

**Questions 42-52 are based on the following passages.**

Passage 1 is adapted from Michael Slezak, "Space Mining: the Next Gold Rush?" ©2013 by New Scientist. Passage 2 is from the editors of *New Scientist*, "Taming the Final Frontier." ©2013 by New Scientist.

**Passage 1**

Follow the money and you will end up in space. That's the message from a first-of-its-kind forum on mining beyond Earth.

Line Convened in Sydney by the Australian Centre for  
5 Space Engineering Research, the event brought together mining companies, robotics experts, lunar scientists, and government agencies that are all working to make space mining a reality.

The forum comes hot on the heels of the  
10 2012 unveiling of two private asteroid-mining firms. Planetary Resources of Washington says it will launch its first prospecting telescopes in two years, while Deep Space Industries of Virginia hopes to be harvesting metals from asteroids by 2020. Another  
15 commercial venture that sprung up in 2012, Golden Spike of Colorado, will be offering trips to the moon, including to potential lunar miners.

Within a few decades, these firms may be meeting earthly demands for precious metals, such as  
20 platinum and gold, and the rare earth elements vital for personal electronics, such as yttrium and lanthanum. But like the gold rush pioneers who transformed the western United States, the first space miners won't just enrich themselves. They also hope  
25 to build an off-planet economy free of any bonds with Earth, in which the materials extracted and processed from the moon and asteroids are delivered for space-based projects.

In this scenario, water mined from other  
30 worlds could become the most desired commodity. "In the desert, what's worth more: a kilogram of gold or a kilogram of water?" asks Kris Zacny of HoneyBee Robotics in New York. "Gold is useless. Water will let you live."

35 Water ice from the moon's poles could be sent to astronauts on the International Space Station for drinking or as a radiation shield. Splitting water into oxygen and hydrogen makes spacecraft fuel, so ice-rich asteroids could become interplanetary  
40 refuelling stations.

Companies are eyeing the iron, silicon, and aluminium in lunar soil and asteroids, which could be used in 3D printers to make spare parts or machinery. Others want to turn space dirt into  
45 concrete for landing pads, shelters, and roads.

**Passage 2**

The motivation for deep-space travel is shifting from discovery to economics. The past year has seen a flurry of proposals aimed at bringing celestial riches down to Earth. No doubt this will make a few  
50 billionaires even wealthier, but we all stand to gain: the mineral bounty and spin-off technologies could enrich us all.

But before the miners start firing up their rockets, we should pause for thought. At first glance, space  
55 mining seems to sidestep most environmental concerns: there is (probably!) no life on asteroids, and thus no habitats to trash. But its consequences—both here on Earth and in space—merit careful consideration.

60 Part of this is about principles. Some will argue that space's "magnificent desolation" is not ours to despoil, just as they argue that our own planet's poles should remain pristine. Others will suggest that glutting ourselves on space's riches is not an  
65 acceptable alternative to developing more sustainable ways of earthly life.

History suggests that those will be hard lines to hold, and it may be difficult to persuade the public that such barren environments are worth preserving.  
70 After all, they exist in vast abundance, and even fewer people will experience them than have walked through Antarctica's icy landscapes.

There's also the emerging off-world economy to consider. The resources that are valuable in orbit and  
75 beyond may be very different to those we prize on Earth. Questions of their stewardship have barely been broached—and the relevant legal and regulatory framework is fragmentary, to put it mildly.

Space miners, like their earthly counterparts, are  
80 often reluctant to engage with such questions. One speaker at last week's space-mining forum in Sydney, Australia, concluded with a plea that regulation should be avoided. But miners have much to gain from a broad agreement on the for-profit  
85 exploitation of space. Without consensus, claims will be disputed, investments risky, and the gains made insecure. It is in all of our long-term interests to seek one out.