Name: _____

Montsaye ACADEMY
Excellence Resilience Aspiration

Geography

Homework Booklet

Year 9

Term 3: Glaciation and Antarctica

Homework 1	Learn keywords	Due date:	Completed? Yes/No
Homework 2	Guided Reading Activity	Due date:	Completed? Yes/No
Homework 3	Prepare for knowledge test	Due date:	Completed? Yes/No

Geography Homework Tasks Term 2

Homework 1 - Learn the keywords below for a mini test at the start of next lesson.

You could read through the words, write them out, create a match up activity or get someone to test you.

Keyword	Definition
Abrasion	erosion caused by rocks and boulders in the base of the glacier acting like a giant file scratching and scraping the rocks below.
Arete	A sharp mountain ridge
Corrie	armchair-shaped hollow in the mountainside formed by glacial erosion and freeze-thaw weathering. This is where the valley glacier begins.
Glacier	A sheet of ice that moves slowly down a river valley under the influence of gravity.
Ice age	a period of colder climate when ice sheets form on the land, causing a lowering of sea level.
Plucking	a type of erosion where melt water in the glacier freezes onto rocks, and as the ice moves forward it plucks or pulls out large pieces along the rock joints.
Roches Moutonnées	A rock with one side smoothed and polished and the other plucked and jagged.
Tarn	A deep circular lake filling a cirque hollow
U shaped valley	A river valley widened and deepened by the action of glaciers

Homework 2 – Complete the guided reading activity on the next page.

You may wish to write your answers out on paper, so you have more space.

Homework 3 - Learn the facts below, and in the knowledge organiser at the end of this booklet, for a knowledge test next lesson. You could highlight the key information, create revision cue cards or get somebody to test you.

guided READING

1 What equipment is needed for an ice trek?

2 What are "grizzlies" and how can their threat be reduced?

3 Name the organisations involved in researching glacier change in Montana, USA.

4 When was Glacier National Park created and how many glaciers where there then?

5 Watching the glaciers melt is happening so quickly, what is it compared to?

6 How much has Sperry Glacier shrunk since 1901?

10 What do the letters IPCC stand for?

As the climate warms, how much, and how quickly, will Earth's glaciers melt?

"If we don't have it, we don't need it," pronounces Daniel Fagre as we throw on our backpacks. We're armed with crampons, ice axes, rope, GPS receivers, and bear spray to ward off grizzlies, and we're trudging toward Sperry Glacier in Glacier National Park, Montana. I fall in step with Fagre and two other research scientists from the U.S. Geological Survey Global Change Research Program.

They're doing what they've been doing for more than a decade: measuring how the park's storied glaciers are melting. So far, the results have been positively chilling. When President Taft created Glacier National Park in 1910, it was home to an estimated 150 glaciers. Since then the number has decreased to fewer than 30, and most of those remaining have shrunk in area by two-thirds. Fagre predicts that within 30 years most if not all of the park's namesake glaciers will disappear.

"Things that normally happen in geologic time are happening during the span of a human lifetime," says Fagre. "It's like watching the Statue of Liberty melt."

Scientists who assess the planet's health see indisputable evidence that Earth has been getting warmer, in some cases rapidly. Most believe that human activity, in particular the burning of fossil fuels and the resulting buildup of greenhouse gases in the atmosphere, have influenced this warming trend. In the past decade scientists have documented record-high average annual surface temperatures and have been observing other signs of change all over the planet: in the distribution of ice, and in the salinity, levels, and temperatures of the oceans.

"This glacier used to be closer," Fagre declares as we crest a steep section, his glasses fogged from exertion. He's only half joking. A trailside sign notes that since 1901, Sperry Glacier has shrunk from more than 800 acres (320 hectares) to 300 acres (120 hectares). "That's out of date," Fagre says, stopping to catch his breath. "It's now less than 250 acres (100 hectares)."

Everywhere on Earth ice is changing. The famed snows of Kilimanjaro have melted more than 80 percent since 1912. Glaciers in the Garhwal Himalaya in India are retreating so fast that researchers believe that most central and eastern Himalayan glaciers could virtually disappear by 2035. Arctic sea ice has thinned significantly over the past half century, and its extent has declined by about 10 percent in the past 30 years. NASA's repeated laser altimeter readings show the edges of Greenland's ice sheet shrinking. Spring freshwater ice breakup in the Northern Hemisphere now occurs nine days earlier than it did 150 years ago, and autumn freeze-up ten days later. Thawing permafrost has caused the ground to subside more than 15 feet (4.6 meters) in parts of Alaska. From the Arctic to Peru, from Switzerland to the equatorial glaciers of Man Jaya in Indonesia, massive ice fields, monstrous glaciers, and sea ice are disappearing, fast.

