

Scope of Syllabus for the 2023 Youth Stem Cup

Biology

- The chemistry of life
- The cell
- Mechanisms of evolution
- Evolutionary history of biological diversity
- Basic principles of animal form and function
- Ecology
- Genetics

Chemistry

- A-level Physical Chemistry
- Organic Chemistry
 - NMR spectroscopy (C-13 & H)
 - Nucleophilic substitution at carbonyl groups
 - Acidic and basic catalysis
- Inorganic Chemistry
 - Group 1, 2, 14, 15, 16, 17 chemistry
 - Solid-state chemistry

Physics

- Forces and Equilibrium
- Electric flux
- Direct currents
- Rotational mechanics
- Doppler effect
- Fluid mechanics
- Polarisation of light

Mathematics

- Basic algebra
- Permutations and combinations
- Sums and series
- Modular arithmetic
- Matrices and determinants
- Geometry and trigonometry
- Single-variable calculus
- Multi-variable calculus
- Complex numbers

Astronomy and Astrophysics

- Celestial Mechanics
 - Apparent Motion of Celestial Bodies
 - Universal Law of Gravitation
 - Kepler's Laws of Planetary Motion
- Radiation and Matter
 - Stellar Magnitude System
 - Flux and Luminosity
 - Radiative Mechanisms
 - Matter in Thermal Equilibrium
- Optics
 - Magnification
 - Field of View
- Star Formation
- Expansion of the Universe