



SAMPLE SCIENCE TEST QUESTIONS

Passage 1

Unmanned spacecraft taking images of Jupiter's moon Europa have found its surface to be very smooth with few meteorite craters. Europa's surface ice shows evidence of being continually resmoothed and reshaped. Cracks, dark bands, and *pressure ridges* (created when water or slush is squeezed up between 2 slabs of ice) are commonly seen in images of the surface. Two scientists express their views as to whether the presence of a deep ocean beneath the surface is responsible for Europa's surface features.

Scientist 1

A deep ocean of liquid water exists on Europa. Jupiter's gravitational field produces tides within Europa that can cause heating of the subsurface to a point where liquid water can exist. The numerous cracks and dark bands in the surface ice closely resemble the appearance of thawing ice covering the polar oceans on Earth. Only a substantial amount of circulating liquid water can crack and rotate such large slabs of ice. The few meteorite craters that exist are shallow and have been smoothed by liquid water that oozed up into the crater from the subsurface and then quickly froze.

Jupiter's magnetic field, sweeping past Europa, would interact with the salty, deep ocean and produce a second magnetic field around Europa. The spacecraft has found evidence of this second magnetic field.

Scientist 2

No deep, liquid water ocean exists on Europa. The heat generated by gravitational tides is quickly lost to space because of Europa's small size, as shown by its very low surface temperature (-160°C). Many of the features on Europa's surface resemble features created by flowing glaciers on Earth. Large amounts of liquid water are not required for the creation of these features. If a thin layer of ice below the surface is much warmer than the surface ice, it may be able to flow and cause cracking and movement of the surface ice. Few meteorite craters are observed because of Europa's very thin atmosphere; surface ice continually *sublimes* (changes from solid to gas) into this atmosphere, quickly eroding and removing any craters that may have formed.



SAMPLE SCIENCE TEST QUESTIONS

Passage 2

Aristotle developed a system of physics based on what he thought occurred in nature. For example, he thought that if a stone is released from rest, it instantaneously reaches a speed that remains constant as the stone falls. He also believed that the speed attained by a stone falling in air varies directly with the weight of the stone. A 5-pound stone, for example, falls with a constant speed 5 times as great as that of a 1-pound stone. Aristotle also noted that stones dropped into water continue to fall, but at a slower rate than stones falling through air. To account for this, he explained that the resistance of the medium through which an object falls also affects the speed. Therefore, he said, the speed of a falling object also varies inversely with the resistance of the medium, and this resistance is the same for all objects.

Galileo disagreed with Aristotle's explanation. He generated the following arguments to refute Aristotle.

Consider a stake partially driven into the ground and a heavy stone falling from various heights onto the stake. If the stone falls from a height of 4 cubits, the stake will be driven into the ground, say, 4 fingerbreadths. But if the stone falls from a height of 1 cubit, the stake will be driven in a much smaller amount. Certainly, Galileo argued, if the stone is raised above the stake by only the thickness of a leaf, then the effect of the stone's falling on the stake will be altogether unnoticeable.

On the basis of a careful set of experiments, Galileo argued that the speed of an object released from rest varies directly with the time of fall. Also, the distance the object falls varies directly with the square of the time of fall if the effect of air resistance on the object is negligible. Thus, according to Galileo, objects actually fall with constant acceleration, and if air resistance is negligible, all objects have exactly the same acceleration.