

Year 9 Geography Knowledge Booklet

Term 6 The Polar Regions

Name:

Class:

 **Geography**



Enquiry Question:

Geography—Polar Regions

Big questions that will help you answer this enquiry question:

Big Q 1: What do we mean by the term 'Polar Region'?

Big Q 2 and 3: How were the Polar Regions created?

Big Q 4: Where in the world are the Polar Regions?

Big Q 5: How different are Antarctica and the Arctic?

Big Q 6: What is the climate like within the Polar Regions?

Big Q 7 and 8: What are glaciers and how are they formed?

Big Q 9: Can we define the Polar Regions as desert environments?

Big Q 10: Why is ice important?

Big Q 11: What are the Northern Lights?

Big Q 12: How biodiverse are the Polar Regions?

Big Q 13: How have animals adapted to the harsh Polar environment?

Big Q 14: Have plants been able to adapt to the harsh Polar environment?

Big Q 15: How have people adapted to living in the Polar Regions?

Big Q 16 and 17: What are the dangers and challenges for people visiting the Polar Regions?

Big Q 18: Why do tourists flock to Antarctica and what impact does this have?

Big Q 19: What is the Antarctica Treaty and why is it important?

Big Q 20: How do humans use the Polar Regions for their own gains?

Big Q 21 and 22: What impact is the demand for energy having on the Polar Regions?

Big Q 23: What are the causes of climate change?

Big Q 24: How is climate change impacting the Polar Regions?

Big Q 25: How can we protect the Polar Regions from the effects of climate change?

Big Q 26: Why are countries fighting to claim parts of the Arctic?

The Polar Regions topic —Key Words

Key term	Definition
Ablation	the loss of ice or snow from a glacier or iceberg, or the loss of rock or similar material, caused by a process such as melting or ero-
Abrasion	the gradual rubbing away of the surface of rock, for example, by other rock, water, or a glacier (= large moving mass of ice)
Accumulation	to gradually increase in number or amount
Biodiversity	the number and types of plants and animals that exist in a particular area or in the world generally, or the problem of protecting
Biome	a region of the earth's surface and the particular combination of climate, plants, and animals that are found in it
Carnivores	an animal that eats meat
Climate	the general weather conditions usually found in a particular place
Climate change	changes in the world's weather, in particular the fact that it is believed to be getting warmer as a result of human activity increas-
Compression	the act of pressing something into a smaller space or putting pressure on it from different sides until it gets smaller
Condensation	the drops of water that appear on cold windows or other surfaces, as a result of hot air or steam becoming cool
Consumer	a person who buys goods or services for their own use
Crevasse	a very deep crack in the thick ice of a glacier (= moving mass of ice)
Deforestation	the cutting down of trees in a large area, or the destruction of forests by people
Deposition	the process by which solid materials, such as earth and rock, are added to gradually by the action of wind or water, or the struc-
Desert	an area, often covered with sand or rocks, where there is very little rain and not many plants
Erosion	the fact of soil, stone, etc. being gradually damaged and removed by the waves, rain, or wind
