

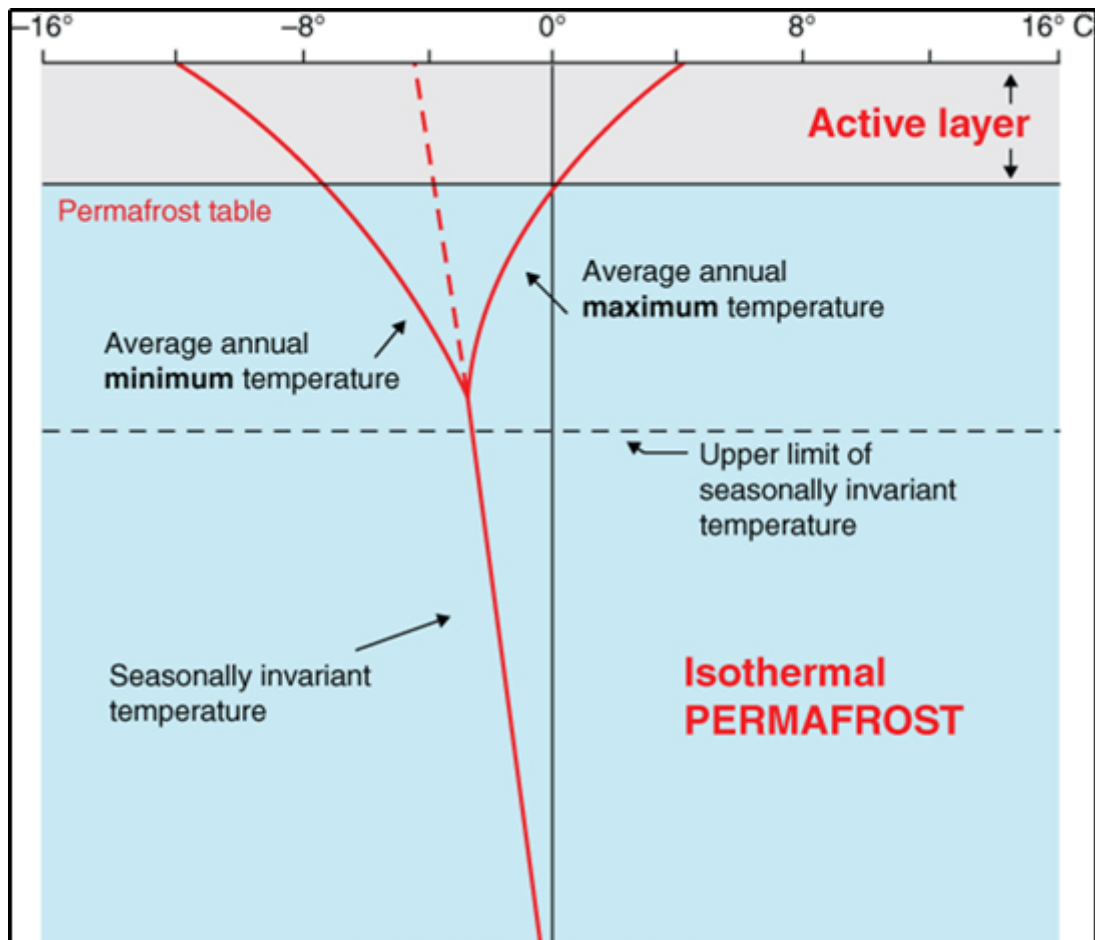
## Examrace

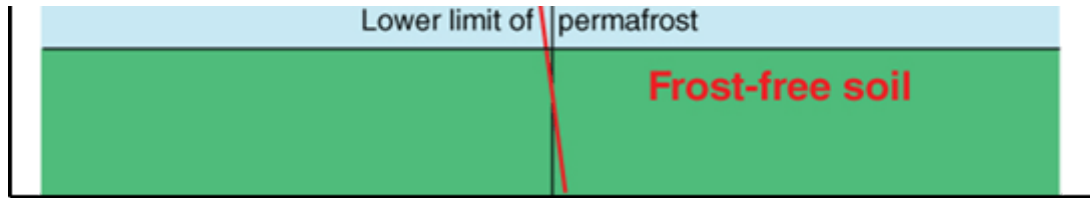
# Arctic Permafrost Climate Change Active Layer YouTube Lecture Handouts

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### Arctic Permafrost Climate Change

- Permafrost is any ground that remains completely frozen —  $32^{\circ}F$  ( $0^{\circ}C$ ) or colder — for at least two years straight. These permanently frozen grounds are most common in regions with high mountains and in Earth's higher latitudes — near the North and South Poles.
- Permafrost covers large regions of the Earth. Almost a quarter of the land area in the Northern Hemisphere has permafrost underneath. Although the ground is frozen, permafrost regions are not always covered in snow.





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- Permafrost is made of a combination of soil, rocks, and sand that are held together by ice. The soil and ice in permafrost stay frozen all year long.
- Near the surface, permafrost soils also contain large quantities of organic carbon — a material leftover from dead plants that couldn't decompose, or rot away, due to the cold. Lower permafrost layers contain soils made mostly of minerals.
- A layer of soil on top of permafrost does not stay frozen all year. This layer, called the **active layer**, thaws during the warm summer months and freezes again in the fall. In colder regions, the ground rarely thaws — even in the summer. There, the active layer is very thin — only 4 to 6 inches (10 to 15 centimeters) . In warmer permafrost regions, the active layer can be several meters thick.
- Many **northern villages are built on permafrost**. When permafrost is frozen, it's harder than concrete. However, thawing permafrost can destroy houses, roads and other infrastructure.
- When permafrost is frozen, plant material in the soil — called **organic carbon** — can't decompose, or rot away. As permafrost thaws, microbes begin decomposing this material. This process releases greenhouse gases like carbon dioxide and methane to the atmosphere.
- When permafrost thaws, so do ancient bacteria and viruses in the ice and soil. These **newly unfrozen microbes could make humans and animals very sick**. Scientists have discovered microbes more than 400,000 years old in thawed permafrost.
- From the unexpected speed of Arctic warming and the troubling ways that melt water moves through polar landscapes, researchers now suspect that for every one degree Celsius rise in Earth's average temperature, permafrost may release the equivalent of four to six years' worth of coal, oil, and natural gas emissions — double to triple what scientists thought a few years ago. Within a few decades, if we don't curb fossil fuel use, permafrost could be as big a source of greenhouse gases as China, the world's largest emitter, is today

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