What would happen to the air if you un-did the valve? Go in, or go out?

High pressure wants to move to a low pressure area – recall this later…

The Atmosphere

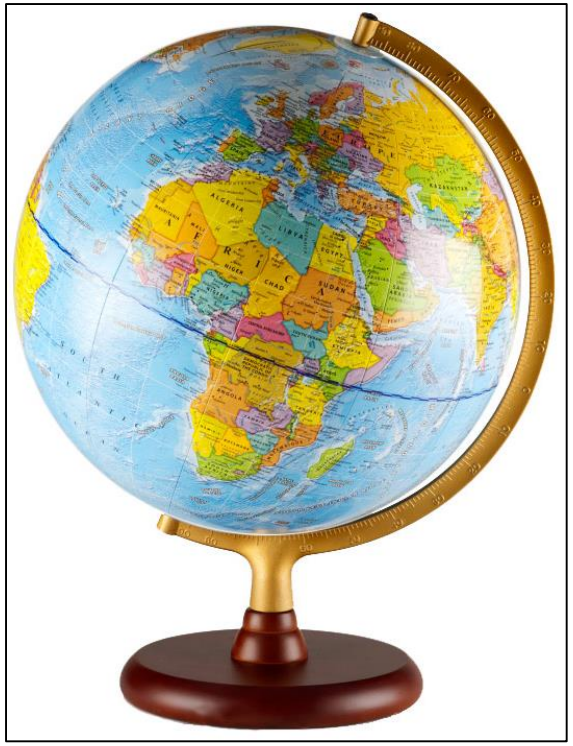
Learning Objective:

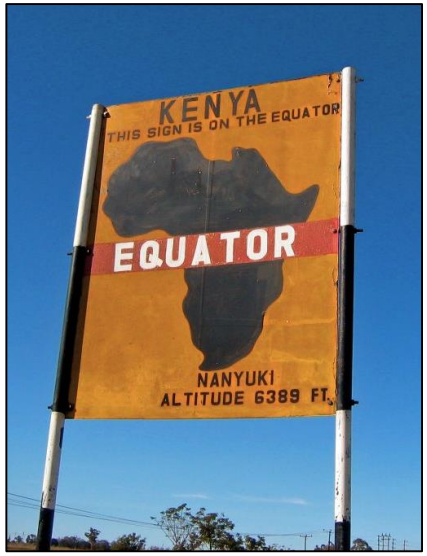
- **Analyse** how the atmosphere affects weather and climate

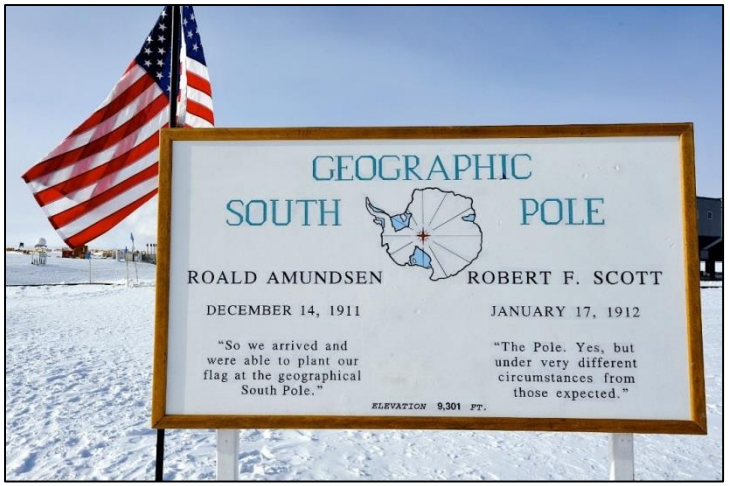
Learning Outcomes:

- **Describe** how latitude affects weather and climate
- **Explain** Global Atmospheric Circulation
- **Assess** how the global atmospheric system affects weather and climate

