Arizona Astrobiology Center

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Extreme Environments

Frozen Lakes

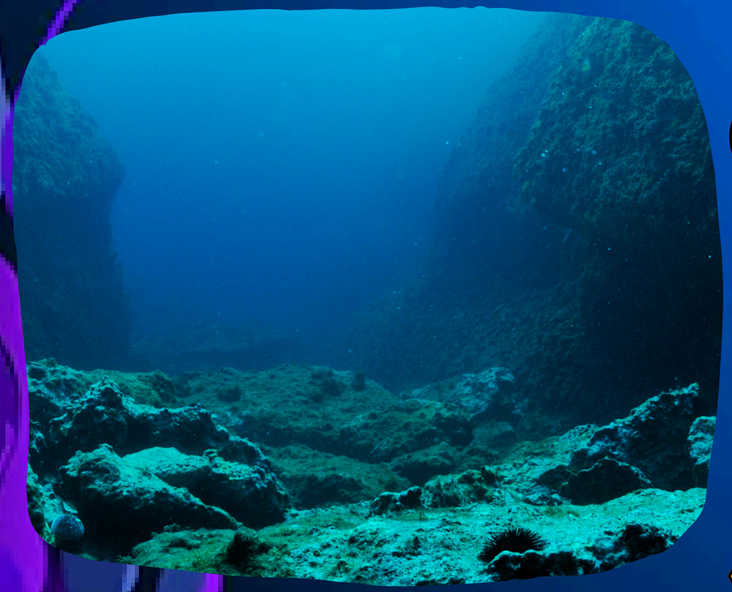
FROZEN LAKE

- Frozen lakes form when water freezes in cold seasons or polar regions.
- The ice can be several feet thick. However, cold liquid water will still be underneath.
- Fish, algae, and microorganisms can survive under the ice, since it's not solid all the way through.
- Fun Fact: In some places, the ice is so clear that you can see the fish swimming below your feet!

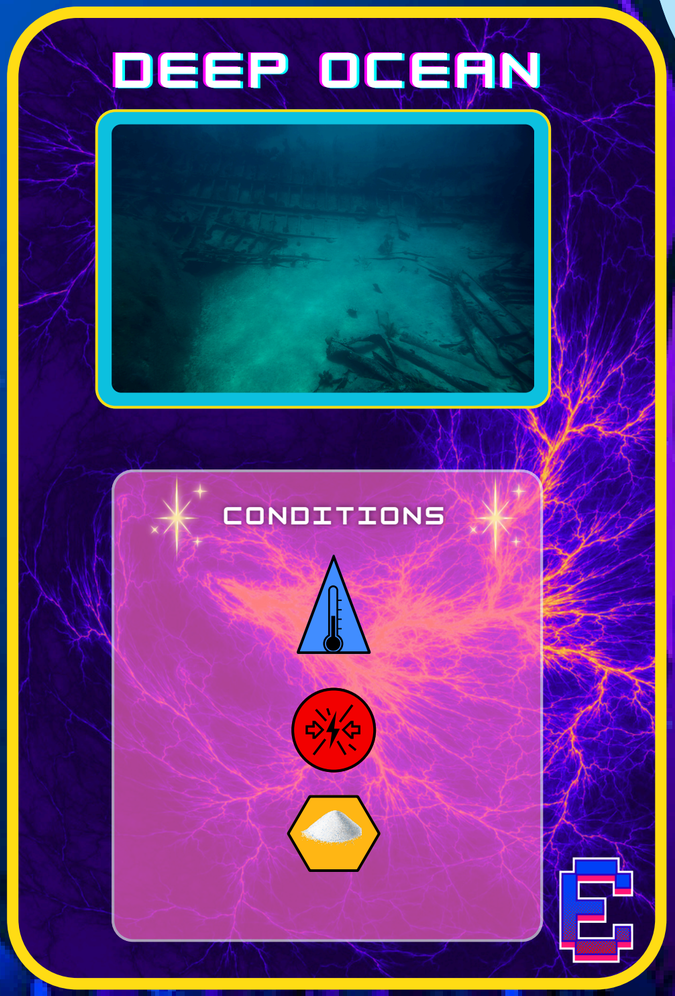
Hot Springs

- Hot springs are pools of hot water that get their temperature from Earth's underground heat.
- The water can be hotter than 200°F.
- Hot springs can be so acidic that they can dissolve rocks!
- Fun Fact: Some are rainbow-colored from heat-loving bacteria!

