



2022

Siam International Math and Science Olympics

SCIENCE CATEGORY

SIMSO ABSTRACT

What is SIMSO?

The Siam International Math and Science Olympiad (SIMSO), is an international competition in **Mathematics** and **Science** for elementary students - with three (3) Lower Primary Levels (Grades 1 to 3) and three (3) Upper Primary Levels (Grades 4 to 6); and for high school students, with three (3) Junior High school/Secondary Levels (Grades 7 to 9) and two (2) Senior Secondary Levels (Grade 10 and 11/12). It aims to promote excellence and proficiency in Mathematics and Science through friendly global competitions.

What are the contents of each competition level in SIMSO – Science?

I. Lower Primary Levels / Elementary G1-G3

- a. **Life Sciences:** living and nonliving things; senses; basic human anatomy; basic plant structure; parts of the eye, ear, nose, mouth; the skin; animals; life stages and development; introduction to ecology; how to stop the spread of Covid-19; keeping oneself healthy during a pandemic
- b. **Physical Sciences:**
 - **Chemistry** – materials used in everyday life; properties and intended uses of matter; phases and changes in matter; measurements; food and household products.
 - **Physics** – force and motion; light and color; speed; and simple machines
- c. **Earth and Environmental Sciences** – weather and climate; seasons; direction of shadows; clouds; rocks; wind system, water, and air; food chain and food webs; weathering and erosion; farming methods; land forms and water forms; properties and layers of the earth; natural phenomena and hazard.
- d. **Space Sciences:** Earth-moon system; Earth-moon-Sun system; phases of the moon; the Sun and the planets; comets, meteors and asteroids





II. Upper Primary Levels / Elementary G4-G6

The syllabus includes the following subject domains:

- a. **Life Sciences:** human organ systems; puberty and health; ecological relationships; levels of organization; basic animal taxonomy; basic plant taxonomy, basic cell

biology; how to stop the spread of Covid-19; keeping oneself healthy during a pandemic

- b. **Physical Sciences:**

- **Chemistry:** phases and states of matter; physical and chemical properties of matter; physical and changes in matter; basic atomic theory; solutions; measurements; energy and matter
- **Physics:** units and measurements; force and motion; forms of energy; velocity and acceleration; light and color; speed; sound; gravity; heat transfer

- c. **Earth and Environmental Sciences:** soil, rocks and minerals; land and water forms; climate change; water cycle; climate change and global warming; fossil fuels; pollution; wildlife extinction

- d. **Space Sciences:** Solar System; the Earth in the solar system; beyond the Solar System; the Milky Way and its neighboring galaxies; the constellations; the relative sizes of the planets, stars and galaxies; measuring distances in the solar system and beyond

III. Junior High School Levels / Secondary G7-G9

The syllabus includes the following subject domains:

- a. **Life Sciences:** cell biology; microscopy; human and animal organ systems; plant tissue systems; bioenergetics; ecology; evolution; genetics; bacteria and archaea; animal taxonomy; plant taxonomy; new vaccine technologies against SARS-COV2, HIV, etc.

- b. **Physical Sciences:**

- **Chemistry** – structure of matter; phases and properties of matter; atomic theory; chemical bonding and intramolecular forces; gas laws; chemical reactions; stoichiometry; thermochemistry; solution chemistry
- **Physics** - kinematics, Newton's Laws of motion, work, energy and power, gravity, periodic motion, wave mechanics, thermodynamics, electromagnetism, light and color; introductory quantum mechanics
- **Materials Science**





- c. **Earth and Environmental Sciences:** origin and structure of the earth; plate tectonics; earth materials and processes; natural hazards, mitigation, and adaptation; history of the earth; geology, minerals and energy; the scientific method; ecology; the biosphere; lithosphere; climate, hydrosphere and atmosphere; population; the land, forests and soil; water resources and water pollution; energy and resources; societies and policy; sustainability and the human endeavor; waste management; climate change and global warming; fossil fuels; pollution; wildlife extinction
- d. **Space Sciences:** comparing planets and stars; star systems; the stars and the galaxies; formation of the universe; the universe; space explorations (US, USSR, China, India); the ISS; planetology; Mars explorations; Mars rovers; Kepler's planetary laws; Newton's three laws of motion; Newton's gravitation; Ptolemaic-Aristotelian vs Copernican vs Newtonian models of the universe; 21st century space explorations (SpaceX and Elon Musk, colonizing and terraforming Mars; China's 2023 Space Station and 2021 Mars rover)

IV. Senior High School Levels / Secondary G10-G12

- a. **Life Sciences:** central dogma of molecular biology; biomolecules; omics; cancer biology; genetic diseases; microbiology and pathogenic diseases; epidemiology; genetic engineering; molecular tools; biotechnology; biophysics; bioinformatics; paleobiology; CRISPR; new vaccine technology against SARS-COV2, HIV, etc.
- b. **Physical Sciences:**
 - **Chemistry:** atomic and molecular structure; chemical bonding and intermolecular forces; chemical reactions and stoichiometry; quantum chemistry; chemical analysis; analytical techniques; organic structures; biochemistry
 - **Physics:** kinematics; wave mechanics; quantum mechanics; statistical thermodynamics; optics and photosciences; relativity
 - **Materials Science, Nanoscience, and Nanotechnology**
- c. **Earth and Environmental Sciences:** wind system; lithosphere; hydrosphere; global warming; atmospheric processes; climate change and global warming; fossil fuels; microplastics; wildlife extinction
- d. **Space Sciences:** the Big Bang; black holes; gravitational waves; particle physics and the early universe; Einstein's general theory of relativity; quantum mechanics; Quantum Chromodynamics (QCD); astrophysics; galactic

paleontology; galactic archeology; space microbiology; space geology; space medicine (orbital medicine, aerospace medicine, emergency medical procedures in space); 20th-21st century astronomy; 21st century space explorations (SpaceX and Elon Musk, colonizing and terraforming Mars; China's 2023 Space Station and 2021 Mars rover)