When temperatures rise and ice melts, more water flows to the seas from glaciers and ice caps, and ocean water warms and expands in volume. This combination of effects has played the major role in raising average global sea level between four and eight inches (10 and 20 centimeters) in the past hundred years, according to the Intergovernmental Panel on Climate Change (IPCC).

Scientists point out that sea levels have risen and fallen substantially over Earth's 4.6-billion-year history. But the recent rate of global sea level rise has departed from the average rate of the past two to three thousand years and is rising more rapidly—about one-tenth of an inch a year. A continuation or acceleration of that trend has the potential to cause striking changes in the world's coastlines

11 Question

12 What other questions do you have now that you have read this article?

9 Why will melting glaciers affect sea levels?

7 How many acres is the glacier's area now?

8 Name other parts of the world that are changing and describe what is happening there

Knowledge Organiser: Y9 Glaciation

Overview of topic

What is a glacier?
How does a glacier move and erode the landscape?
What are glacials and inter-glacials?
How are upland glacial erosional landforms produced?
How are lowland glacial depositional landforms produced?
How do people use glaciated landscapes?
How are glaciers changing?
What are some of the consequences of these changes?

Keywords

Glacier – a large mass of slowly moving ice occupying a mountain valley, formed from years of annual snowfall over mountain areas which has not melted but gradually compacted to form ice.
Abrasion and **plucking** – are the two main ways in which glaciers erode
Glacial – a period of time when average global temperature was colder than they are now and glaciers extended further than they do now.
Interglacial – a period of time when average global temperature was like it is now or warmer and glaciers cover less of the landscape than in glacial periods.
Upland erosional landforms include grooves, roche moutonee, U shaped valleys, corries, aretes and pyramidal peaks.
Lowland depositional landforms include erratics, glacial till, terminal and lateral moraines, and drumlins

Key concept #1

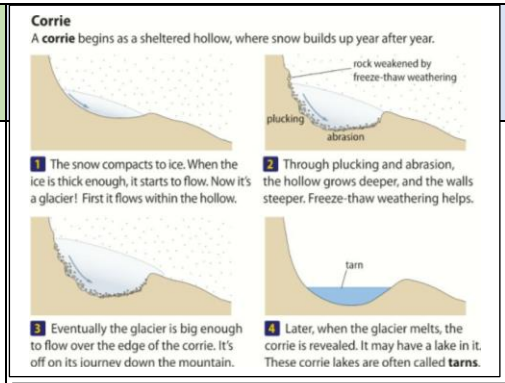
How does a glacier move and erode the landscape.

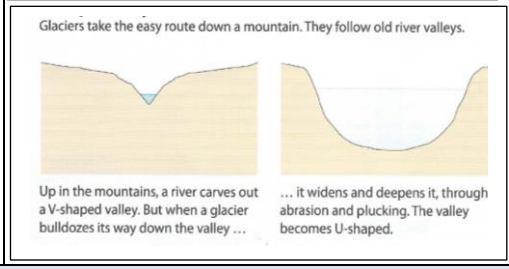
Glaciers move down a slope because of **gravity**. Glaciers in most mountain regions move mostly by **basal slippage**. There is a layer of **meltwater** between the glacier and the bedrock and this lubricates the movement. Glaciers in polar regions move by individual layers of ice sliding over one another (**plastic flow**) as the glacier is frozen onto the bedrock. Basal slippage causes erosion of the bedrock by **abrasion** (sharp rocks stuck in the basal ice grind away the bedrock). Freezing of ice onto fractured bedrock causes erosion by **plucking** out chunks of rock.

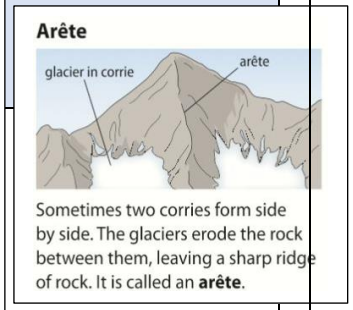
Question #2

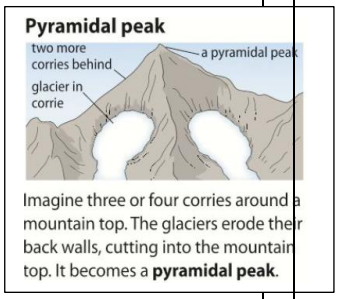
How are upland glacial erosional landforms produced?

Snow collects in hollows on the sides of mountains. If temperatures are cold enough in summer it does not melt but gradually turns into ice and becomes a glacier. The glacier slides out of the hollow and enlarges it creating a **corrie**.
Abrasion produces **grooves** on bedrock under the glacier. Harder areas of bedrock form mounds (**roche moutonee)** by abrasion and plucking. As several corries on a mountain erode bachwards, sharp ridges (**aretes**) form between them. If three or more corries erode backwards the mountain top can become a **pyramidal peak**.
Glaciers moving down V shaped river valleys erode them into wider **U shaped valleys** (glacial troughs).









