it reaches its carrying capacity?

- A. It continues to grow exponentially.
- B. It dies out immediately.
- C. It stabilizes around a maximum population size.
- D. It experiences rapid, random fluctuations.

52. Which of the following characteristics is true of both chloroplasts and mitochondria?

- A. They both contain their own DNA and ribosomes.
- B. They both produce sugar.
- C. They are both found in both animal and plant cells.
- D. They both have a single membrane.

53. If a trait is polygenic, it means that...

- A. One gene controls many traits
- B. The trait is controlled by a single gene
- C. The trait is influenced by multiple genes
- D. The trait is only expressed in males

54. Which organ is responsible for producing white blood cells?

- A. Heart
- B. Liver
- C. Bone marrow
- D. Lungs

55. What crucial piece of evidence in the fossil Archaeopteryx suggested a link between dinosaurs and birds?

- A. It had a long, bony tail and teeth like a reptile, but also feathers.
- B. It was found in the same rock layer as a T-rex.
- C. It was small enough to be eaten by mammals.
- D. It had a beak exactly like a modern chicken.

56. Which part of the brain controls balance and coordination?

- A. Cerebrum
- B. Cerebellum
- C. Brainstem
- D. Medulla oblongata

57. What adaptation allows reptiles to reproduce successfully on dry land?

- A. Moist skin for respiration
- B. External fertilization
- C. The amniotic egg
- D. Gills for gas exchange

58. Which plant hormone is most famously associated with the ripening of fruits?

- A. Cytokinin
- B. Gibberellin
- C. Auxin
- D. Ethylene

59. What prevents a plant cell from bursting when placed in a hypotonic environment?

- A. The contractile vacuole
- B. The plasma membrane's rigidity
- C. The cell wall
- D. The central vacuole

60. Which of the following is considered a pioneer species in primary succession?

- A. Lichens
- B. Conifers
- C. Grasses
- D. Shrubs

61. What are the three components of a nucleotide?
- Sugar, base, and amino acid
 - Phosphate group, base, and protein
 - Sugar, phosphate group, and lipid
 - Sugar, phosphate group, and nitrogenous base
62. In a pedigree, a filled-in circle represents:
- A male with the trait
 - A female without the trait
 - A male without the trait
 - An affected female
63. What is a "pathogen"?
- An infectious agent that causes disease
 - A type of white blood cell
 - A medicine used to treat infections
 - A nutrient required for health
64. According to the law of superposition, where are the oldest fossils typically found in undisturbed rock layers?
- At the top
 - In the middle
 - At the bottom
 - Intermixed with younger fossils
65. What is the primary functional unit of compact bone?
- Osteon
 - Osteoblast
 - Osteocyte
 - Trabeculae
66. What is unique about the digestion of ruminants (like cows) compared to humans?
- They have a shorter digestive tract to speed up waste elimination.
 - They do not produce amylase in their saliva.
 - They regurgitate and chew food only once.
 - They use specialized bacteria in a four-compartment stomach to break down cellulose.
67. Which photosynthetic pathway is an evolutionary adaptation to arid environments, characterized by the uptake of carbon dioxide at night to minimize water loss?
- C3 pathway
 - C4 pathway
 - CAM (Crassulacean Acid Metabolism) pathway
 - Glycolysis pathway Correct
68. Which of the following best describes a chemoautotroph?
- An organism that uses sunlight for energy and organic carbon for food
 - An organism that uses chemical compounds for energy and inorganic CO₂ for carbon
 - An organism that uses chemical compounds for energy and organic carbon for food
 - An organism that uses sunlight for energy and inorganic CO₂ for carbon
69. The excessive growth of algae in a lake, often caused by fertilizer runoff, is known as:
- Biomagnification
 - Eutrophication
 - Nitrogen fixation
 - Succession
70. Which of the following is a key functional difference between the rough ER and the smooth ER?
- Only the rough ER is involved in protein modification.
 - Only the smooth ER is composed of phospholipid bilayers.
 - The rough ER detoxifies drugs, while the smooth ER makes proteins.
 - The smooth ER breaks down nucleic acids.
71. What is the significance of the Hershey-Chase experiment?
- It demonstrated that DNA is the genetic material.
 - It proved that protein is the genetic material.
 - It identified the structure of DNA.
 - It showed that DNA replicates conservatively.
72. An auto-immune disease occurs when:
- The immune system fails to produce white blood cells.
 - The immune system attacks the body's own healthy cells.
 - A pathogen mutates rapidly.
 - The body is infected by multiple pathogens at once.
73. Tiktaalik is a famous transitional fossil that shows the evolution of fish into:
- Birds
 - Mammals
 - Reptiles
 - Tetrapods
74. The "all-or-none" law applies to which of the following?
- Smooth muscle contraction
 - Cardiac muscle contraction
 - Muscle fiber contraction
 - Smooth muscle relaxation

75. The process of shedding an old exoskeleton to allow for growth in arthropods is scientifically known as:

- A. Ecdysis
- B. Parthenogenesis
- C. Fragmentation
- D. Regeneration

Tiebreaker

This question will only be scored if there is a tie for placement on the exam. **This is a required question, but there is no penalty for a wrong answer to this question.**

Write your answer legibly in the space provided on your scantron.

Give the sum of the following years in biology history -

1. The year that William Harvey published his theory of blood circulation in the human body
2. The year that Charles Darwin published "The Origin of Species"
3. The year that the Human Genome Project BEGAN
4. The year that geneticist Barbara McClintock won the Nobel Prize in Physiology or Medicine