NTX Future City Junior, 2021

PART 1
RESEARCH ESSAY: LIVING ON THE MOON

Students write a 1,000-word essay that introduces their city and provides a solution to this year’s challenge—Living on the Moon. Design a future lunar city and provide examples of how your city uses Moon resources to keep your citizens safe and healthy.

Suggestions and Resources for Completing the Essay Assignments
See the Research Essay Outline (attached). Go over the outline with the students and have them list what they want to say in each section. Then suggest that they divide the sections so that everyone writes at least one part of the draft. When it’s time to write the final version, they'll have plenty of material to work with. Also remind students that they can include up to four graphics in their essay.

Research Essay Resources (see attached forms or download from website: http://futurecity.org/resources)
- Living on the Moon Overview and Research Questions student handout: This resource provides background information on the Moon and guiding questions for student research.
- Living on the Moon: Questions to Consider student handout: These guiding questions will help students remember to research all the different aspects of their future city.
- Living on the Moon Real World Case Studies student handout: Students will find these real-life examples of lunar technological advances both inspiring and instructive.
- City Essay Suggested Outline: This outline explains what students should include in each section of their essay and how to organize their essay.
- Living on the Moon Resources: Start your team’s research with this preselected set of websites, books, and videos. Download the list at futurecity.org/resources (filter for Research Resources & Websites).
- Review the Research Essay Rubric (attached) to make sure you understand what the judges will be looking for in your paper.
- Analyze Essays from past NTX Junior winners to give the students a strong sense of what they are aiming for in their own essays. Go to Junior Team Center (http://www.dfwfuturecity.org/team_junior.html).
- Use the Research Cards as a way for the team to document and organize the information and relevant sources that they find. Review the Research Strategies for more ideas and information on citing sources in the bibliography. Go to futurecity.org/resources (filter for Research Resources & Websites).

Research Essay Assignment
Students research and write a 1,000-word essay that describes the unique attributes of their city and provides a solution to this year’s challenge: Living on the Moon.

Living on the Moon Overview
At night, surrounded by stars or clouds, the Moon looks distant and lifeless. However, it holds a place of unique beauty and dominance in the sky and has been inspiring humanity for eons. Dreamers of all kinds—including artists, science fiction writers, scientists, and engineers—have imagined a thriving city on the Moon, one with healthy people and a resourceful, sustainable ecosystem. The challenges of living on the Moon do not daunt them—though those challenges are sizeable! There’s no breathable atmosphere. In most places the temperature is either freezing cold or boiling hot. Human bodies weaken with gravity only 1/6 of that on Earth. On much of the Moon, night lasts for 14 days at a time. There are no plants or animals, no flowing water. Tiny meteorites crash into the Moon regularly. Solar radiation is constant and deadly. Dust that’s sharp as glass gets into every crevice.
Engineers and scientists are exploring solutions to the obstacles that make living on the Moon sound far-fetched. Frozen reservoirs of water are believed to exist at the Moon’s poles, deep inside craters. This water can be extracted, filtered with algae, and made drinkable. Lunar pioneers can eat the algae as well. They can breathe the oxygen produced during the process of extracting water. There are no trees or building materials as we know them, but regolith—lunar dirt and dust—can be heated into a strong, hard material for making buildings and roads. The Moon’s lava tubes could offer some protection from meteorites, making these places more inviting for building living quarters, and there is sunlight that can be harnessed for energy. New ideas are constantly being dreamed up and tested. A future lunar city is really going to happen!

Research Essay Requirements

- In their essay, students will present their future lunar city, describe its location, and share its innovative features.
  - Assume that the city has already gone through many years of development. It started as a collection of lunar landers that expanded into an outpost. Gradually it grew into a village and is now a city. The team builds on this history in describing their future lunar city.
- The essay will provide a detailed description of how the city uses one of the Moon’s resources in a futuristic way to keep their residents safe and healthy.
- The essay cannot exceed 1,000 words and should be free of grammatical and spelling errors.
- The essay can include a maximum of four graphics.
- The essay must cite at least three sources of information used during the idea development process. MLA style is preferred (see Research Strategies for more detail).
- Students should use a variety of sources of information, such as interviews with experts, reference books, periodicals, and websites. (Note: Wikipedia is not accepted as a source of research.)