DEEP OCEANS



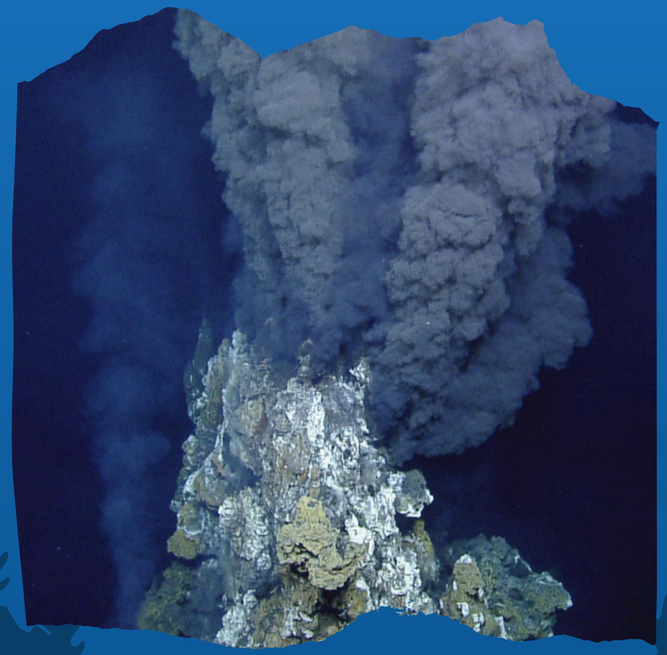
- In the deepest parts of the ocean, pressure can be over 1,000 times what we feel at the surface.
- The temperatures are near freezing, usually around 39°F.
- Even in the deepest parts of the ocean, the water is still salty.
- Fun Fact: Since it's so dark, many deep sea animals are capable of producing their own light, meaning they can glow in the dark!



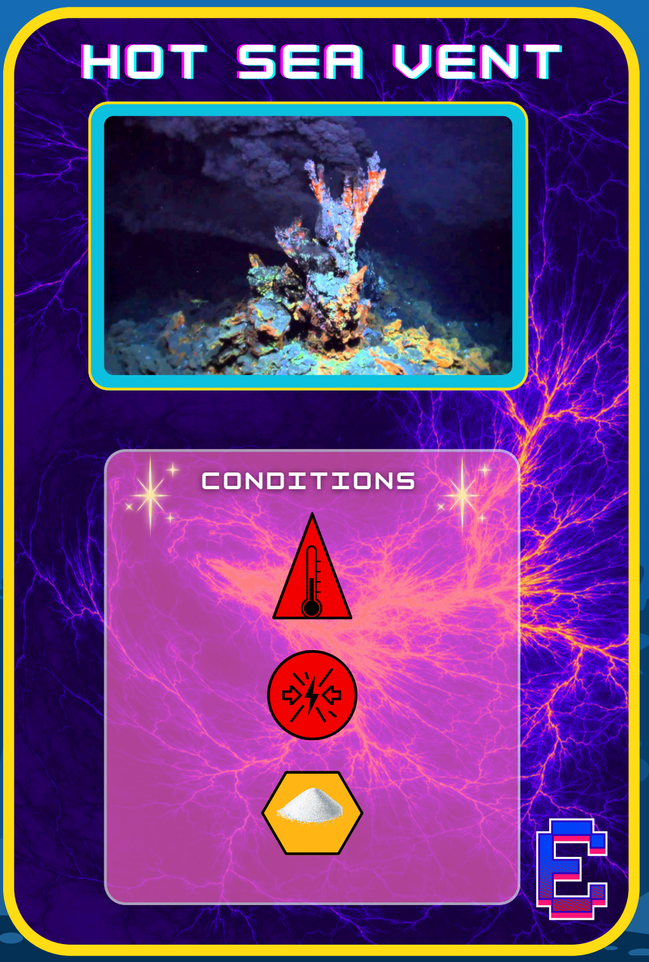
VOLCANIC VENTS

- Volcanic vents are openings in Earth’s surface that release heat, gases, or lava.
- Magma and gas building up under the surface cause pressure in the vents.
- Io, one of Jupiter’s moons, has hundreds of volcanic vents.
- Fun Fact: Lava from these vents can build mountains and islands!