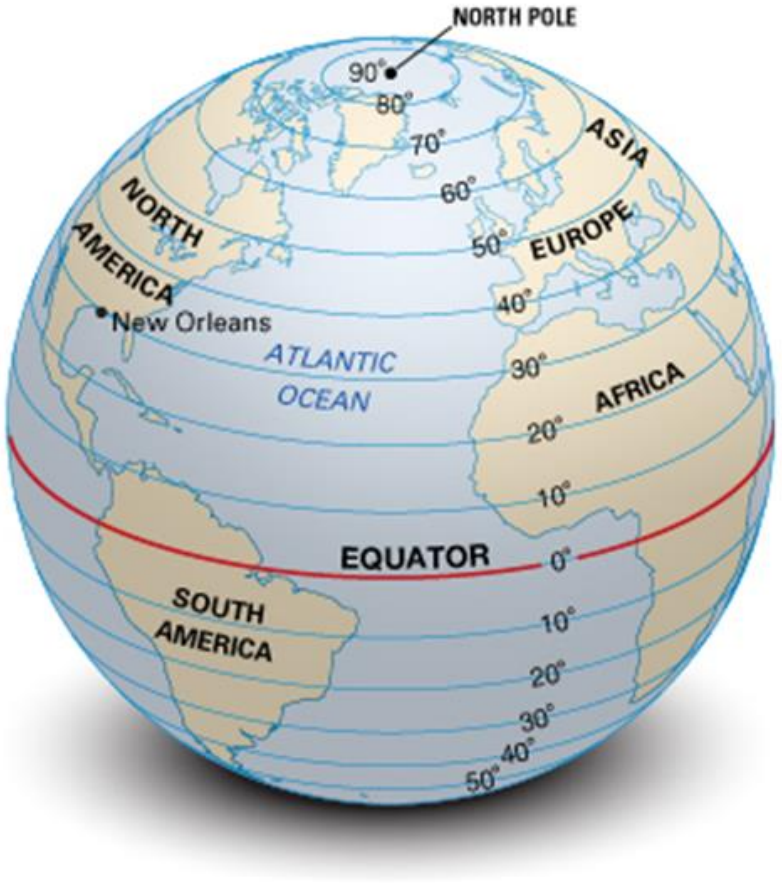
Why is the equator so hot, whilst the poles are so cold?







How does latitude impact our weather?



What does the term 'latitude' mean?

How far north or south a place is from the Equator.

Other than the Equator, name the other <u>four</u> main lines of latitude?

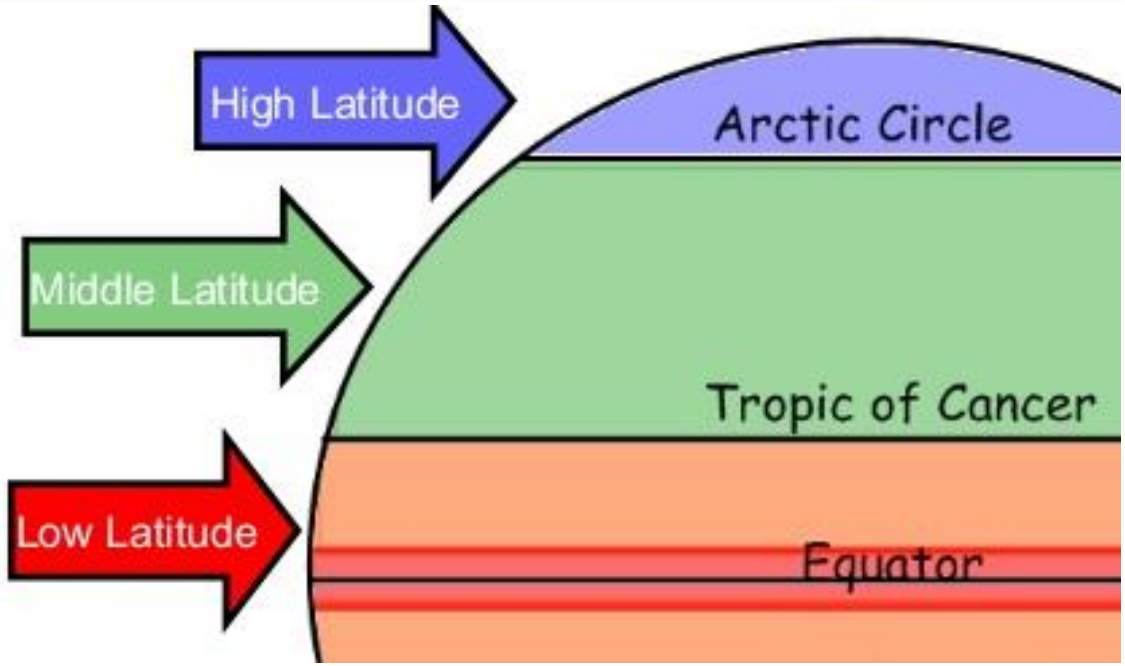
Arctic Circle
Tropic of Cancer
Tropic of Capricorn
Antarctic Circle

How does latitude impact our weather?