Evaporation	the process of a liquid changing to a gas, especially by heating
Extinction	a situation in which something no longer exists
Food chain	a series of living things that are connected because each group of things eats the group below it in the chain
Fossil fuels	fuels, such as gas, coal, and oil, that were formed underground from plant and animal remains millions of years ago
Geology	the study of the rocks and similar substances that make up the earth's surface
Glaciation	the forming, existence, or movement of glaciers over the surface of the earth
Greenhouse effect	an increase in the amount of carbon dioxide and other gases in the atmosphere (= mixture of gases around the earth), that is be- lieved to be the cause of a gradual warming of the surface of the earth
Greenhouse gases	a gas that causes the greenhouse effect, especially carbon dioxide
Herbivores	an animal that eats only plants
Hypothermia	a serious medical condition in which a person's body temperature falls below the usual level as a result of being in severe cold for a
Ice cap	a thick layer of ice that permanently covers an area of land
Infiltration	(of water) to flow slowly down into the earth from the earth's surface, for example, through cracks in rocks
Latitude	the position north or south of the equator measured from 0° to 90°
Omnivores	an animal that is naturally able to eat both plants and meat
Pangea	the name given the one large area of land that began to break apart about 200 million years ago to create the present continents
Permafrost	an area of land that is permanently frozen below the surface
Plankton	very small plants and animals that float on the surface of the sea and on which other sea animals feed
Precipitation	water that falls from the clouds towards the ground, especially as rain or snow
Primary producers	in the food chain, a plant that produces food from the sun and is then eates
Refuge	(a place that gives) protection or shelter from danger, trouble, unhappiness, etc.
Resources	Resources are natural substances such as water and wood which are valuable in supporting life
Snow blindness	a temporary loss of sight that is caused by the brightness of light reflected by large areas of snow or ice
Snowball earth theory	The Snowball Earth hypothesis proposes that during one or more of Earth's icehouse climates, Earth's surface became entirely or nearly entirely frozen, sometime earlier than 650 Mya (million years ago)
Solstice	either of the two occasions in the year when the sun is directly above either the furthest point north or the furthest point south of the equator that it ever reaches. These are the times in the year, in the middle of the summer or winter, when there are the long-
Sustainable / Sustainability	the quality of causing little or no damage to the environment and therefore able to continue for a long time
Transpiration	the process of losing water through the surface or skin of a body or a plant
Treaty	a written agreement between two or more countries, formally approved and signed by their leaders
Tundra	(part of) the very large area of land in North Asia, North America, and northern Europe where, because it is cold, trees do not grow
Weathering	the processes by which rock is broken into smaller pieces by the action of the weather