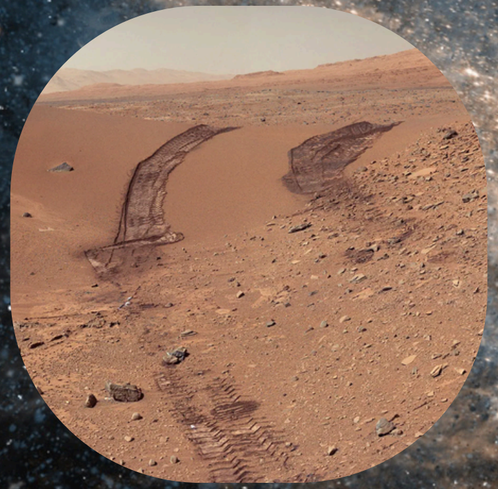
HOT SEA VENTS



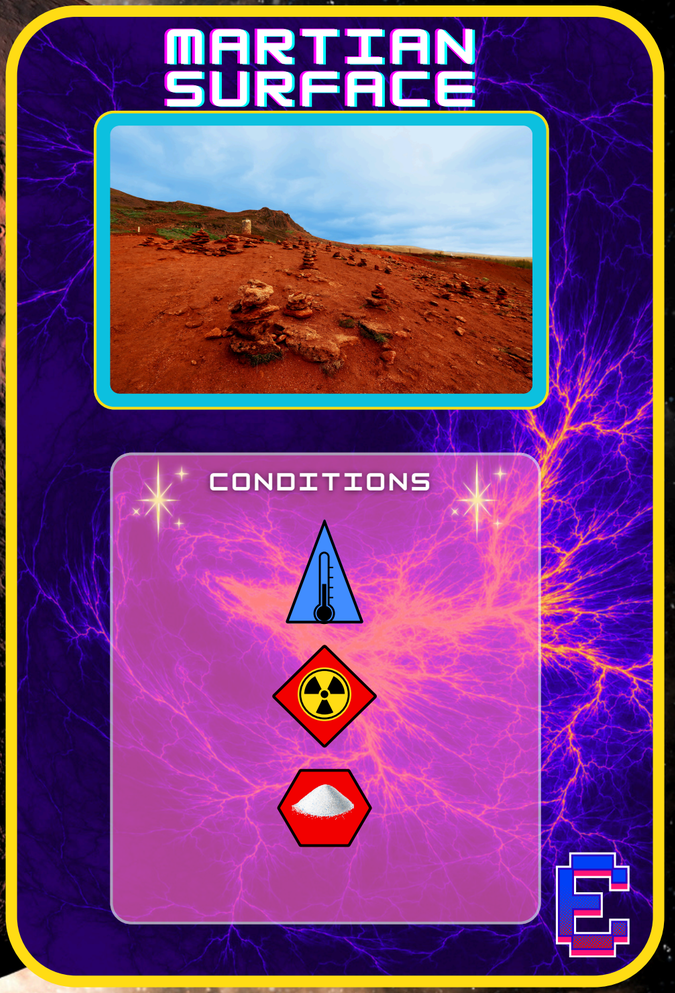
- This kind of volcanic vent is found at the bottom of the ocean.
- The water is heated by magma and has a lot of minerals that make it look like smoke.
- The pressure in these vents is extremely high, due to them being miles under the ocean.
- Fun Fact: Some scientists believe that life on Earth started in hot sea vents!



MARTIAN SURFACE

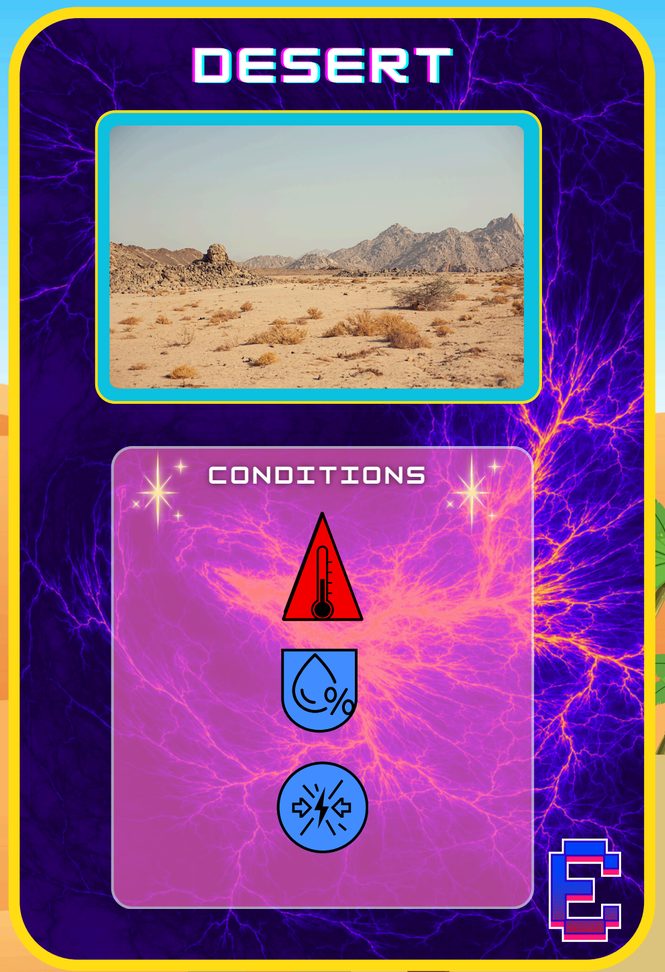


- Mars is very cold, with the average temperature being -85 °F.
- Evidence suggests that salty, liquid water exists on Mars
- Because it has no thick atmosphere, high radiation hits the surface.
- Fun Fact: Scientists believe that ice beneath the surface of Mars could have microbial life!