The sun heats up air in the Earth's atmosphere. The temperature of the Earth's atmosphere depends on latitude (how far away you are from the Equator). As the Equator is closest to the sun, the air here is warm and the air at the North and South Pole is cold.

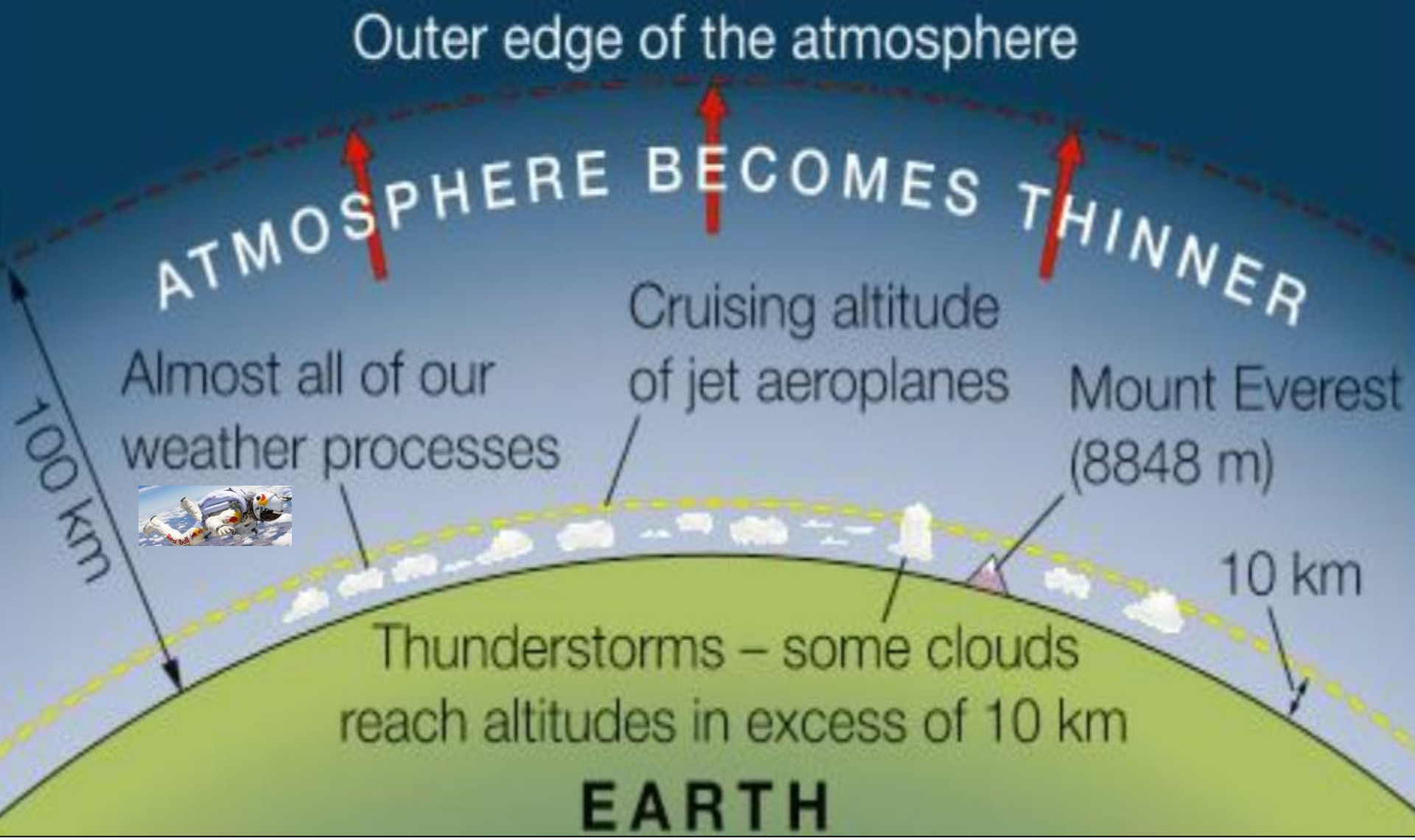
High latitudes have warm/cold air because...

