

Name: _____

Teacher: _____

ENERGY AND STATES OF MATTER: ICE FUMARoles | FORMATIVE ASSESSMENT TASK MS-PS1-4



Ice fumaroles are chimneys of ice that form over volcanoes, with the greatest number of them in the world being found in Antarctica on Mount Erebus. Underground volcanoes release extremely hot gas from cracks in the Earth's surface. This gas, made of CO₂ (carbon dioxide) and H₂O (steam), melts through the deep snow and ice on the surface and creates ice caves above the volcano. The air outside is much colder (-22°F or -30°C) than the air inside the caves (32-48°F or 0-6°C). Some of the gas escapes all the

way up through the snow to the surface. When the escaping gas reaches the surface, the hot steam freezes as it meets the extremely cold outside air, causing snow to build up like a tube above the cave where the gas is escaping. As more gas escapes the cave, more snow builds up. Over time, the gas must travel higher through new snow to reach the outside air, eventually forming the chimneys.

TASK 1

1. Draw and label a model of the ice fumarole system. Include the following components:

- Ice fumarole
- Cave
- Volcano
- Volcanic gas
- Air outside
- Temperature inside the cave
- Temperature inside the fumarole (estimate)
- Temperature outside the fumarole

TASK 2

The scientists who study ice fumaroles say that the caves beneath the fumaroles change from season to season as ice melts and refreezes in new ways.

4. Imagine that the cave changes in a way that seals the volcanic crack so that **no more gas is released** into that cave. Predict how the **growth of the fumarole** would change without the volcano releasing more gas into the system. Use evidence from your model and your understanding of particle motion and thermal energy to support your prediction.