The Polar Regions

Life in the planet's polar regions can be incredibly difficult. Bitterly cold winds whip across the landscape. Winter temperatures can reach deep into the negatives, and the winter night can last for months. But these seemingly barren landscapes are home to a rich diversity of wildlife—both on land and under the sea surface—that has evolved to survive these harsh conditions.

Millions of people also live in the Arctic, but Antarctica has no permanent inhabitants. Antarctica is protected by a 1959 treaty that established the continent as a place to be used only for peace and science—though several thousand scientists and support staff periodically inhabit the area in the pursuit of research.

But even the relatively untouched expanse of Antarctica has not been immune to the effects of climate change. And the Arctic, in addition to climate change, has suffered from pollution, development by the oil and gas industry, and overfishing.

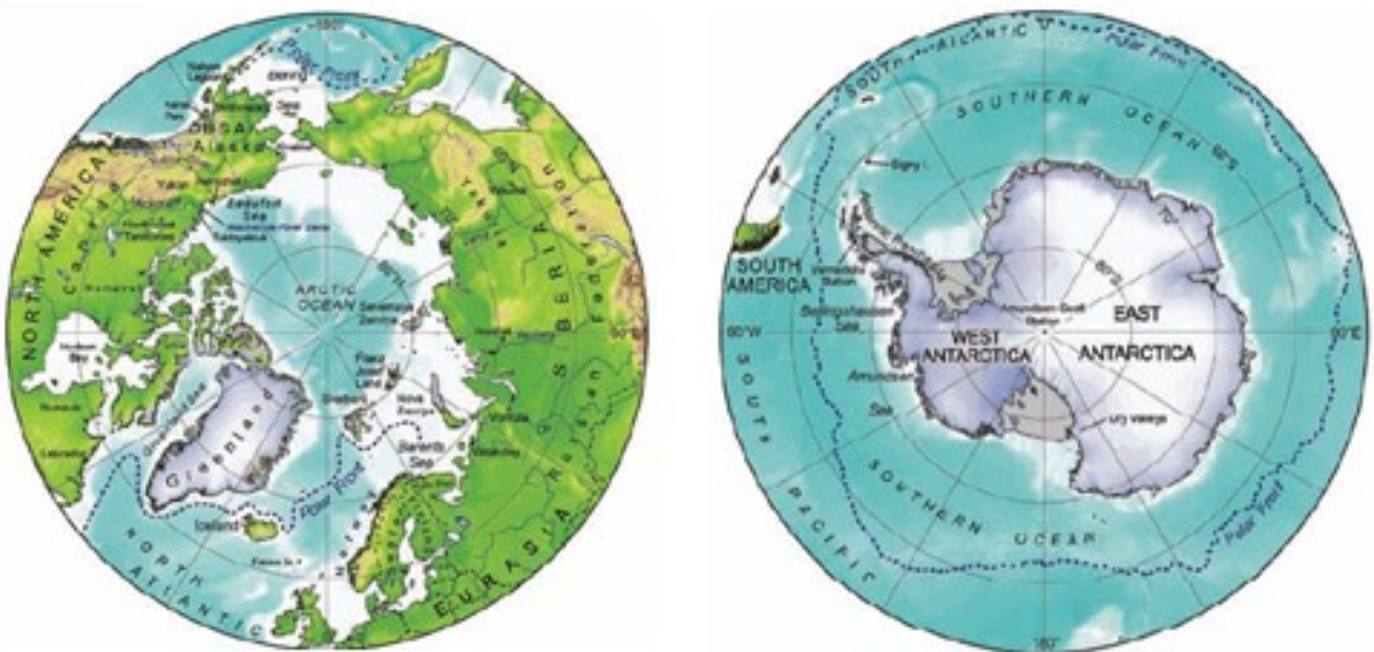


Figure 2. The left map shows the Arctic region that covers the area within the Arctic Circle, whilst the right map shows the southern polar region of Antarctica that covers the area within the Antarctic Convergence, including the Antarctic continent, the Southern Ocean and the sub-Antarctic islands.

What are the polar regions?

Polar region, area around the North Pole or the South Pole. The northern polar region consists mainly of floating and pack ice, 7–10 feet (2–3 m) thick, floating on the Arctic Ocean and surrounded by land masses. The ice cap of the southern polar region averages 6,700 feet (about 2,000 m) in thickness, is underlain by the continental landmass of Antarctica, and is surrounded by oceans. Both were first penetrated as far as the poles in the early 20th century—the North Pole in 1909 by Robert Peary and the South Pole in 1911 by Roald Amundsen.

What are the differences between the Arctic and Antarctic?

The Arctic and Antarctic are geographic opposites, and not just because they sit on opposite ends of the globe. They also have opposite land-sea arrangements. In the Arctic there is an ocean surrounded by continents, while the Antarctic is continent surrounded by oceans. These differences in the arrangement of land and water contribute to differences in each polar region's climate, oceanic and atmospheric circulation patterns, and sea ice — all of which were on display in 2011.

Why are the Polar Regions so cold?