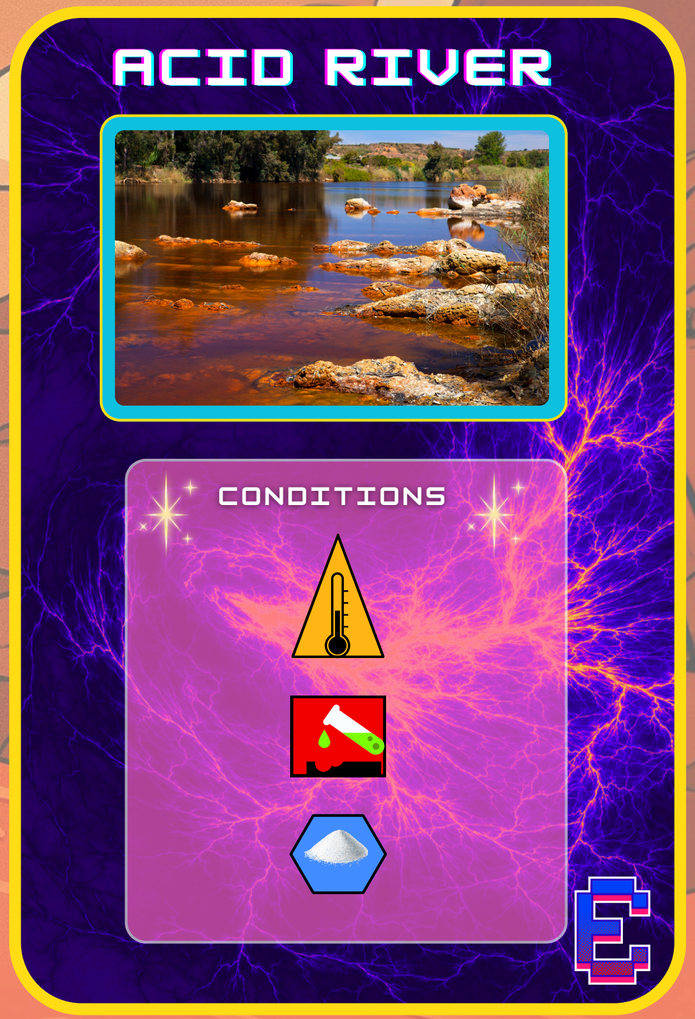
Deserts

- Deserts are the driest environments to exist. They only get around 10% of the rain that rainforests get.
- Many deserts are known for having very high temperatures, and some on Earth have gotten as hot as over 150 °F.
- Fun Fact: Some desert plants, like cacti, store water inside of them in order to stay alive!



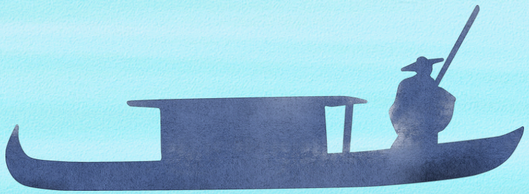
Acid Rivers

- Acid rivers have water that is more acidic than normal water because volcanoes and mines have released chemicals into the water.
- Even though these rivers are at a temperature and salt level that many organisms like, the acid in the water makes it very hard to survive in.
- Fun Fact: Scientists study the Rio Tinto acid river in Spain because it’s similar to Mars!