Research Essay Deliverable

- The essay must be submitted as a Word document via the Junior Team Center (http://www.dfwfuturecity.org/team_junior.html).

Competition Scoring

Teams can earn up to 60 points for their Research Essay. Make sure they have thoroughly covered these categories in the rubric to maximize points:
- Introduce City 15 points
- Problem and Solution 18 points
- Judge Assessment of Solution 15 points
- Writing Skills 12 points
Total 60 points

Scoring Deductions

5 points – Late submissions are accepted with a small point deduction (see online schedule)
10 points – For essays that exceed the 1,000-word limit.
**SUGGESTED ESSAY OUTLINE**

In the Research Essay, you will share your vision of your future city and your solution Living on the Moon challenge and using one of the Moon's resources in a futuristic way to keep the residents safe and healthy.

You can use the following outline as a guide to help you organize and draft your essay.

**Introduction**
Briefly describe where your city is located on the Moon. Include the geographic features and terrain, the benefits of that location, and the risks and tradeoffs of that location. Include any unique, futuristic features of your city, in particular, how the city protects residents from the hazards of the Moon environment.

**Using the Moon's Resources**
Define the Problem:
- Select one moon resource. Describe how your lunar city uses this resource to keep its residents safe and healthy. Be sure to:
  - Describe the resource, including what form(s) it is found on the Moon.
  - Share how your city obtains or collects each resource.
  - Describe how the resource is used. Include:
    - The problem or challenge the resource is being used to address. (For example, is it being used to create a breathable atmosphere, protect your residents against a Moon hazard, or create rocket fuel for travel to Earth and back?)
    - What are the benefits of using this resource?

Describe the Solution:
- Describe the technology involved in obtaining and/or processing the resource for use in the city.
  - Highlight the futuristic and innovative aspects of this technology and solution.
  - Describe some of the risks and tradeoffs connected with using this resource and technology and how the solution reduces these risks.
  - Explain what types of engineering were involved and what types of engineers or technicians were most helpful.

**Conclusion**
Share why people want to live in your city. Summarize what makes it a safe and satisfying place to live.
Living on the Moon: Overview and Research Questions

Living on the Moon Overview

At night, surrounded by stars or clouds, the Moon looks distant and lifeless. However, it holds a place of unique beauty and dominance in the sky and has been inspiring humanity for eons. Dreamers of all kinds—including artists, science fiction writers, scientists, and engineers—have imagined a thriving city on the Moon, one with healthy people and a resourceful, sustainable ecosystem. The challenges of living on the Moon do not daunt them—though those challenges are sizeable! There’s no breathable atmosphere. In most places the temperature is either freezing cold or boiling hot. Human bodies weaken with gravity only 1/6 of that on Earth. On much of the Moon, night lasts for 14 days at a time. There are no plants or animals, no flowing water. Tiny meteorites crash into the Moon regularly. Solar radiation is constant and deadly. Dust that’s sharp as glass gets into every crevice.

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Research Questions

Life on the Moon will be quite different from life on Earth. It’s literally another world! Before you begin to design your city, you’ll start your research by learning about the Moon: its features, terrain, available resources, and unique hazards.

Lunar Features and Terrain

The Moon is 238,900 miles away from Earth. While we can only see one side of the Moon here on Earth, there is a lot more to explore.

• Does the Moon have an atmosphere? Is there oxygen or a way to make it?
• What is the Moon’s surface gravity? How does that compare to Earth’s? How will the Moon’s surface gravity affect humans living on the Moon?
• What are days and nights like on the Moon? How long is an average “day” in most places?
• Are there areas of the Moon that get more sunlight than others?
• What is the temperature on the Moon? What affects the Moon’s temperature? Are there places where the temperature is more stable than other areas?
• Terrain is a term for the natural features of the land. What types of terrain are found on the Moon?
• Like Earth, the Moon has an equator and a north and south pole, it also has different types of regions. What are the Moon’s regions? Where are they? How do they differ from each other in terms of temperature, amount of sunlight, and terrain?
• Does the Moon have a magnetic field? How would a magnetic field, or the lack of one, affect people’s lives?

The students’ challenge: Design a future lunar city and provide examples of how your city uses two Moon resources to keep your residents safe and healthy.
Lunar Resources

Conditions may be challenging on the Moon, but certain abundant resources could make living there sustainable. And some might be valuable resources back on Earth! Below are a few resources to explore, but it is not a full list. What other resources does the Moon contain? As you research these resources ask how your future city’s residents might use these lunar resources.