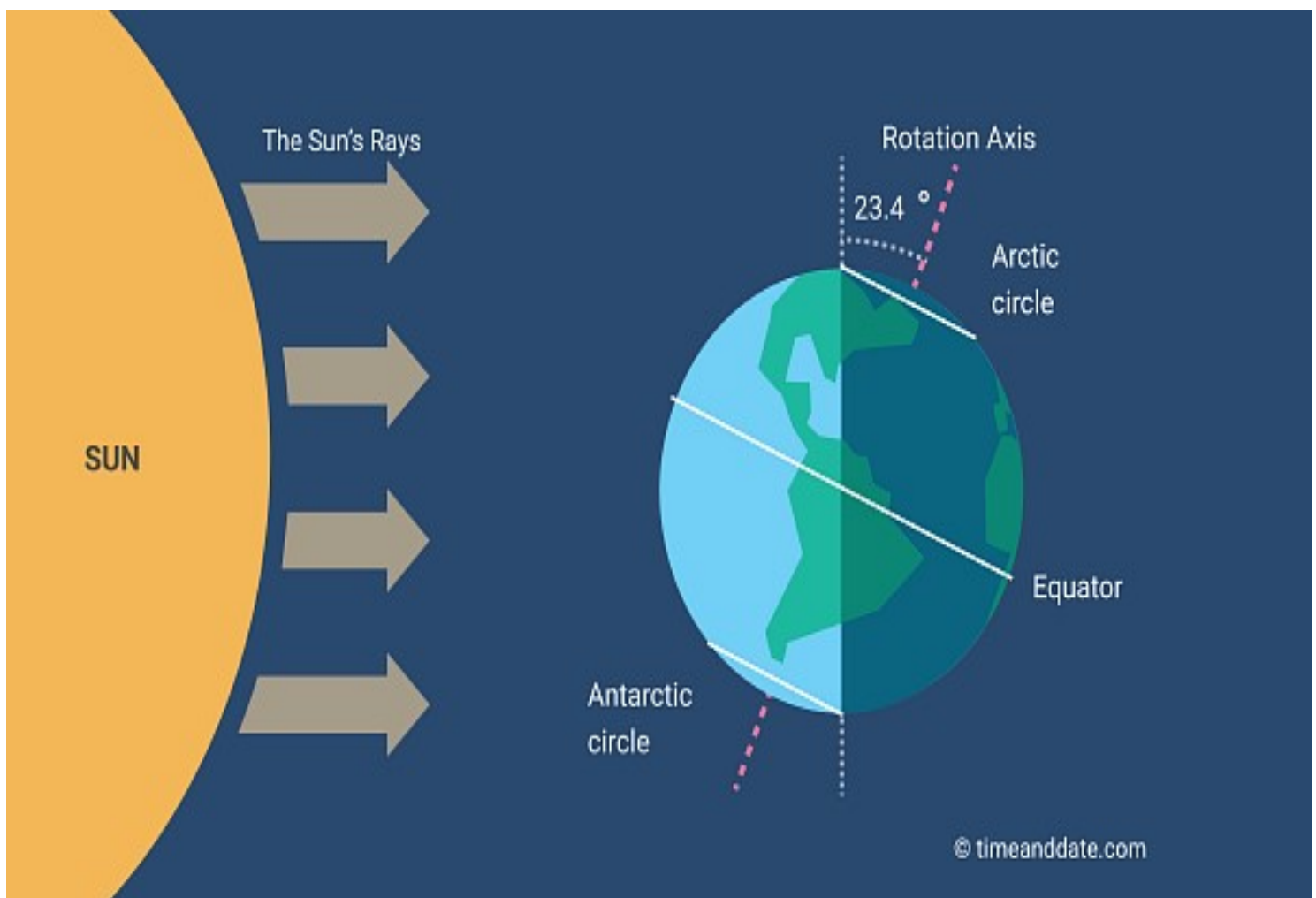
According to the World Meteorological Organization (WMO), the coldest place in the world is the Russian Antarctic research station Vostok. It was established in 1957 in the middle of the East Antarctic Ice Sheet, where it lies at an elevation of 3488 metres above sea level. From the station building it is about 1300 kilometres to the geographic South Pole. On 21 July 1983, at the standard measurement height of two metres above the ice, the station meteorologist measured a low temperature of minus 89.2 degrees Celsius – officially the coldest temperature ever directly measured on the Earth.

But at a height of just a few centimetres above the surface of the East Antarctic Ice Sheet the air temperature drops even further. According to satellite data obtained between 2004 and 2016, in a region of the ice sheet further to the south with a higher elevation, near-surface air temperatures can fall to minus 98 degrees Celsius.

The singular interplay between sun, ice, humidity and wind is the key to the extremely cold climate in the polar regions. The sun is the primary driving force of weather and climate on the planet. Its radiation warms the continents, the oceans and the atmosphere. The intensity with which the sun's rays impinge upon the outer boundary of the Earth's atmosphere has remained fairly constant since satellite measurements began in 2000. But because of the spherical shape of the Earth, not all locations on its surface receive the same amount of solar radiation. Where the rays intersect with the atmosphere at right angles, the light energy has a strength of 1361 watts per square metre (solar constant). Where the solar radiation strikes the Earth's atmosphere at a much lower angle, as in the polar regions, the incoming solar energy per unit of area is substantially reduced.

