Harvard Undergraduate Science Olympiad Dubai
2026 Final Round
7th-8th Grade
Earth and Space Science Section: Exam

NAME: _____

Student ID: _____

Instructions:

The HUSO-Middle East Final Round Earth and Space Science exam consists of 4 problems with several parts each. You should have 5 pages of problems – 1 for each problem and a tiebreaker/feedback page at the end. You will have 1 hour for the exam.

All answers must be written on the designated answer sheet. Any writing on the exam booklet outside the answer sheets will not be graded. You may write in this booklet, but NO WRITING IN THIS BOOKLET WILL BE GRADED**.** Feel free to use this booklet as extra scratch paper.

The exam consists of mostly true/false statements – for those questions, the scoring is as follows: You will receive 1 point for a correct answer, 0 points for an incorrect answer, and 0.5 points if you choose to leave the question blank. Unless noted otherwise, all questions are worth 1 point.

For this exam, you are allowed to bring a non-programmable, non-graphing calculator and a wrist-watch. You are not allowed to bring a smart watch, textbooks, notes, or any other electronic devices.

Best of luck!

Problem 1: Rock'in around the Christmas Tree

In this problem, we will explore the geology of Oman, starting with the Semail Ophiolite, one of the most complete ophiolites on Earth. An ophiolite is a section of Earth's oceanic crust and upper mantle that has been uplifted and exposed.

1. True/False: The majority of the Semail Ophiolite is mafic/ultramafic.
2. True/False: Oceanic crust is denser than continental crust.

Next, we turn to the Hajar Mountains—a mountain range shared between Oman and the UAE.

3. True/False: The Hajar Mountains were created on a transform boundary.
4. True/False: The Hajar Mountains is a great place to view fragments of the Mohorovičić discontinuity, the boundary between the crust and the upper mantle of Earth.

The exhumation event mentioned earlier created possibly the largest megasheath fold on Earth, the Wadi Mayh megasheath fold. The rare metamorphic rock, eclogite, can be found in the fold.

5. True/False: The presence of a megasheath fold in the Hajar Mountains indicates that the rocks experienced higher strain than rocks that demonstrate smaller, tighter, sheath folds.
6. True/False: The eclogite was most likely created during the folding process.

We can't forget about the desert sands!

7. True/False: The primary mineral in sand is quartz.
8. True/False: If we were to compress the sand into a rock, we would get a sedimentary rock.
9. True/False: Sand dunes are primarily shaped by tectonic activity and the rotation of the earth.

Problem 2: The Sky is Not The Limit

This problem features astronomy and its on-Earth effects in Saudi Arabia.

The star Altair is the twelfth-brightest star in the night sky – its name comes from its original Arabic name, Al-Nasr Al-Ṭa'ir meaning "the flying eagle".

1. True/False: Altair is located in the Milky Way Galaxy.
2. True/False: Altair is part of the constellation Cygnus.

Heading a little closer to the present day, an asteroid weighing 2,045 kilograms is orbiting the Sun with a semi-major axis of 2.5 AU.

3. Using Kepler's Third Law, calculate the orbital period of the asteroid in Earth years. Kepler's Third Law states that the square of a planet's orbital period is proportional to the cube of the length of the semi-major axis of its orbit. (2pts)

4. True/False: Most of the Solar System's asteroids are located in a belt between Earth and Mars.

Oh no! The asteroid is hurtling towards Earth (it is now a meteorite!) and lands in Saudi Arabia, creating one of the famed Wabar craters.

5. True/False: The Wabar meteorite fragments are primarily composed of iron.
6. True/False: Melted sand around the craters indicates that the impact was low-energy.

Looking to the future, the "solar eclipse of the century" occurs in August 2027! Jeddah and other parts of Southern Saudi Arabia will get a full 6-minute view, as well as various parts of Europe and Northern Africa.

7. True/False: The path of totality is wider when the Moon is closer to Earth in its orbit.
8. True/False: A solar eclipse occurs when the Earth comes directly between the Sun and the Moon.

Problem 3: Weather You Like It Or Not

On December 18th, 2025, the Burj Khalifa was struck by lightning amidst a thunderstorm due to the Al-Bashayer system passing through the UAE.

1. True/False: The Al-Bashayer storm system is a low-pressure system.
2. True/False: High-pressure weather systems are inherently unstable.
3. True/False: Moisture from the Arabian Sea and Persian Gulf can reach the UAE.
4. True/False: At this time, Earth was closer to an equinox than a solstice.

The Intertropical Convergence Zone is a global low-pressure zone near the equator that shifts seasonally.

5. True/False: The trade winds are responsible for the creation of the ITCZ.

Looking ahead to summer, the UAE is very dry! It implements cloud seeding (injecting particles into clouds) to promote precipitation.

6. True/False: The particles are much colder than the air around them, causing the water vapor inside the cloud to condense into liquid water droplets.
7. True/False: The particles' main purpose is to provide a nucleus for supercooled water vapor to condense.

Oh no! Seems like the cloud seeding didn't work – a dust storm has started, a common phenomenon in Middle Eastern deserts.

8. True/False: Dust storms negatively affect the soil fertility of the deposit (where the storm ends).
9. True/False: Dust storms can cause increased precipitation.

Problem 4: Water We Doing Here

Last question! We are almost there – just a little bit more about bodies of water in/around Jordan.

Jordan is actually considered one of the four most water scarce countries in the world, with a severe lack of renewable water sources.

1. True/False: The water table in Jordan is rising.
2. True/False: The Jordan Rift Valley, the location of vital aquifers in the region, is formed with rocks of low porosity.

Jordan is salty! It contains sabkhas, salt flats that form in arid coastal or inland regions, and of course the iconic Dead Sea.

3. True/False: Sabkhas indicate high evaporation rates relative to precipitation.
4. True/False: The Dead Sea's salinity is higher than that of typical ocean water, making the water less dense and therefore easier to float in.

Wadi Rum, often called the "Valley of the Moon," is a spectacular desert valley known for its towering sandstone mountains and dramatic rock formations.

5. True/False: Due to its wideness, Wadi Rum is characterized as a U-shaped river valley.
6. True/False: Wadi Rum's valley was primarily carved by water erosion over millions of years.

We now turn westward to the Red Sea, a sea inlet of the Indian Ocean lying between Africa and Asia.

7. True/False: The Gulf of Aqaba (Jordan's only coastline on the Red Sea) experiences relatively small tidal ranges due to the shape of the Red Sea.
8. True/False: The Red Sea is relatively oligotrophic (nutrient-poor) because it lacks the strong seasonal upwelling that characterizes the Arabian Sea.
9. True/False: Increasing ocean acidification is reducing the ability of corals in the Red Sea to build their calcium carbonate skeletons.

Problem 5: Feedback

1. What was your favorite problem (1, 2, 3, or 4)?
2. What was your least favorite problem (1, 2, 3, or 4)?
3. Which was the easiest problem (1, 2, 3, or 4)?
4. What was the hardest problem (1, 2, 3, or 4)?

If you have further feedback, please feel free to write in this booklet – but it will not be graded.

Problem 6: Tiebreaker

This problem will only be graded if you end up tying with another participant. In the event of a tie, this question will be used to determine placements.

Pick a "sphere" from the following list: atmosphere, geosphere, hydrosphere.
A forest fire occurs. Explain in as many ways as possible how your chosen sphere is impacted.