Low latitudes have warm/cold air because...



Explain, using examples, how latitude and the curvature of the earth impact our weather.

Felix freefall



What is the cruising altitude of a typical aeroplane?

Felix is 39 km up!

Gases, liquids and solids are swirling above our heads….such as?

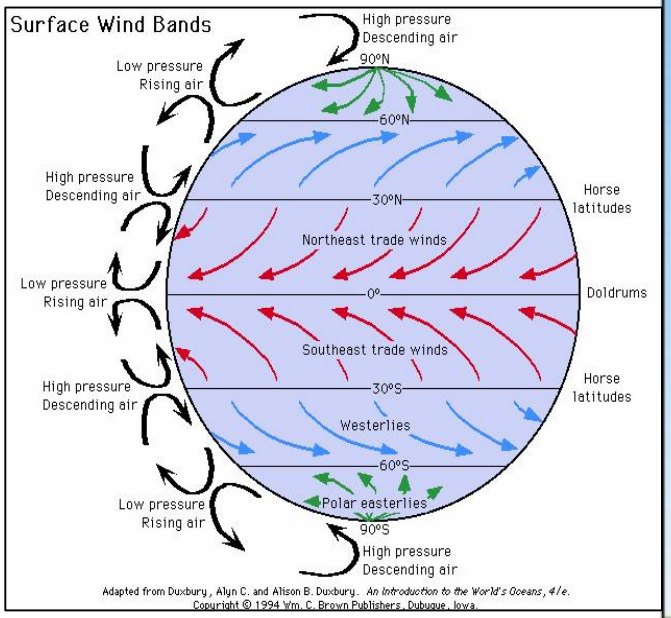
Global Atmospheric Circulation

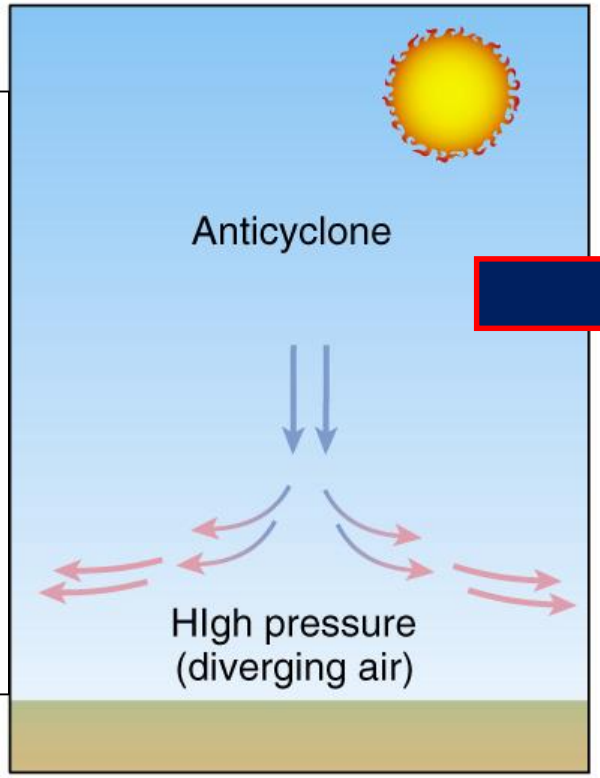
- Global – The earth.
- Atmosphere – The air above our heads: a mass of swirling gases, liquids and solids, such as carbon dioxide and oxygen, water vapour and droplets, and ash.
- Circulation – Circular air movements called cells. These cells all join together to form the overall circulation of the earths atmosphere.