Moreover, the radiation always falls only on the side of the Earth that is facing towards the sun. Accordingly, the global average solar energy arriving at the upper margin of the atmosphere can be calculated as approximately 340 watts per square metre. The much smaller amount of heat that reaches the polar regions can be illustrated by a simple example: If sunlight falls on the Antarctic continent at an angle of 30 degrees on a cloudless summer day, only half as much energy will arrive there as will fall on the surface near the equator at an angle of 90 degrees.

The major reason for the differences in heat input during the year is the fact that the Earth is spinning like a top in space, and its axis of rotation is not exactly perpendicular to its plane of orbit around the Sun. Instead, it is presently tilted at an angle of 23.4 degrees. If the Earth's axis were at right angles to its orbit there would be no seasons. Due to its inclination, however, the northern hemisphere faces toward the sun during the northern summer and receives more sunlight, but in the northern winter it is tilted away from the sun



Polar regions—What are glaciers and how do they form?

A glacier is a huge mass of ice that moves slowly over land

How do glaciers form?

Glaciers develop over many years in places where snow has fallen but not melted. Snow is compacted and turns to ice. The weight of the ice means that it starts to slip down mountain sides over time.

A glacier is a **system**. There is a **zone of accumulation** where snow is added. This is normally at the start of a glacier in a highland area. As more and more snow falls, it is compacted so the bottom layers become ice.

Ice moves downhill due to the force of **gravity**.

Near the end, or **snout**, of the glacier ice may melt. This is the **zone of ablation** and is more likely to occur in warm summer months.

Landforms created by glacial erosion

Processes of erosion

Plucking - melted water at the base and sides of the glacier freeze onto the surrounding rock. As the glacier moves, the rock which is embedded in the ice is pulled away.

Abrasion - the bits of rock which are embedded in the ice from plucking and **freeze-thaw weathering** scrape and grind against the rock at the base and sides of the glacier, wearing it away.

Erosional landforms

Cirques

Cirques are arm-chair-shaped hollows with a steep back wall. They occur in highland areas. They are also known as corries or cwms.

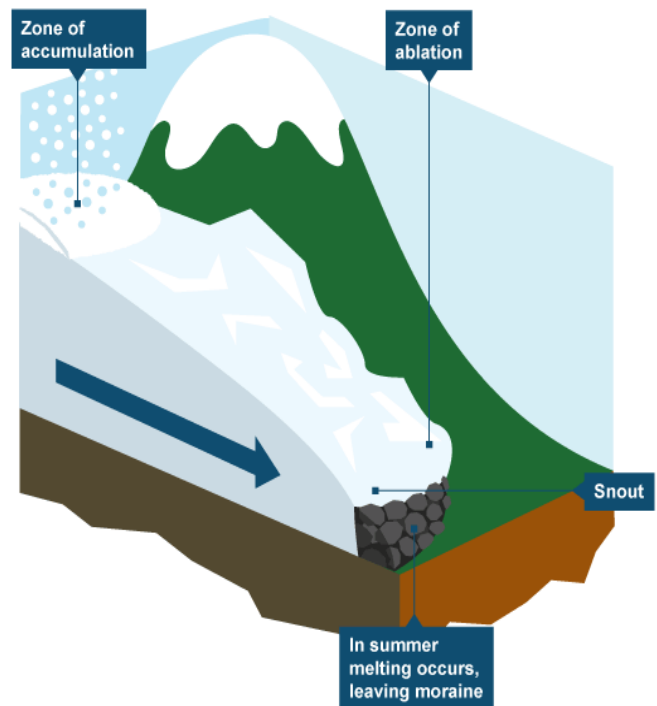
Glacial Erosion

As glaciers moved, they caused erosion. This erosion was caused by either plucking or abrasion. Plucking occurred because meltwater would freeze onto passing rocks. As the glacier moved, the rocks would have been pulled along too. Abrasion involved the glacier and the rocks that had been picked up wearing against the land that they travelled over.

As glaciers moved, they caused erosion. This erosion was caused by either plucking or abrasion. Plucking occurred because meltwater would freeze onto passing rocks. As the glacier moved, the rocks would have been dragged along too. Abrasion involved the glacier and the rocks that had been picked up wearing against the land that they travelled over like sandpaper.

