

NAME: _____ PER: _____

The Martian

ENJOY THE FILM... BUT LEARN THE SCIENCE!

The Martian is a 2015 science fiction film based on Andy Weir's novel about an astronaut who is mistakenly presumed dead and left behind during a mission to Mars. The film shows his struggle to survive and Earth's efforts to rescue him. The huge cast features Matt Damon (*Jason Bourne*), Jessica Chastain (*Interstellar*), Kristen Wiig (*Ghostbusters*), Donald Glover (aka *Childish Gambino*) Jeff Daniels (*Dumb and Dumber*), Sean Bean (*Lord of the Rings*), Sebastian Stan (*Captain America: Winter Soldier*) and loads more actors you might recognize.



The film opens with a massive dust storm. Dust storms on Mars can be planet-spanning events, with winds up to 160 km/hour. However, Mars's **much thinner atmosphere** means those winds would have much less impact than a wind storm on Earth. Even the largest storm isn't going to fling around pebbles, and it certainly isn't going to tip over a spacecraft or spear a pole into a hapless astronaut.

As in the movie, if we sent humans to Mars, we'd experiment with farming on the planet. Experiments on the **International Space Station** serve dual function of testing locally-sourced food and in providing substantial psychological benefits for their astronauts. Raising a plant is proven to be psychologically good for you. We're pretty certain we could grow things in Martian soil. Perchlorates, a type of salt in the Martian soil, wash out easily, so it just needs a bit of supplementing with nitrogen and bacteria. Although it's not good idea to use human waste as fertilizer since it's far too easy to transmit diseases, it could work in a desperate situation.

NASA is working on plans to harvest key materials locally on Mars to minimize how much we need to ship ahead. In fact, the Mars 2020 rover is going to try to use local materials to **produce oxygen!** And duct tape really does work everywhere. But Mars has no magnetic field to block **deadly Solar Radiation**, and the soft inflatable habitat we see in the movie would provide no protection for squishy, fragile humans or for our delicate electronics. In reality, Martian colonists would probably be like mole-people, hiding in caves.

Because of fuel needs, the only way to go is with small spacecraft to get from planet to orbit, then a larger craft to fly around in deep space. While harsh, Watney's heroic **12g launch** at the climax is survivable and would certainly lead to blacking out. But could a spacecraft really be stripped down to a tarp-topped convertible and still successfully launch through the thin Martian atmosphere? It's plausible, but it'd be uncertain and risky enough to be a last-ditch do-or-die, not a rational choice made deliberately when any other options are possible.

The Martian isn't a documentary of 100% accurate science, but it's plausible and mostly consistent. It's a film about competent, intelligent people trying to solve an enormous challenge. A few moments strain credibility but this is a story where science plays the starring role and it shows. Science can accept this love letter as a fictional tribute, a story that inspires and celebrates the very best human knowledge and courage has to offer.

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1. What is the name of the mission commander, played by Jessica Chastain?
2. The character Teddy Sanders, played by Jeff Daniels, has what job?
3. What is the "Hab"?
4. What events lead to the crew of the Ares thinking Watney is dead?
5. What machine does Watney use to start communicating with NASA?
6. What term do they keep referring to days as? What does that mean?
7. Describe as best you can how Watney makes water.
8. Why the toilet waste? What element is necessary?
9. Why does Director of Mars Missions Vincent Kapoor start taking a picture off the break room walls?
10. What is the "Rich Purnell Maneuver"? Explain it as best you can.
11. Why does NASA team with the Jet Propulsion Laboratory?
12. What does the Chinese National Space Administration have to offer the mission?
13. What is Watney's new job at the end?