• **Sunlight** is strong and predictable on the Moon as there are no clouds to get in the way.
• **Water** can be found as ice in deep craters near the Moon’s poles.
• **Key Elements** including oxygen, silicon, aluminum, iron, calcium, magnesium, hydrogen, and titanium are found in the surface layer of lunar dust, soil, and broken rock.
• **Geographic Features** such as lava tubes or craters might make good building locations.
• **Helium 3** is an isotope that some people think might be a good energy source.
• **Rare Earth Elements (REE)** may be used to manufacture many types of electronics.

Lunar Hazards

Moon dwellers will face serious hazards that we don’t have on Earth and that our cities aren’t built to withstand. Everything must be engineered to protect people from these hazards and that means thinking in a whole new way about how a city is planned and built.

• **Lunar dust** is mostly made of silicon dioxide glass with some particles of iron, calcium, and magnesium, that has been ground into a very fine powder over billions of years of being smashed by meteorites. How is lunar dust dangerous to humans?
• **Radiation** is energy that travels through space; solar radiation is energy emitted by the sun that travels to the Moon as well as Earth. Without a magnetosphere and with little atmosphere, the Moon offers no protection against solar radiation. Moon dwellers will have to be protected from solar flares and cosmic rays, two especially dangerous forms of radiation. Why is this radiation a hazard to your lunar residents?
• **A meteorite** is an object in space that hurtles into the surface of the Moon, Earth, or other planets. It can be as tiny as a grain of dust or it can be a massive rock weighing many tons. The Moon is bombarded by meteorites because it does not have the atmosphere to break them up before they hit the surface. Meteor strikes can create explosions of energy, as well as damaging micro impacts. What might protect people in a lunar city from meteor strikes?
• **Moonquakes** are known to rock the Moon. Tides, vibrations from meteorites smashing into the surface, and thermal quakes from the Moon’s crust expanding in the morning sun are all pretty mild and harmless. A fourth kind, shallow moonquakes, can register 5.5 on the Richter scale and last for more than 10 minutes. What are the implications of these various moonquakes for a lunar city?
Living on the Moon: Questions to Consider

Your future lunar city is set at least 100 years in the future. It has already gone through many years of development. It started as a collection of lunar landers that expanded into an outpost. Gradually it grew into a village and is now a fully functioning city.

Your challenge: Build on this history to develop a future lunar city. You will describe where your city is located on the Moon, share its innovative features, and provide a detailed description of how your city uses two of the Moon’s resources in futuristic ways to keep its residents safe and healthy.

Use the topics and questions below to guide your research, brainstorming, and design sessions. Remember that no city can provide everything—especially one on the Moon! What are the most important elements in your future lunar city? What makes your city futuristic, innovative, and scientifically plausible? What tradeoffs do you need to make?

City Location

The conditions and geography of the Moon are very different than on Earth. From your research, you learned that the Moon is covered in regolith, the terrain is full of huge craters, there are lunar highlands that look like old, eroded mountains, and the poles have ice hidden deep inside huge craters. The near side of the Moon always faces the Earth, while the far side always faces away from the Earth. As you think about the Moon, discuss where you’d like to locate your city.

• What areas of the Moon are possible locations?
• What are the benefits of these different locations? What are the drawbacks?
• How do the natural features of each potential area impact your city and its residents (for example, mountains, craters, access to water, sunlight)?

Livable Atmosphere

The Moon has no breathable atmosphere and no plants. All it has is an exosphere, which is not that much more than the vacuum of space. It has some molecules of different gases floating around in it, along with Moon dust that is gritty and clings to everything. To survive and thrive, people will need breathable air at the right pressure. Remember the Moon’s low gravity means there is less pressure than on Earth.

• How do you supply breathable air at the right pressure?
• How do you maintain comfortable humidity and temperature?
• How do you replenish oxygen and process excess carbon dioxide so that the air stays breathable?
• How do you filter contaminants out of the air?

Water

At first, scientists thought there was no water on the Moon, but recently they discovered that it exists frozen deep within craters at the poles. This water has to be mined, the way we mine for precious metals and oil on Earth. Small amounts of water are also embedded in lunar soil. Your residents will need water for drinking, bathing, and growing crops. It can also be used to make fuel, especially rocket propellant.