Glacial Deposition

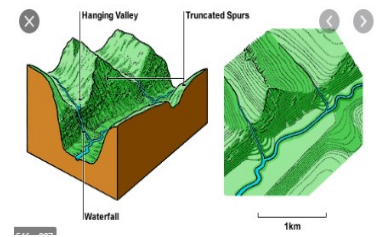
Glaciers were capable of transporting a lot of material at once because of all of the rocks that they picked up. That material could not simply disappear. It had to end up somewhere.



There are seven main glacial landforms caused by erosion that you should know about. They include:

1. Truncated Spurs

A long time ago, glaciers will have had to move from one area to another. While they were moving, they will have cut off different areas of land. We can see evidence of this when walking through valleys. Have you ever noticed that there are cliff-like edges with exposed rock faces? These are called truncated spurs.



2. Corries

Corries are quite easy to spot because they look like small hollows. A lot of them have a distinctive armchair shape and most of them contain small bodies of water that we call tarns.



3. Ribbon Lakes

If you are asked to spot a ribbon lake during your exam, then you are in for an easy time. You just have to look for a lake that is elongated in appearance. When glaciers retreated, ribbon lakes were left behind.



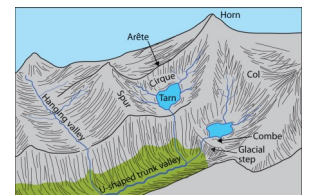
4. U shaped valley

Glacial troughs are also relatively easy to spot. They look like valleys that have really steep sides, but they usually have an area of flat ground in the bottom.



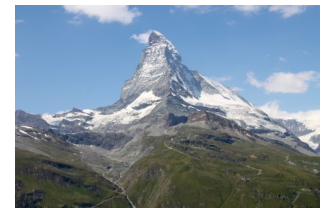
5. Hanging Valleys

Hanging valleys are similar to glacial troughs, but the glaciers that formed them were smaller. They are less deep than glacial troughs and because the glaciers were smaller, they would have melted before they had the chance to reach low ground. This means that you can usually spot hanging valleys quite high.



6. Pyramidal Peaks

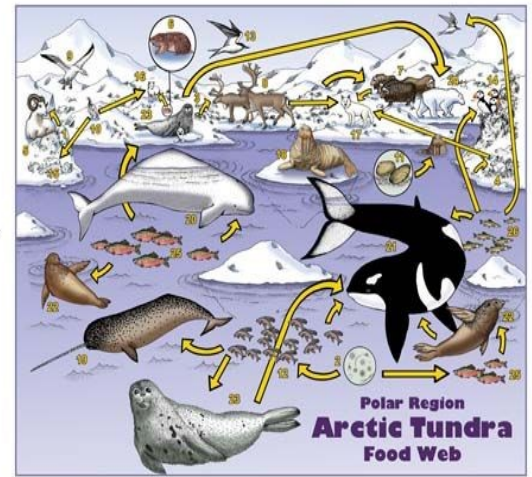
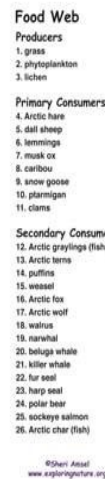
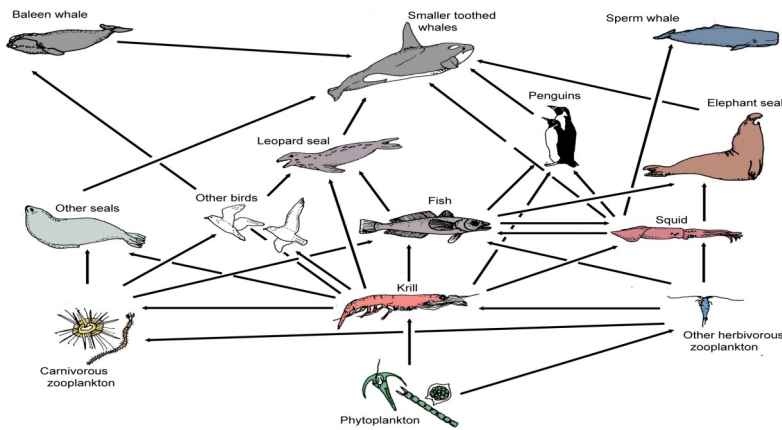
A pyramidal peak is something that looks like a pointed mountain peak. When back-to-back glaciers eroded a mountain, pyramidal peaks formed.



