Potential Science Content Connections and Discussion Suggestions from *The Martian*


Overall book

How much has our actual Mars exploration provided material for the book? Research Mars exploration history. Do you think our future plans for exploration would ever make the story possible?

Does the author set the story in the present time? Is the time made clear?

Map in the front of the book

Where do the place names come from? Are the place names ones that actual Mars exploration has assigned, or were they chosen for the book?

Map Watney’s path. Does the kilometer measurement match the book’s description?

Sol 6, pg. 1

Uses two terms: “sol” and “day.” Are they interchangeable? Differences?

Name of program is “Ares.” Is there a meaning behind it?

Sol 6, pg. 2

Mentions that *Hermes* spacecraft is powered by ion engines that use argon. Is this possible? Is it being done already in our time?

Sol 6, pg. 3

A description of the Mars ascent vehicle (MAV) mentions that through a set of chemical reactions, hydrogen can be converted to fuel, with a ratio of 1 kg hydrogen for 13 kg fuel. Is this possible chemistry-wise? What type of fuel is made? What reactions are used?
Supplement to “The Martian: Popular Fiction Plus Chemistry” by Erica K. Jacobsen
http://www.jce.divched.org/blog/martian-popular-fiction-plus-chemistry

Sol 6, pg. 5
Mentions that carbon dioxide filters can become used up. Connection to Apollo 13 movie scene with carbon dioxide filters.
Is an “oxygenator” real? Is it possible as described?

Sol 6, pg. 6
Describes action of space suit, filling in missing air with more oxygen than human body is normally subject to in Earth’s atmosphere, with a risk of “oxygen toxicity.”
What is the body’s response to too much oxygen? How quickly does it happen? It’s labeled “an ironic death” for someone in space—why?

Sol 6, pg. 7
Idea of leaving an astronaut’s corpse behind on the planet to save fuel for the spacecraft’s trip home.

Sol 7, pg. 8
Amount of food for entire crew for a certain number of days. Unit conversion problem for how many days the food could last if it is just one crew member. Also relates to Sol 7, pg. 10, with the time it takes the entire crew to saturate/use up the available carbon dioxide filters.

Sol 7, pg. 9
Mentions the square meters of solar cell surface available, plus hydrogen fuel cells for storage. Investigate the typical output of solar cells. What construction/surface area is required for electricity for an average house?

Sol 7, pg. 11
Watney mentions needing to ration the carbon dioxide filters. How do the filters work? What actually becomes “saturated” in the filter?
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Sol 7, pg. 12

Mention of Martian soil versus Earth soil. What makes the two different?

Sol 14, pg. 13

Watney collects his feces to use as compost in the soil and discusses its smell in connection with the bacteria at work.

Sol 14, pg. 14

Discussion of making Martian soil usable for planting potatoes.

Sol 16, pg. 15–16

Requirement of water for soil. Discussion of what can be done to obtain it on Mars.

Sol 22, pg. 17

Calculating calories of the amount of potatoes Watney estimates he can grow. What assumptions does he make? Can he realistically grow enough potatoes to survive?

Sol 25, pg. 18

Discussion of the length of a sol, in that it is 39 minutes longer than a day. Is it connected to the Mars orbit? How? Is the word “sol” an apt choice to label it?

Sol 26, pg. 21

Mentions that the time from planting to crop of full-sized potatoes is 90 days, but plans to cut the time down by providing optimum conditions. Compare with personal experience with a garden on Earth.

Sol 30, pg. 24–25

Watney says he’ll have to make water “from scratch.” Includes a discussion of reserve oxygen tanks, and other ways of obtaining oxygen and hydrogen.
Sol 30, pg. 26–27

Mention of hydrazine, along with its past use in World War II. What is the formula? Structure? Typical uses?

Sol 32, pg. 28–29

Watney looks for ideas for storing hydrogen. Considered using rover vehicle, but can only handle a certain pressure.

Describes plan to use hydrazine, iridium catalyst. Mentions the dangers of it.

Sol 33, pg. 31

Mentions that hydrazine is a liquid. What are its other properties?

Sol 33(2), pg. 31

Description of safety measures Watney took for “suiting up” to work with hydrazine. Compare MSDS for hydrazine with Watney’s descriptions of its toxicity.

Sol 33(2), pg. 32

Mentions that hydrogen gas would be hot after a chemical reaction and “... it’ll want to go up.” Link to the idea of the density of a gas, its relation to temperature. Could also discuss how we sometimes assign human thought to inanimate things.

Sol 33(2) pg. 33

Discussion of the reaction of hydrazine breaking down being “extremely exothermic.” Research the reaction and calculate how exothermic.

Sol 37, pg. 36–37

Description of chemistry as messy.

Unburned hydrogen from hydrazine reaction is present. Comparison of situation to Hindenburg if a small static discharge.