• How does your city harvest water and make it drinkable?
• How does your city supply water? Is there a water recycling system?
• What are the ways water is used in your lunar city? Are there uses that won’t be allowed because it’s a limited resource?

Energy

Energy will be essential to sustaining life on the Moon. Your residents will need it to harvest water and breathable air, grow crops, stay warm and cool during the Moon’s temperature swings, move people and goods around, and travel back to Earth or onward to Mars.

• What energy source(s) does your lunar city use? Is wind a source of energy on the Moon? What about nuclear fusion or fission? Solar energy from light and/or heat?
• What are some ways that energy could be stored and released during the lunar night, when residents need to be kept warm?
• What hazards threaten your city’s energy supplies?
Industry & Manufacturing

Thanks to certain abundant resources, there are great mining and manufacturing opportunities on the Moon. For example, water extracted from lunar craters and regolith can be processed into hydrogen and oxygen—two key elements for rocket propellant. Other elements could be used to make electronics and batteries.

• What resources does your city mine or produce?
• How are these different resources being used in your future city? Is there a Moon resource you use to produce breathable air? To build structures? To grow crops?
• What methods are being used to extract and mine these resources?
• Does your lunar city trade any resources with Earth?

Structures and Housing

On the Moon, buildings will need to protect people from the Moon’s many hazards—such as lunar dust, radiation, meteorites, and moonquakes—while also providing breathable air and pressure.

• What Moon resources do you use as building materials? How might these materials affect a building’s design?
• How might buildings take advantage of the Moon’s terrain?
• Where do your residents live? Individual houses, apartments, or a new configuration? How do your home designs create comfortable places for people to sleep, eat, relax, and exercise?
• How do your city’s buildings protect against the Moon’s harsh conditions and hazards?

Food

On the Moon, special systems will be needed to grow crops. There are no pastures for farm animals or oceans for seafood. What do your residents eat?

• What crops can you grow and/or farm successfully in small spaces with low gravity? Are some growing methods more efficient on the Moon than others?
• What high-value, nutritious food do you produce?
• How do you provide crops light, water, and humidity?

Transportation

Transportation options need to be designed with the Moon’s limits and resources in mind. Traditional Earth-based options like biking, walking, and driving cars will be challenging.

• How do your residents travel around your future city? Is there more than one way to get around?
• What lunar resources are used in your transportation system?
• How do your residents travel back and forth to Earth, Mars, and beyond?

Government, Zoning, & Services

On the Moon, there will need to be ways to govern the people. This includes making and enforcing laws, settling disputes, and planning city growth.

• How is your city zoned? Are the zones separate or are there mixed-use zones (e.g., commercial and residential or commercial and industrial) in your city?
• How is your city governed? Who makes the laws and regulations?
• How does your city provide basic and emergency services (e.g., education, medical, fire)?
• How does your city provide various utilities (water, sewer, waste management and recycling, electricity, Internet)?
• What Moon hazards are possible disruptions to residents’ access to those utilities? What alternatives does your city provide?

People, Health & Education

Think about your city’s residents. Are they Moon natives, born on the Moon without ever traveling to Earth? How do the Moon’s conditions (e.g., low gravity) and restrictions (e.g., staying indoors or traveling outside with protective gear) affect the community and its people?

• How would you describe the people who live in your city and what they do?
• What does your city offer for entertainment and cultural enrichment?
• What specific activities do people need to engage in to stay healthy on the Moon?
• How are public spaces for recreation incorporated into your city?
• How are people educated in your lunar city?
Living on the Moon: Real-World Case Studies

Lunar Elevator

There are abundant resources on the Moon, but their types are limited and none are organic (carbon-based). So, a lunar city could benefit with supplies from the Earth and there are also some lunar resources or products that could be valuable and useful on Earth. How could we make transport trips between the Earth and Moon without using the massive resources and fuel needed to build, maintain, and fly a fleet of cargo rockets?

Two astronomy students at Columbia University have come up with an idea that is being seriously considered: building a lunar spaceline that is anchored on the Moon and stretches about 200,000 miles until it ends at Earth’s orbit. It stays taut from its own weight and because it is pointed towards Earth’s gravitational field. By anchoring the spaceline on the Moon, where gravitational force is only 1/6th of Earth’s, and by dangling the other end at the edge of Earth’s atmosphere, the Earth’s gravity is no longer a problem. Not only that, but the Moon always shows the same side to Earth, so the spaceline wouldn’t be subjected to the twisting it would have to endure if it were anchored to Earth.