7. Arêtes



The biodiversity of polar regions



Biodiversity is specifically the number of different species. Biodiversity is greater in ecosystems that provide a bigger range of different **habitats**, which are home to larger populations of a variety of organisms. An area with large **populations** of few species is not biodiverse

When we take a look at ecosystems around the world, ecosystems that exist among colder climates are unique. They are less diverse, but we can see an array of different mammals and marine mammals. When we look at the tundra, we can also see everything from reindeer and wolves to lemmings.

Animal Adaptations

There are a lot of different ways in which some animals have adapted to survive in polar and tundra environments. They include:

- A lot of the animals who call these regions their homes have white coats. This is because they have to be able to hide from their predators in the snow or sneak up on their prey.
- Because of how difficult it is to survive in these regions during the winter, a lot of birds are migratory birds.
- Insulation plays a massive role in the adaptations that can be seen on some arctic animals. For example, a lot of marine mammals like seals have thick layers of blubber.

When we talk about biodiversity, we are actually talking about the number of species that we can see. We can see low levels of biodiversity in these regions because of how difficult it is to survive there. This means that any change in the ecosystem would have a massive effect on the other components of the ecosystem.

Plants in Tundra and Polar Regions

As we are sure you can imagine, it is very difficult for plants to grow in such cold environments. There are some mosses that can thrive, but it is rare to see grasses that are not right on the warmer coasts of Antarctica.

We know that all of the biotic and abiotic components greatly rely on each other. If one part of the ecosystem were to slightly change, then the whole ecosystem would feel a knock on effect.

Plant Adaptations

There are lots of different ways in which some plants have adapted to survive in polar and tundra environments. They include:

- In tundra and polar regions, the summer months are very short. This means that a lot of the plants that grow there have adapted to have short growing seasons. In the winter, they usually become dormant. This means that they stop growing.
- Plants in these regions reproduce in quite a unique way. They use underground runners or bulbs. This is because seeds would take too long to spread and they have the short growing season to contend with.

The roots that can be found on plants in the tundra tend to be quite short. This is because a layer of permafrost can be found just below the soil.

People in Tundra and Polar Regions

Our Polar regions are unique because they are some of the most uninhabited places on Earth, although there are a few research bases where people live for short time periods. There are a few indigenous people, but they are few and far between. There are also a lot of indigenous peoples around tundra regions.

Biodiversity

Because it is difficult to survive in cold environments, almost all of the plants and animals that can be found there are adapted to live there. These adaptations are really important because of how harsh the conditions really are.

Management

Unfortunately, a lot of the colder environments in the world are fragile and we have to manage them in a sustainable way. This is because these wild, natural environments are the reality of the world that we live in. They are wilderness areas that are largely undeveloped and uninhabited.

If we do not protect these places, then we could end up losing some or all of the biodiversity that can be found there. We are also currently able to study some of the plants and animals that can be found in polar and tundra regions, where we can take a look at their ecosystem properly and really understand the roles that they play.

If we were to damage these fragile lands, then that damage would be visible for a long time. The species that can be found in these regions are highly adapted and they would struggle to change quick enough to keep up with the damage that we cause. We can see this by taking a look at how polar bear numbers are dwindling as sea ice melts.

There are several things that we can do to sustainably manage these environments. They include:

1. Conservation

Conservation groups play a really important role when it comes to protecting these cold environments as they pressure people to protect them. For example, the WWF and Greenpeace are both conservation groups that preach sustainable management.

2. Governing Bodies

It is really important that governing bodies bring in strict regulations that stop development from occurring in these cold environments. They should also make laws to protect them, like the 1964 Wilderness Act.