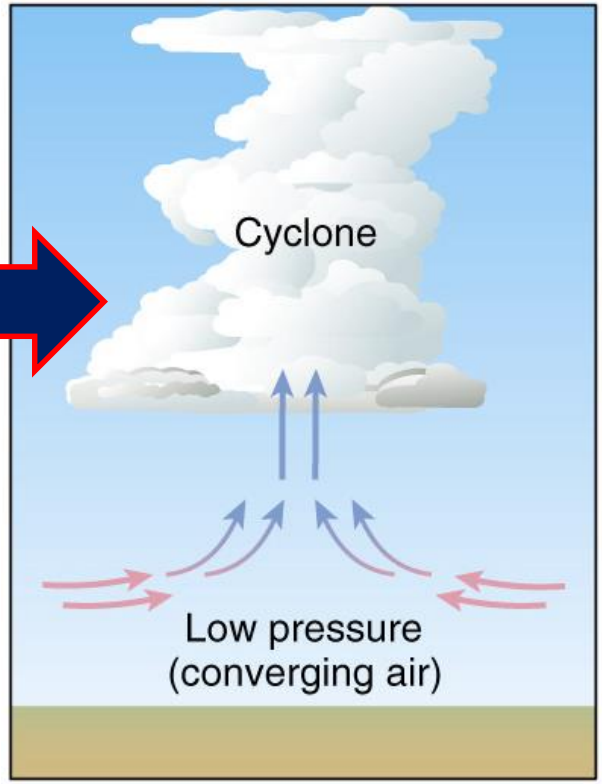
- Task – Write your own definition for 'global atmospheric circulation' in no more than 20 words.

How does air pressure impact our weather?

Winds blow from high pressure zones to low pressure zones.



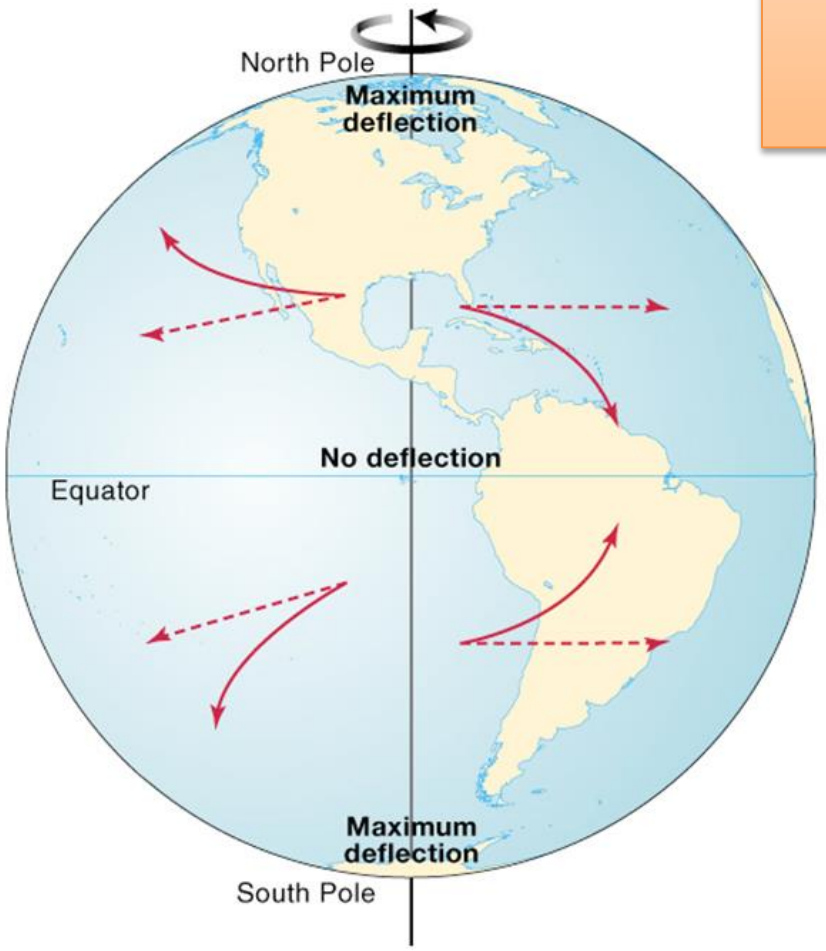




- Air that is **sinking towards** the ground surface forms areas of **high** pressure, e.g. at the North Pole. Winds on the ground move **outwards** from these areas. [High pressure = lots of air pressing down on the ground]
- Air that is **rising from** the ground surface forms areas of **low** pressure on the ground, e.g. at the Equator. Winds on the ground move **towards** these areas of low pressure. [Low pressure = not much air pressing down on the ground]

How does air pressure impact our weather?

