

英国系列生物赛事备赛建议

英国初级生物思维挑战 **BC** (Biology Challenge) -每年 5 月, 中英文双语

英国中级生物奥林匹克 **IBO** (Intermediate Biology Olympiad) -每年 11 月, 中英文双语

英国生物奥林匹克 **BBO** (British Biology Olympiad) -每年 4 月, 中英文双语

I. BC、IBO、BBO 这三个考试的难度逐级递增:

【BC】旨在激发学生的生物兴趣, 为入门级别赛事, 除了生物课堂上的基本知识, 多看生物相关的书籍期刊生物节目新闻、多关注自然界的东​​西基本能拿个高分;

【IBO】的命题思路取自 GCSE 和 A-Level 生物初级课程, 重点考察学生对生物基本概念的理解和运用, 而且会结合生物领域当前最新研究来出题, 多数题目需要学生运用生物直觉、逻辑和想象力来回答。赛事提供备考大纲, 备考大纲非常详细, 非常建议吃透大纲;

【BBO】主要考察 A-Level 的课程内容, 和 IBO 有相同的出题风格, 难度更大一些, 考纲之外, 非常建议同时参考 BBO 往年真题。

II. 【IBO】-课程大纲 Syllabus

Core topics consistent with AQA, OCR, Edexcel AS/A-level syllabus

1. Biological Molecules

- Concepts of monomers, polymers, condensation & hydrolysis reactions
- Monosaccharides, e.g. glucose, galactose, fructose, ribose
- Di-/polysaccharides, e.g. sucrose, maltose, lactose, cellulose, starch (amylose, amylopectin)
- Quantitative Benedict's test, iodine test for starch
- Glycerol, fatty acids (saturated and unsaturated), triglycerides, ester bond formation, phospholipids, emulsion test
- Amino acids, levels of protein structure (including types of non-covalent bonds involved), peptide bond formation, Biuret test
- Haemoglobin and collagen as examples of globular and fibrous proteins (detailed structure of collagen often omitted)
- DNA and RNA structure and formation of phosphodiester bonds between nucleotides
- Semi-conservative replication of DNA
- Structure of ATP and basic role in cells
- Enzymes: lock and key and induced fit models of action; effect of pH, temperature, enzyme/substrate concentration, inhibitors (competitive and non-competitive) (cofactors/coenzymes sometimes included)
- Role of inorganic ions
- Biologically important properties of water

2. Cell Structure

- Structure of eukaryotic cells, including:
 - o cell-surface membrane
 - o nucleus (containing chromosomes, consisting of protein-bound, linear DNA, and one or more nucleoli)

- o mitochondria
- o chloroplasts
- o Golgi apparatus and Golgi vesicles
- o lysosomes
- o ribosomes
- o rough endoplasmic reticulum and smooth endoplasmic reticulum
- o cell wall
- o cell vacuole
- Structure of prokaryotic cells
- Cytoskeleton sometimes included – usually just actin and tubulin
- Manipulating magnification for light and electron micrographs (usually including use of graticules)
- Use of stains in light microscopy
- Characteristics of light and electron microscopes
- Cell cycle – the main stages of mitosis and meiosis
- Structure of the cell membrane, including phospholipids, glycoproteins, glycolipids, membrane proteins, cholesterol in the fluid mosaic model
- Membrane transport: active transport, facilitated diffusion, carrier and channel proteins, diffusion, osmosis (using water potential terminology)

3. Immune System

- Definition of antigen and structure and function of antibodies
- Phagocytosis
- Antigen presentation, stimulation of B cells, clonal selection and expansion, plasma cells
- Role of T cells (normally highly simplified and restricted to helper T cells and cytotoxic T cells)
- Primary and secondary immune responses
- Passive and active immunity
- HIV as an example of a pathogen (other syllabuses may include other diseases such as cholera, measles, TB, flu)
- Uses of monoclonal antibodies

4. a. Exchange Surfaces

- SA:Vol relationships for cells and organisms, features of exchange surfaces and the need for circulatory systems
- Examples of gas exchange systems: human always included, often fish gills or insect trachea
- Gas exchange in plants
- Mechanism of ventilation in humans and structure of trachea epithelium
- COPD and smoking

4. b. Circulatory Systems

- Structure of single and double circulatory systems (sometimes also open/closed)
- Structure and function of haemoglobin, including Bohr effect and transport of CO₂ (sometimes also fetal haemoglobin and myoglobin)
- Structure of arteries, veins, capillaries
- Structure of the mammalian heart, including valves

- Electrical activity of the heart and role of AVN, SAN (sometimes ECG included)
- Formation and composition of tissue fluid
- CHD is on most syllabuses

4. c. Plant Transport

- Structure of xylem
- Cohesion-tension theory
- Structure of phloem
- Mass flow hypothesis

5. Molecular Genetics

- Structure of chromosomes, DNA and genes
- Role and structure of mRNA, tRNA and ribosomes
- The genetic code, transcription and translation
- Exons and introns and splicing of pre-mRNA
- Mutations and the effect on proteins
- Mutations as a source of genetic variation for natural selection

6. Biodiversity

- Hierarchical nature of taxonomic systems
- Three domains versus 5 kingdom classifications
- Idea of a phylogenetic classification
- Random and systematic sampling
- Simpson's diversity index

III. 生物赛事书籍推荐:

<https://biolympiads.com/what-are-the-best-resources-for-studying-for-the-biology-olympiad-competition/>