3. International Agreements

When we take a look at the map, we can see that some cold environments are currently covered by international agreements. In 1959, the Antarctic Treaty was signed by 12 nations. It limits the number of people who can land at any one given time, which reduces the amount of damage that we cause.



Homework 1: Spelling Test

Instructions: You will be given a list of 10 key terms that will be used with this topic.

1. Write the definition for each term .
2. Write the word within a sentence.
3. Practice spelling the word.

You will be tested on these spellings and your understanding of what the words mean.

Spellings

Abrasion

Arete

Biodiversity

Moraine

Pyramidal peak

Carnivore

Compression

Solstice

Biome

Ablation

Due date:

Homework 2: Russia Quiz

Using the internet and / or an atlas to help you answer the 10 quiz questions.

- Each answer has an anagram and a clue to help you.
- Write the answer in the table provided.

Due date:

Homework 3—Revision for Mid Unit test

Instructions: Revise for a mid unit test.

You will be tested on all that you know from your lessons about polar regions so far.

Please use this knowledge organiser as a clear focus and to help answer the questions in your homework booklet for your upcoming mid unit test.

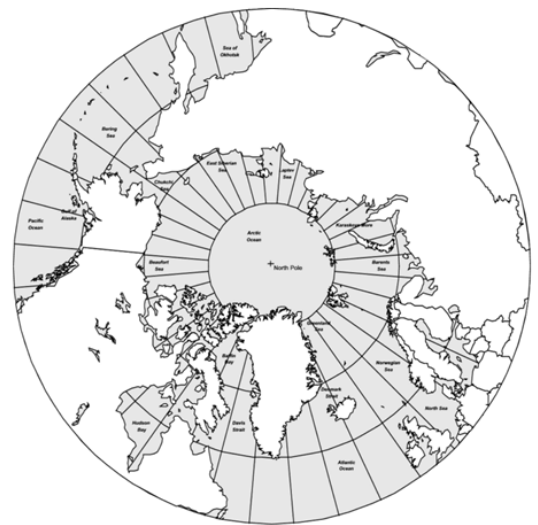
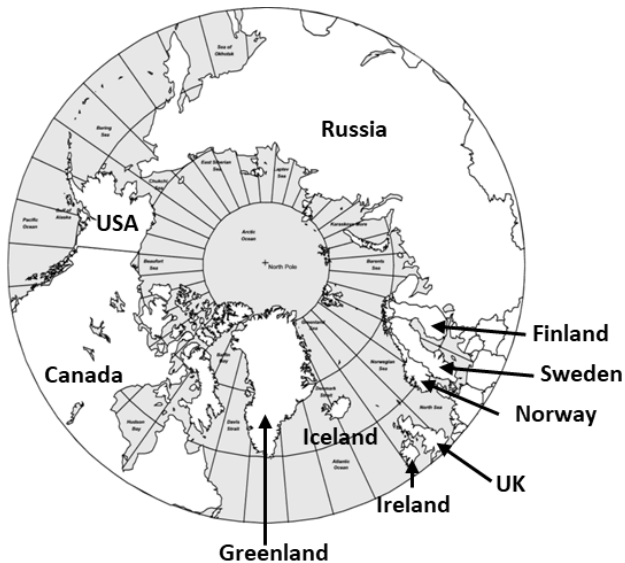
Due date:

Homework 4: Knowledge

Instructions: Using the map below you need to learn the spelling and location of 10 countries in and around the North Pole.

- You should practice on the three blank maps for a quick quiz in lesson where you will be given a blank map and 10 minutes.
- One mark for location, one mark for spelling. There will be house points rewarded for high scorers!

Due date:



Homework 5—Polar Animal Adaptations

Read the information about Polar animals and their adaptations in your homework booklet before answering the questions that follow.

Due date:

Homework 6—Revision for End of Year test

Instructions: Revise for a end of topic test

You will be tested on all aspects of the Polar Regions topic .

Please use this knowledge organiser as a clear focus for your upcoming test.

Due date:

Wider Reading List

Polar Regions