The spaceline would be a cable thinner than a pencil! Supply pods would be flown in a rocket and then transferred to a robotic vehicle that would climb the cable until it reached the Moon. The robotic vehicle would not need any fuel; it would rely on solar power and friction to ascend or descend. A rocket still has to get the supplies to the spaceline, but it would use a fraction of the fuel and resources needed to fly all the way to the Moon.

The spaceline could be built and maintained using resources from the Moon. For example, the cable could be made from titanium, which exists in abundance on the Moon. Other materials being considered could also be fabricated from precious metals found on the Moon. Lunar silicon could be refined into semi-conductors that create the solar panels used on the robotic vehicles traveling up and down the spaceline.

The cable elevator design still has some challenges to address, such as how to prevent the cable from breaking or collapsing, which could happen from the many stresses that it would experience. There is also the problem of debris flying around in space that could crash into the cable or the robotic vehicles. Nevertheless, this bold idea has engineers working hard to design a prototype and test its feasibility.

Martian Bricks

Lugging heavy, cumbersome construction materials to the Moon or Mars has proven to be so expensive and difficult that it is not considered an option. It’s hard enough just getting astronauts to these places! The alternative is to use the materials that are already there, and that’s what scientists and engineers have been figuring out how to do.

Fourteen-year-old Sidor Clare from Utah has made a major contribution to this effort. She and her partner Kassie Holt learned about what the soil on Mars is made out of and replicated it here on Earth. They used a mix called Mars Global Simulant MGS-1 because its chemical and mechanical properties are similar to the soil on Mars. They mixed this simulant with different binders to see which ones held the soil together best and then tested their bricks with equipment at a community college. Of the ones they tried, the soil mixed with polyester resin held together really well. This resin plus Martian soil makes extremely durable bricks—they are even stronger than concrete! “Our resin brick was so strong that we had to move to a concrete crusher to test it,” Clare said.
Lunar Greenhouse

We can’t plant crops on the Moon like we do on Earth. Soil and pollinators like bees don’t exist, the atmosphere and temperatures are unlivable, and the available water is frozen inside craters. If we built regular greenhouses, plants couldn’t survive the radiation coming through the glass and the plants would die during the two weeks of darkness every month. But without solving the problem of food—nutritious food that can be grown there, using local resources—there can’t be any lunar residents.

Engineers and scientists are devising ways around these obstacles. They gleaned some ideas from The South Pole Growth Chamber. It grows food for researchers in Antarctica, who can be cut off from the rest of the world for up to eight months a year. Lunar scientists repurposed successes in this environment to the much harsher conditions on the Moon. They have constructed prototypes for a lunar greenhouse that would exist underground, protected from solar flares, cosmic rays, and micrometeorites. It is tube-shaped, 18 feet long and 8 feet in diameter. These greenhouses can be folded into crates while traveling to the Moon. They’d arrive equipped with seeds that can sprout hydroponically, meaning that they only need water (no soil) in order to grow. Water can be brought from Earth to start the greenhouses, but then provided from frozen lunar deposits as well as water extracted from residents’ urine.

Light pipes using fiber-optic cables would channel sunlight from the Moon’s surface to the plants. Once the greenhouses are set up, the settlers’ own breath would provide the CO2 that the plants need, and settlers could breathe the oxygen that the plants create during the process of photosynthesis. Engineers call these greenhouses bioregenerative life support systems; everything they need will exist within them, and they will create habitats where humans can flourish.

Plastic Refabricator

Waste is a serious problem on Earth. Plastics in particular are a monumental issue because they take up to a thousand years to decompose. Plastic waste would also be a problem on the Moon, unless engineers figure out a way to turn it into a renewable resource for lunar residents.

The Refabricator does this brilliantly. It is part plastics recycler, part 3D printer. It melts plastic waste into a 3D printing filament, which transforms it into new tools for astronauts to use. NASA engineers tested the Refabricator’s ability to work on the Moon by simulating microgravity. They found that the objects had similar thickness, strength, and flexibility as objects created on Earth.

