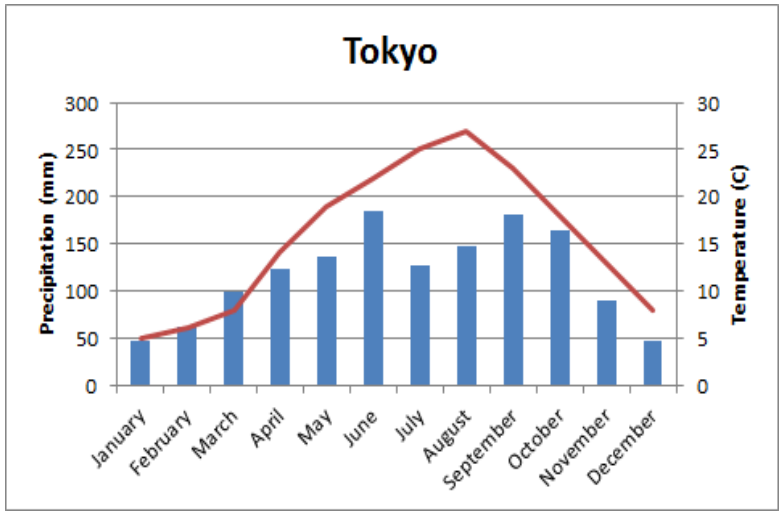
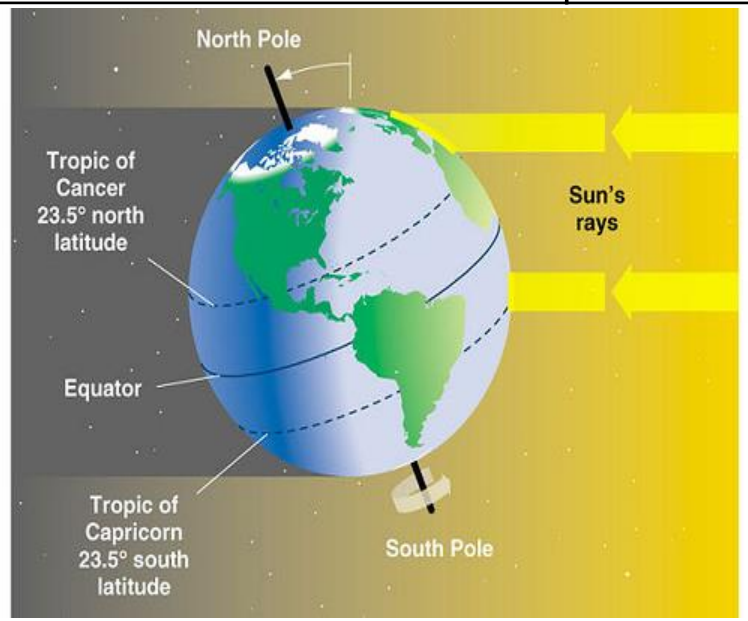
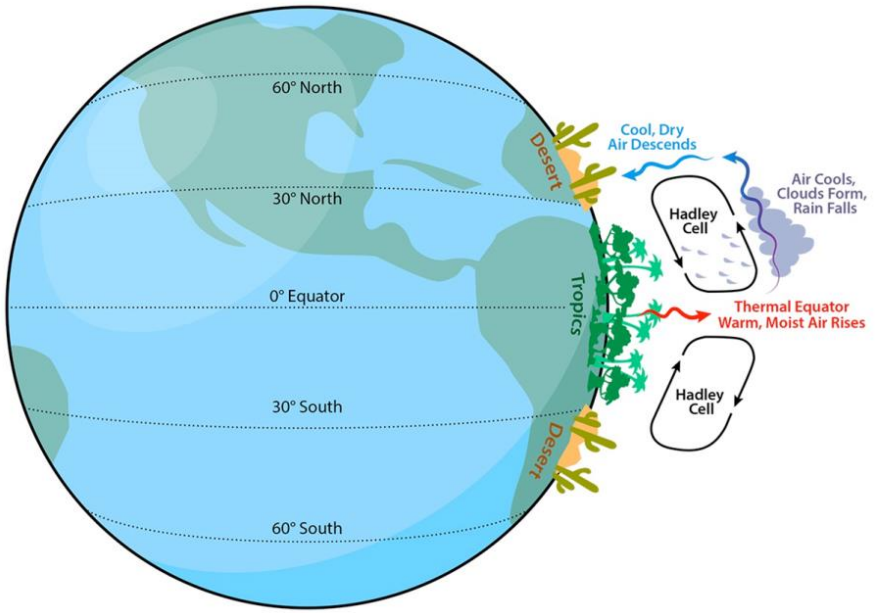
Topic 1: Atmospheric Circulation and Climate Change

