Harvard Undergraduate Science Olympiad 2026
Open Round
Biology Syllabus: 7th - 8th

Reference Material: No reference material will be provided for the Biology section.

Potential Topics Covered on the Exam:
Please note that not necessarily every topic on this list will be on the exam, don't get overwhelmed! The syllabus is meant to be exhaustive of all *potential* topics that could be on the exam. For students, a great place to start is with making sure you're comfortable with the ICSE curriculum for 7th-8th grade. It will be a difficult exam, but remember you don't need to (nor do we expect you) get a 100%! Just do your best and show us all that you've learned! Good luck and happy studying!

Topics are based on the ICSE Class 7-8 Syllabus with a few select topics from Class 9:

Biochemical Structures
- Carbon as the basis of life
- Nucleic Acids, Lipids, Proteins, Carbohydrates

Cell Biology:
- Molecular Biology:
  - Central Dogma: DNA, RNA, Proteins
  - Processes: Transcription, RNA Processing, Translation, DNA replication
- The Cell:
  - The Cell Theory of Life, components of cells, structure and function of cellular organelles, function of compartmentalization
    - Organelles to know: Nucleus, cytoplasm, ribosome, chloroplast, mitochondria, endoplasmic reticulum, golgi, lysosome, cell membrane, vacuole, cell wall.
  - Differences between prokaryotic and eukaryotic cell; differences between an animal and a plant cell.
  - Use of microscopy to view cells
- Photosynthesis

    - Definition, overall reaction process, factors affecting photosynthesis: (light, carbon dioxide, water, chlorophyll), significance of photosynthesis, setup.
- Cellular Respiration
    - Definition, overall reaction process; respiration as a process which releases energy; respiration in plants: two types (aerobic and anaerobic: basic concept, word equations for both, examples).
    - Respiration and photosynthesis in plants, differences in both processes.

Animal Anatomy & Physiology:

- Animal Tissues
    - Epithelial tissue: simple location, and function (types of epithelial tissue not to be mentioned).
    - Muscular tissue: location and one function of:
        - striated (voluntary or skeletal muscle),
        - unstriated (involuntary/ smooth muscle),
        - cardiac (specialized muscle).
- Digestive System
    - Organs, digestive glands and their functions
    - Nutrition: Classes of food; balanced diet. Malnutrition and deficiency diseases
- Respiratory System
    - Organs; mechanism of breathing; tissue respiration, heat production.
- Excretory System
    - Organs and their excretory products (kidneys, sweat glands, lungs);
    - Renal Excretory System – kidneys, ureter, urinary bladder, urethra (location and functions to be explained along with diagram);
- Nervous System
    - Main parts: brain, spinal cord, nerves.
    - Central nervous system (CNS) parts and their functions.
        - Brain: cerebrum, cerebellum, medulla oblongata (location and function).
        - Spinal cord: location and function.
    - Types of nerves: sensory, motor, mixed (function only).
    - Structure of a motor neuron
- Circulatory System
    - Internal structure of heart (including valves, septum).
    - Schematic diagram of the heart and double circulation
    - Blood vessels – aorta, pulmonary trunk, coronary artery & vein, vena cava.
    - Blood Groups (A, B, AB and O): universal donor and universal acceptor.
    - Introduction of lymphatic system as a parallel circulatory system.

Ecology:

- Understanding ecosystems: definition, interaction between biotic and abiotic factors.
- Biotic components consisting of producers, consumers, decomposers.
- Meaning of food chain. Food web, and pyramid of numbers.
- Interdependence between organisms: symbiosis, parasitism and predation.
- Abiotic components such as air, soil, water and climatic factors such as sunlight, temperature, humidity and wind

Biosystematics:

- Meaning and concept of classification
- Need and advantages of Classification
- Characteristics of each kingdom
    - Monera: bacteria – shape; organelles; movement
    - Protista: Amoeba – basic structure and life processes (nutrition, locomotion, respiration, excretion and reproduction – by binary and multiple fission).
    - Fungi: basic structure of mould, nutrition and respiration in mould.
    - Plantae: characteristics and examples (classification of plantae NOT to be tested).
    - Animalia
        - Vertebrates.
        - Invertebrates

Preparation for Exam:

The Byjus website has links to textbooks for ICSE Class 8 and ICSE Class 9 biology. Note that none of these books are not required to prepare for the exam, nor are they the only way to prepare. Other possible methods to prepare include watching relevant biology videos on YouTube and doing practice problems (see below).

Sample Questions:

Exam questions will require greater synthesis and application of knowledge than on the ICSE Exams. Example questions of comparable difficulty can be found from past INJSO exams:

- 2023 INJSO Exam + Key
- 2022 INJSO Exam + Key

More sample questions can be found at past INJSO exam compilation.