

CHAPTER 2	Thought Lab 2.5: Design a Self-Sustaining Mars Colony	BLM 2.3.8
HANDOUT		
Purpose: Create an ecosystem that can sustain itself in a manner similar to Earth’s biosphere.		

Procedure

1. In a group, design a self-sustaining Mars colony. Begin by brainstorming the requirements of such a colony. How would water, oxygen, and carbon dioxide be exchanged? How would nutrients be recycled? How would you address the issue of food production and waste disposal? How would energy be generated?
2. Make a list of what colonists would need to survive on Mars. Create a table of "inputs" the colony would require in order to obtain these things, and "outputs" that could be recycled to obtain them. What cycles would exist as a result of this recycling? How might the colony be affected if one of these cycles were to become disrupted?

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Analysis

1. On Mars, large quantities of water are frozen in the polar ice caps and under the planet's surface. How could these resources be incorporated into a self-sustaining ecosystem?
2. Scientists have suggested that, like the International Space Station, a Mars colony could be powered by collecting the Sun's energy with solar panels. However, because of its distance from the Sun, Mars only receives half of the solar radiation that Earth does. Extensive atmospheric dust also reflects incoming sunlight. Suggest ways in which a self-sustaining Mars colony could address these issues. Do you think solar panels are a viable means of supplying power to a Mars colony? Why or why not? Can you provide a feasible alternative?
3. Mars has only a third of Earth's gravity. What sorts of problems might this present to a Mars colony and how would you address them?

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4. The soil on Mars is very corrosive. Colonists may be able to grow crops in greenhouses using hydroponics (using nutrient-rich water instead of soil). Suggest a way that nutrients required for plant growth (such as nitrogen and phosphorus) might be recycled within the greenhouse.

5. The thin Martian atmosphere is about 95 percent carbon dioxide. However, Mars experiences only a very slight greenhouse effect. As part of the plans for colonizing Mars, some scientists have suggested the need to create a greenhouse effect for Mars—called a “runaway greenhouse effect.” What do you think might be necessary to engineer this effect? What are some possible consequences of doing so?

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6. Some people find the idea of terra-forming another planet or moon (making it Earth-like for human habitation) disagreeable. They point to the current condition of Earth as evidence that we have not yet learned how to live in balance with our home planet. On the other hand, some people find the idea of terraforming inspiring—an opportunity to have a fresh start, to “get things right” based on the knowledge we have developed about the biosphere and its interconnected systems. What is your opinion? Provide reasons to support it.