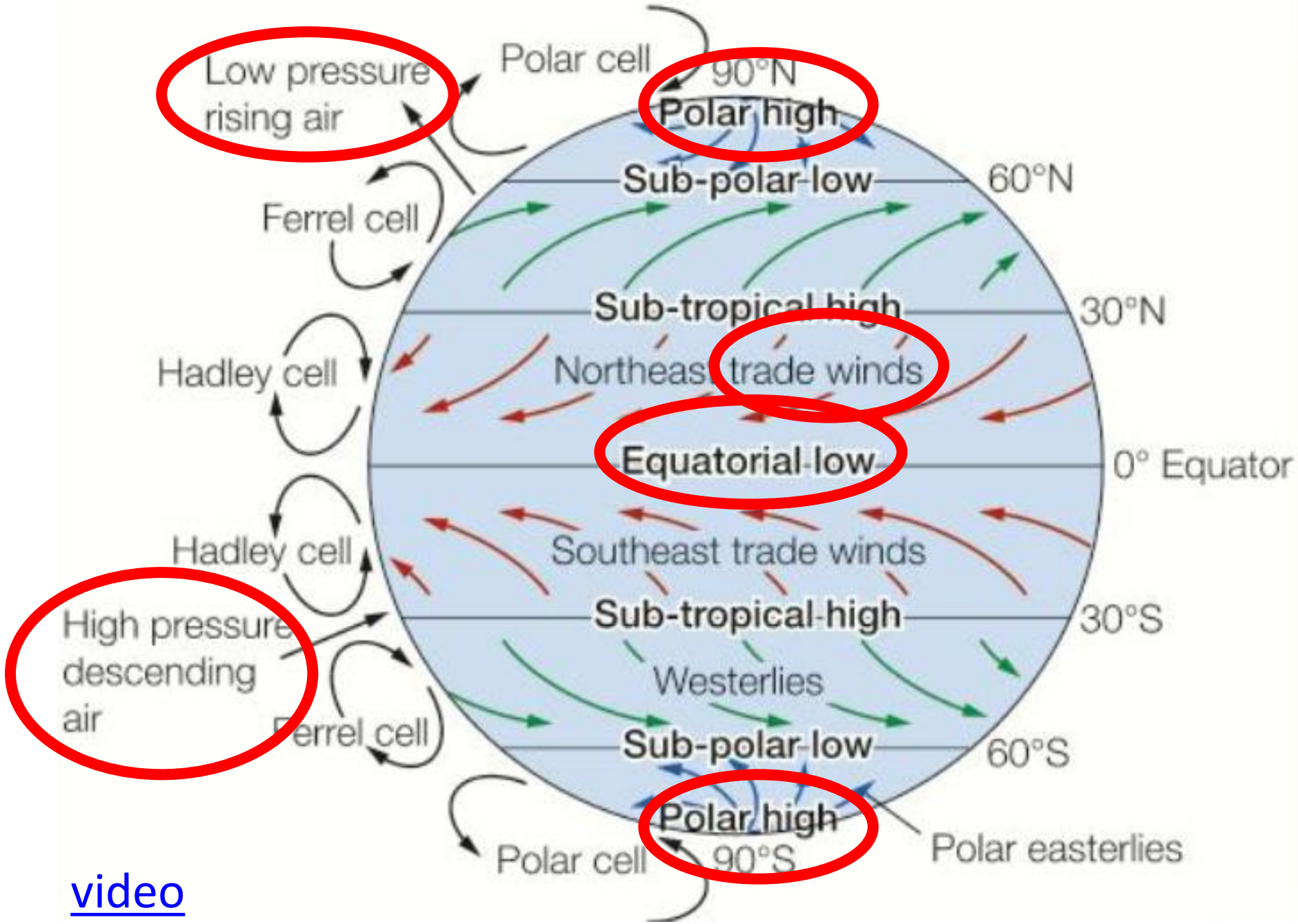
- Winds on the ground are distorted by the **Earth's rotation**. They **curve** as they move from areas of high pressure to areas of low pressure.
- **Surface winds** are very important in **transferring heat** and **moisture** from one place to another.



Winds are deflected to the right in the northern hemisphere and to the left in the southern hemisphere.

Winds blow from high pressure zones to low pressure zones

This is also known as the Coriolis effect, which results from the difference in velocity as the earth spins.