In November 2018, the Refabricator was installed on the International Space Station. As Niki Werkheiser, the project manager for NASA’s in-space manufacturing arm explains, “The Refabricator is key in demonstrating a sustainable model to fabricate, recycle, and reuse parts and waste materials on extended space exploration missions.”

Engineers see other applications for the Refabricator that would help make life on the Moon self-sustaining. For example, it could enable the 3D printing of skin, bone, and body parts to treat injured residents! This technology is already being used here on Earth, in the field of regenerative medicine, to bioprint ligaments and tendons from stem cells.
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<th>Essay Rubric (FC Jr.)</th>
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<tr>
<td>I. INTRODUCE CITY (15 points)</td>
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<tr>
<td>- Introduce city and basic features</td>
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<td>2. City Location</td>
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<tr>
<td>- Geographic features of lunar location</td>
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<td>3. Hazards and challenges of lunar location</td>
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<tr>
<td>- Challenges to city and impacts on citizens</td>
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<td>- Protection against hazards</td>
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<td>III. PROBLEM AND SOLUTION (18 points)</td>
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<td>6. Utilizing Moon resources</td>
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<tr>
<td>- Identify one Moon resource used by the city</td>
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<td>- Obtaining and/or processing the resource</td>
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<td>8. Risks, tradeoffs, and compromises</td>
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<tr>
<td>- Benefits, drawbacks, risks</td>
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<tr>
<td>9. Describe benefits to citizens</td>
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<tr>
<td>- How does the technology and use of this resource benefit the residents</td>
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<td>10. Engineering disciplines involved</td>
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### IV. PROBLEM AND SOLUTION (Cont’d)

| Role of 1-2 engineers | Role of engineers are not identified | Underdeveloped discussion of role of one engineer | Clear description of role of 1-2 engineers involved in system and solution | Clear and detailed description of role of 1-2 engineers involved in system and solution |

### IV. JUDGE ASSESSMENT OF SOLUTION (15 points)

<table>
<thead>
<tr>
<th>Overall city concept and design</th>
<th>Poorly conceived city design.</th>
<th>Fairly conceived city design.</th>
<th>Well thought out city design.</th>
<th>Thoroughly thought out city design.</th>
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<tbody>
<tr>
<td><strong>Effectiveness of city design for lunar environment</strong></td>
<td>Not effective</td>
<td>Solution is somewhat effective. Technology and design need improvement. Questionable ability to ensure citizen safety and health.</td>
<td>Solution is effective, but technology and design could be improved; good ability to ensure citizen safety and health.</td>
<td>Solution is a highly effective, with excellent technology application; excellent ability to ensure citizen safety and health.</td>
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<tr>
<th><strong>Quality of solution to theme: using Moon resources</strong></th>
<th>Not effective</th>
<th>Solution is somewhat effective. Technology and design need improvement. Unimportant benefit to the city.</th>
<th>Solution is effective, but technology and design could be improved; important contribution to the welfare of city.</th>
<th>Solution is a highly effective, with excellent technology application; essential contribution to the city and citizens.</th>
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<tbody>
<tr>
<td><strong>Innovative &amp; futuristic technologies</strong></td>
<td>Not innovative or original</td>
<td>Overall concept is somewhat original or innovative. Not futuristic.</td>
<td>Overall concept is moderately innovative, original or futuristic.</td>
<td>Overall concept is highly innovative, original and futuristic.</td>
</tr>
</tbody>
</table>

| **Tradeoffs & compromises** | Does not explore tradeoffs | Some consideration of tradeoffs, but ignores major issues. | Adequate assessment of tradeoffs, but analysis and decisions could be improved. | Excellent assessment of risks, benefits, tradeoffs in the decision-making process. |

### V. WRITING SKILLS (12 points)

<table>
<thead>
<tr>
<th>Organization</th>
<th>Poorly organized</th>
<th>Fair organization</th>
<th>Good organization</th>
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<tr>
<td>Writing skills</td>
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<td>Fair writing</td>
<td>Good writing</td>
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<td>Grammar &amp; spelling</td>
<td>Many errors</td>
<td>Some errors</td>
<td>Few, if any, errors</td>
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<thead>
<tr>
<th>Maximum number of Graphics</th>
<th>Exceeds maximum of 4 graphics, illustrations</th>
<th>Does not exceed maximum of 4 graphics and/or illustrations</th>
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