Harvard Undergraduate Science Olympiad India 2024
Open Round
Earth Science Syllabus: 7th-8th Grade

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. 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!

Atmosphere:
Layers of atmosphere and composition
Fronts
- Air masses and fronts, pressure systems
- Analyzing/predicting weather conditions based on fronts
- Cyclone formation

Humidity and precipitation
- Relative humidity
- Water cycle
- Precipitation formation mechanism

Circulation
- Winds
- Circulation cells
- Influence on local climate

Stability
- Lapse rate
- Adiabatic heating and cooling
- Vertical structure of atmosphere

Specific phenomena
- Cloud formation
- Local winds
- Thunderstorms and other severe weather
- El Niño and La Niña

- Monsoons
- Hurricanes

Hydrosphere:

Freshwater

- Discharge calculations
- Stream order calculations
- Flooding and flood prevention
- Erosional and depositional features
- River valley processes
- Lakes and ponds
- Swamps, marshes, bogs, etc.

Oceans

- Heat fluxes and heat transfer
- Distribution of temperature and salinity
- ~~Wind-driven flow~~
- ~~Overturning circulation~~
- Acidification
- Waves and tides
- ~~Coastal geology and erosional features~~

Other hydrologic features

- Glaciers
    - Formation
    - Erosional and depositional features
- Groundwater
    - Aquifers
    - Water table
    - Porosity and permeability

Geosphere:

Geochemistry

- Bowen's Reaction Series
- Minerals
    - Properties: crystal structure, hardness, opacity, fracture and cleavage, mineral habit, etc.
    - ~~Identification (will not be thoroughly tested)~~

~~Sedimentary Rocks~~

- ~~Sedimentary structures~~
- ~~Depositional environments~~
- ~~Types of sedimentary rocks~~

~~Metamorphic Rocks~~

- ~~Metamorphic facies and zones~~
- ~~Types of metamorphism~~
- ~~Metamorphic grade and index minerals~~

Igneous Rocks

- Igneous rocks/processes
- ~~Minerals commonly found in igneous rocks~~
- ~~Magma types and magma differentiation~~
- Igneous intrusions and extrusive bodies
- Volcanism

Interior

- Layers of the earth
- Earthquakes (types of waves)
- Plate movement and boundaries
- Faults

Dating/Mapping

- ~~Strike/dip calculations~~
- ~~Interpreting geologic maps~~
- ~~Relative dating and unconformities~~
- Radiometric dating

~~You may be asked questions about the following rocks and minerals. You will not be required to know specific information about any rocks and minerals not listed below.~~

~~**Minerals**:~~
~~Mohs Hardness Scale: Talc, Gypsum, Calcite Fluorite, Feldspar, Apatite, Orthoclase/Microcline, Quartz, Topaz, Corundum, Diamond;~~
~~Minerals in Bowen's Reaction Series: Olivine, Pyroxene, Plagioclase, Potassium Feldspar, Biotite, Muscovite.~~

~~**Sedimentary Rocks:**~~
~~Breccia, Coal, Conglomerate, Evaporites, Limestone, Sandstone, Shale.~~

~~**Metamorphic Rocks:**~~
~~Amphibolite, Quartzite, Marble, Slate, Schist, Gneiss.~~

~~**Igneous Rocks:**~~
~~Andesite, Basalt, Diorite, Gabbro, Granite, Obsidian.~~

~~**Advanced Topics:**~~
~~For those looking to further challenge themselves, below are more advanced topics that may also be tested. Students are encouraged to first learn the topics above before tackling these.~~

Preparation for Exam: The following resources may be helpful: ***Foundations of Earth Science by Tarbuck***. This is a great introduction to earth science for anyone who is interested! If you read this book carefully, you will have the necessary knowledge to complete most or even all of the questions.

Practice questions: Past open exams from **USESO** will be good practice, though they may be a little more difficult than the questions on the open round of HUSO-India.

HUSO's flagship competition is based on the American "Science Olympiad", which has competitors compete in teams in a variety of events. You may find Science Olympiad tests in the following events helpful: **Dynamic Planet** (freshwater, glaciers, oceanography, tectonics), **Rocks and Minerals,** and **Geologic Mapping.** Tests should be easily findable online.