Low pressure rising air
Polar cell
90°N
Polar high
Sub-polar low
60°N
Ferrel cell
Sub-tropical high
30°N
Hadley cell
Northeast trade winds
Equatorial low
0° Equator
Hadley cell
Southeast trade winds
High pressure descending air
Sub-tropical high
30°S
Westerlies
Ferrel cell
Sub-polar low
60°S
Polar high
Polar cell
90°S
Polar easterlies

video

Cloudy and wet in the UK

The UK is located at about 55° North just below the 60° N line of latitude. This puts the UK close to the boundary of cold polar air moving down from the north and warm sub-tropical air moving up from the south.

The boundary between these two air masses is unstable. Here there is rising air and low-pressure belts (the *sub-polar low*) on the ground. Rising air cools, condenses and forms cloud and rain. This is why it is often cloudy and wet in the UK.

Surface winds in these mid-latitudes come from the south-west. These winds bring warm and wet conditions to the UK. But sometimes the cold polar air from the north moves down over the UK bringing snow and very cold winter weather.

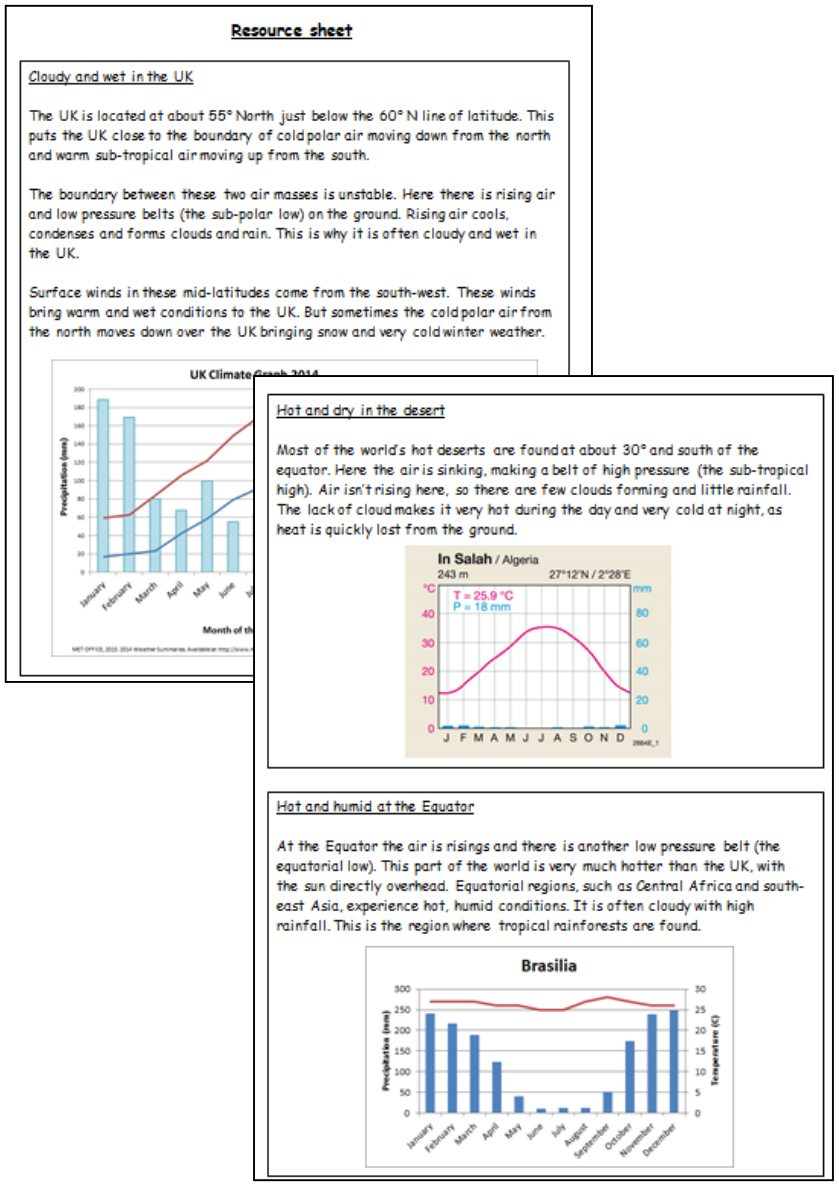
Hot and dry in the desert

Most of the world's hot deserts are found at about 30° north and south of the Equator. Here the air is sinking (diagram **B**), making a belt of high pressure (the sub-tropical high). Air isn't rising here, so there are few clouds forming and little rainfall. The lack of cloud makes it very hot during the day very cold at night, as heat is quickly lost from the ground.