Key-term	Definition
Air Pressure	The weight of air bearing down on the earth's surface.
Where air is rising (evaporation) creates low air pressure as this weight/force pushing down is reduced. Where cold air is sinking this weight/force is increased and creates high air pressure.	
Solar Insolation	The sun's energy
The equator receives the most sunlight as it strikes the equator most directly. As you travel further north and south of the equator places receive less sunlight as it has further to travel due to the curvature of the earth and is dispersed over larger areas.	
Ocean Currents	Flows of ocean water which redistribute heat around the world due to the uneven heating from the suns energy.
An example is the Labrador current that brings cold water down past Canada. Another example is the North Atlantic Drift which carries warm water to the UK.	
Paris Climate Summit 2017	The first of its kind in history, this deal unites all the world's nations in a single agreement on tackling climate change. Nearly 200 countries coming to an agreement on the need to cut greenhouse gas emissions

Global atmospheric Circulation	
Location of high rainfall areas	As warm air rises it cools and condenses into clouds. This continuing rising and condensing of warm moist air creates areas that receive high amounts of rainfall. Combined with direct solar insolation, this is why you find tropical rainforests along the equator.
Location of low rainfall areas	After the warm air has risen and following rainfall it begins to sink back towards earth. However the air is dry as it has little moisture left. This forms areas that receive very little rainfall and creates very dry/arid environments. This movement of air downwards also reduces any evaporation/condensation as air cannot rise as easily.
Hadley Cell	Warm air rises at the equator (0°) creating low pressure, high rainfall areas. Cold air sinks at 30° N and 30° S of the equator creating arid (dry/desert) areas. There are two Hadley cells; one either side of the equator.
Ferrel Cell	Air rises at 60°N and S and sinks at 30°N and S.
Polar Cell	Air rises at 60°N and S and sinks at 90°N and S.







Key-term	Definition
Climate	The average weather, recorded over a long time such as 30 years.
Climate can be shown on a climate graph that shows how temperature (represented as a red line) and precipitation (rainfall, represented as blue bars) vary for each month.	
Glacial	Extremely cold periods in earth's history when the glaciers expanded
Interglacial	A warm period of time between glacial time periods.
Climatologist	A scientist who is an expert in climate and climate change.

The Natural Causes of Climate Change

Volcanic eruptions	These can cause a large amount of ash and gas (sulphur dioxide) to enter the atmosphere and can be spread around the stratosphere (10-50km above earth's surface) by winds. This can have a cooling effect as the gases prevent some of the solar insolation reaching the earth and reflect the sunlight back into space. These happen frequently but have a smaller impact on temperature change
Sun Spot Activity	The sun has dark patches on and the amount/size of these can change. The more sun spots the more solar insolation the earth is receiving. These natural processes can work with or against man-made global warming
Orbital Variations	**1.** Can alter the distance the earth orbits the sun from a more circular orbit to a more elliptical (oval) orbit. This directly affect the amount of solar insolation the earth receives. Changes in orbit don't happen very often (every 100,000 years) but can have drastic changes in temperature plunging the earth into an ice age. **2.** The earth can also tilt further away or closer to the sun which can change every 41,000 years, again altering the amount of solar insolation the earth receives. These are called Milankovitch cycles.
Asteroid Collisions	The impact of an extremely large asteroid impacting earth would blast millions of tonnes of ash and dust into the atmosphere, blocking out incoming sun and causing the climate to fall.

Evidence of climate Change

This evidence allows us to build up a picture of how climate has changed throughout history.

Historic Sources	These include paintings and diaries. These are less reliable as they were not ever intended to be a record of climate change, no specialist equipment was used e.g. thermometers and are open to interpretation
Ice Cores	The youngest ice is at the top of the core and oldest at the bottom. Air bubbles are trapped in the ice which preserve air from the atmosphere at the time the snow fell. These allow us to reconstruct climate for the time period known as the Quaternary; the last 2.6 million years.
Tree Rings	Each ring in the trunk of a tree represents a years growth. Times when growth was larger must have meant a warmer and wetter climate. Where growth was less must have been cooler and drier. Unfortunately the oldest trees are only a few hundred years old but fossils of trees can also be used which go back thousands of years.

The Enhanced Greenhouse Effect

The atmosphere	A thin layer of gases that surround the earth including nitrogen, carbon dioxide, oxygen and water vapour.
The Greenhouse effect	A natural process. Shortwave radiation from the sun enters the earth's atmosphere and is absorbed. Longwave radiation is released back into space. Some longwave radiation is trapped by the earths atmosphere which keeps the planet warm. Without this, Earth would be too cold to sustain life.
The Enhanced Greenhouse Effect	Enhanced means "working more strongly". An enhancing of the greenhouse effect where the atmosphere is thickened due to increased CO2 emissions and therefore traps a greater amount of the suns energy, thus rising the temperature of the earth and causing global warming.
Greenhouse gases	Carbon dioxide, methane and sulphur dioxide. CO2 has increased in the atmosphere since 1850 due to the industrial revolution when humans have been burning fossil fuels in factories/industry to produce energy and increased use of transport. Methane has increased due to large-scale farming of beef.
Effects of Climate Change	Sea level rise caused by thermal expansion, warming of ocean + atmospheric temperatures, declining ice in the Arctic, increase in frequency/strength of tropical cyclones, increased coastal flooding, disruption to farming and food supply and longer/more intense droughts creating climate change refugees. The extent of climate change in the future will depend on the rate of population growth (demand for energy) and the switch from fossil fuels to renewable energy. As these are unknowns, there is a level of uncertainty around the projections of these changes.