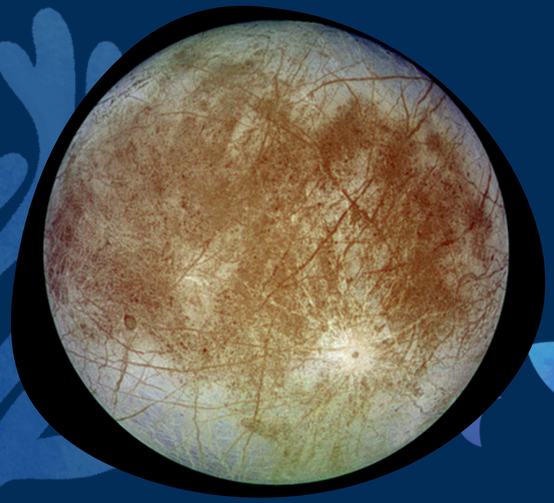


Saline Lakes

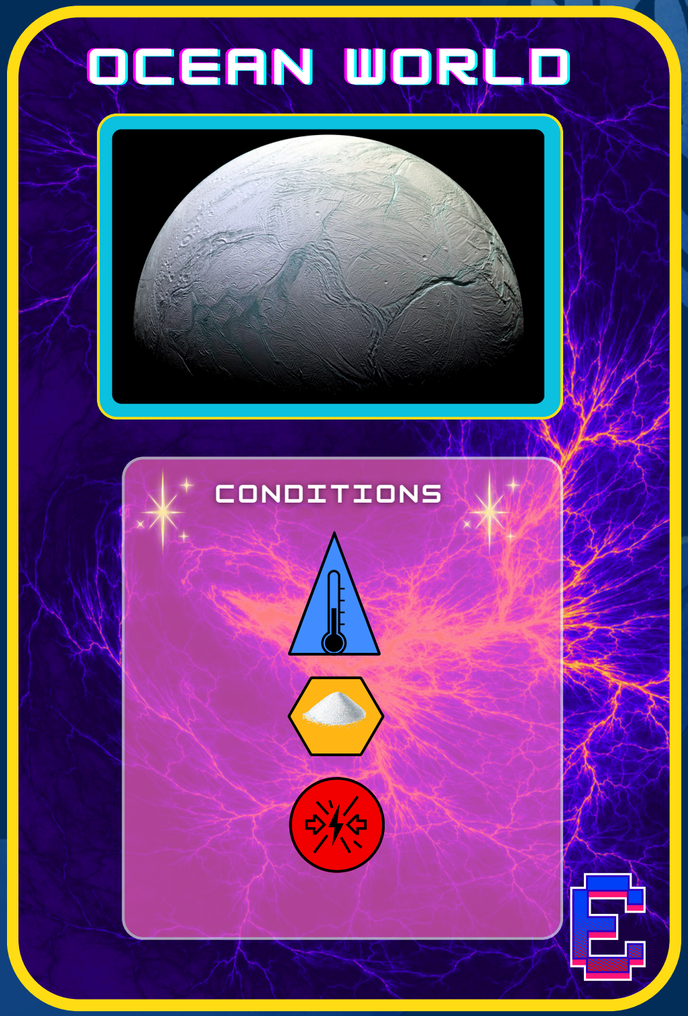
- Saline lakes are lakes that contain a lot of salt in them, often even more than the ocean.
- They form when water evaporates and leaves the salt behind.
- Sometimes the water is so salty that people can float easily near the surface.
- Fun Fact: Bacteria in the water can sometimes make the lakes pink in color!



OCEAN WORLDS

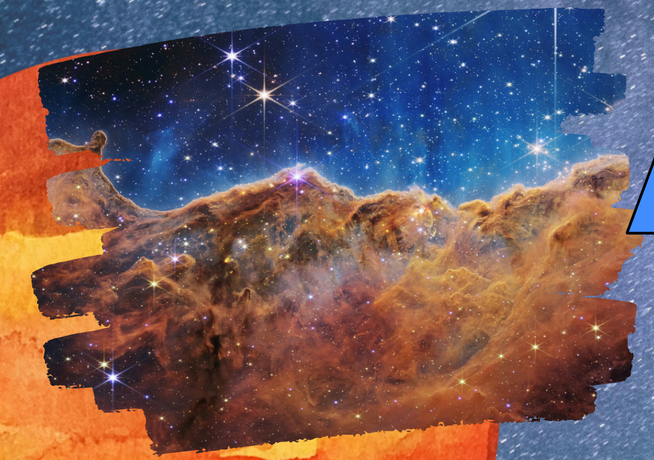


- Some planets and moons are called ocean worlds because they have a lot of liquid water.
- Scientists think these deep oceans would be great places to look for life.
- Same examples of ocean worlds are Europa (moon of Jupiter) and Enceladus (moon of Saturn). They are far from the Sun so the water is very cold!
- Fun Fact: Earth's oceans hold over 97% of all the water on our planet!



OUTER SPACE

- Outer space is everything outside of Earth's atmosphere. Because there is no atmosphere, there is also no protection from the Sun's radiation.
- It has no air, wind, or sound, and the extremely low pressure makes it nearly a perfect vacuum.



- Outer space is very cold, at around -455 °F
- Fun Fact: Since there's no air to scatter sunlight, the sky is always black!