Hot and sweaty at the Equator

At the Equator the air is rising (diagram **B**) and there is another low pressure belt (the *equatorial low*). This part of the world is very much hotter than the UK, with the sun directly overhead. Equatorial regions, such as central Africa and south-east Asia, experience hot, humid conditions. It is often cloudy with high rainfall. This is the region where tropical rainforests are found.

Exam question practice



Resource sheet

Cloudy and wet in the UK

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Grade 1-3 Explain how the global atmospheric system affects the weather and climate of the UK using key terminology. (6 marks)

Grade 4-6 Explain how the global atmospheric system affects the weather and climate of the UK giving evidence from the climate graph and using key terminology. (6 marks)

Grade 7-9 Compare the weather and climate of hot deserts and equatorial areas. Explain how the atmospheric circulation system affects these climates, giving evidence from the climate graphs. (8 marks)

Compare your exam answer with a model

Grade 1-3 – Explain how the global atmospheric system affects the weather and climate of the UK using key terminology. (6 marks)

It is often cloudy and wet in the UK. This is because the UK is located close to the boundary of cold polar air moving for from the north and warm sub-tropical air moving up from the south. The boundary between these air masses is unstable. This means that there is rising air due to low pressure which means that the rising air cools, condenses and forms clouds and rain.

The UK also gets snow and cold winter weather. This is because cold polar air from the north moves down over the UK. In summer it can be warm and wet because surface winds from the south-west bring wet and war, conditions.

Why is this a 6 mark response?
- I have used key terminology such as the names of air masses (e.g. sub-tropical) and high and low pressure.
- I have written about both summer and winter and so haven't just focused on one season.
- I have explained why using the location of the UK to back up what I say.

Grade 4-6 – Explain how the global atmospheric system affects the weather and climate of the UK giving evidence from the climate graph and using key terminology. (6 marks)

It is often cloudy and wet in the UK. This is becaus
of cold polar air moving for from the north and war
south. The boundary between these air masses is u
due to low pressure which means that the rising air
rain. This can be seen in months such as January an
and temperatures are low.

The UK also gets snow and cold winter weather. Thi
moves down over the UK. This can be seen in month
temperatures are low, sometimes below 5°C. In sum
surface winds from the south-west bring wet and w
months such as August where precipitation and tem

Why is this a 6 mark response?
- I have used key terminology such as the names of
and low pressure.
- I have written about both summer and winter and
- I have explained why using the location of the UK
- I have given evidence of months and precipitation

Grade 7-9 – Compare the weather and climate of hot deserts and equatorial areas. Explain how the atmospheric circulation system affects these climates, giving evidence from the climate graphs. (8 marks)

In hot deserts there is little rainfall. This is because these areas are located at about 30° and south of the equator. Here the air is sinking, creating a belt of high pressure. The lack of rising air means that very few clouds are formed and therefore rainfall is minimal. Whereas in the equatorial areas, such as in Tropical Rainforests, rainfall is high because at the equator the air is rising and can form clouds and therefore rainfall. This can be seen on the climate graph for the Amazon rainforest in months such as November and December where precipitation is high (between 240-250mm). On the climate graph for the hot desert in November and December the precipitation is very low (below 3mm).

In hot deserts temperatures are high f. This is because the lack of cloud due to high pressure means that it is very hot in the day but cold at night as the heat can escape from the ground due to the lack of clouds acting as a blanket and keeping the heat in. Similarly, in equatorial areas the sun is directly overhead and so temperatures are also high. However there is more cloud cover and so it is not as cold at night. This can be seen on the climate graph for the Amazon Rainforest as there is very little temperature variation over the year and it remains high between 25-30°C.

Why is this an 8 mark response?
- I have used key terminology such as the names of air masses and high and low pressure.
- I have written about both rainfall and temperature.
- I have explained why using the location of hot deserts and equatorial areas to back up what I say.
- I have given evidence of months and precipitation and temperature to back up what I say.
- I have used compared using words such as whereas, however and similarly.

How does your answer compare?
What can you add or do differently?

Improvement options:

- Add to / re-write your exam answer using the model.
- Write instructions for somebody to use if they were to complete your question. Do this as a step-by-step guide, including what improvements you would need to make.