Key concept # 3 *How are lowland depositional landforms produced*

Geographical Skills

Glaciers eventually move into warmer areas and melt faster than they move down. As the ice melts it deposits the rock debris it is carrying, Large chunks of rock become **erratics**. Finer sediments are deposited as layers of **glacial till** and can be moulded into ridges (**moraines**) and oval shaped hills (**drumlins**).

- Identify and describe glacial erosional and deposition features on photos and OS maps
- Annotate diagrams of glacial features to explain their formation
- Explain the formation of several different erosional and depositional features

Case study #1 The UK

Mountain areas in the UK were repeatedly eroded by glaciers during glacial periods over the last 1.6 million years. When the last glacial ended 10,000 years ago this left many erosional and depositional features in these areas. Examples are the Lake District (NW England), Snowdonia (N Wales), Carngorms (Scotland) and the North-West Highlands (Scotland). Tourism is an important economic activity in these areas because of the landscape features. **Snowdon** is a pyramidal peak surrounded by corries and aretes with several U shaped valleys nearby. On the mountain sides there are lots of examples of rocks with grooves, of glacially eroded mounds called roche moutonee, and erratic boulders.

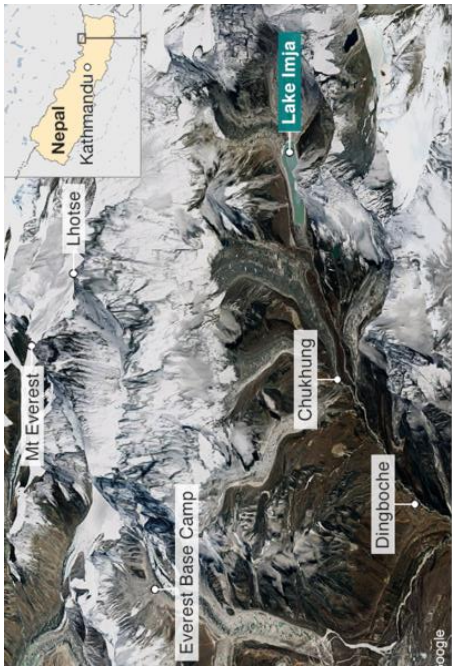



Case study#2 Nepal

Glaciers provide important resources for people:

- Slowly melting glaciers feed some the world's largest rivers (e.g. Ganges in India) and provide millions of people with freshwater for domestic use and crop irrigation
- Glacial deposits are used as a source of gravel for making concrete in construction
- Glaciated landscapes create opportunities for outdoor recreation and tourism (climbing, hiking, skiing etc)

Climate change is causing rapid melting of glaciers. In the Himalayas in Nepal near to Mt Everest, rapidly melting glaciers are forming huge meltwater lakes held in place by unstable natural debris dams. Eventually the dams break and release catastrophic floods (glacial lake outburst floods) down the valleys destroying homes, crops, roads, bridges and killing people. A dangerous glacial lake was drained to a safe level in 2016. The Imja glacial lake, at nearly 5,000m high, was in danger of flooding downstream settlements, trekking trails and bridges. The lake, which was originally 149m deep in places, has had its water levels lowered by 3.4m by engineers cutting a drainage channel to release some of the water slowly.



Homework and enrichment opportunities

- Create an information leaflet for visitors to either Snowdonia or the Lake District describing and explaining some of the glacial erosional and depositional features they can see as they walk, climb and cycle in the area. Include photos, maps and diagrams.

8 marker example (WAGOLL)

Using examples of places you have studied explain how glaciated landscapes are used and managed by people

Snowdonia National Park in North Wales contains many glacial erosional and depositional features. Apart from farming, tourism is the most important economic activity because visitors come to see the landscape features and do outdoor recreational activities such as hiking, climbing, mountain biking and nature watching. Snowdon is a pyramidal peak and is the most visited mountain summit in

• Choose a named glacier and research what is happening to it, how it is changing and the impacts this is having on the surrounding area and people. For example: https://www.aletscharena.ch/nature-en/the-great-aletsch-glacier/ https://www.banffjaspercollection.com/attractions/columbia-icefield/ https://www.chamonix.com/glacier-d-argentiere,47-53987,en.html	the UK either by walking (410,000 people per year) or mountain railway. There are 8 million day visits to the area each year creating 4000 jobs and bringing in £60 million per year. The national park is a protected landscape where the needs of visitors and local people are balanced with conservation of the land and wildlife. Rapidly melting glaciers in mountain regions such as the Himalayas are creating an increasingly high risk of glacial lake outburst floods. In 2016 Lake Imja in Nepal was drained to a safer level by engineers cutting a drainage channel through the unstable rock debris dam to slowly release some of the water before a catastrophic flood happened. Thousands of these lakes are now forming in the Himalayas and Andes mountains as glaciers are melting rapidly due to climate change, creating danger.