

1. Weathering

Chemical weathering	Physical weathering	Biological Weathering
Caused by chemicals such as sulphur dioxide that dissolve in the water vapour in the air to form acid rain. The acid rain reacts with minerals in the rock to break it down.	Onion skin weathering: temperature changes cause rocks to expand and contract, this causes small bits to fall off	Plant roots grow into the cracks in rocks and push the cracks wider. Eventually the cracks widen so much that the bits of the rock erode.
	Freeze-thaw; water gets into cracks, expands when it freezes, then thaws, leaving a larger crack	

2. Rocks

Sedimentary rock	Igneous rock	Metamorphic rock
Formed from compacted grains from weathering and erosion.	Formed from molten rock that has cooled and solidified	Formed from rock that experiences high heat and pressure
Properties	Properties	Properties
Soft and crumbly and easy to break apart Porous so water can pass through Layers that are often distinctive Fossils are often found in sedimentary rock	Hard and difficult to break Non-porous as there is no space between the crystals Crystals that are tightly packed making the rock dense	Hard as pressure has squashed particles together Non-porous due to interlocking grains Layers that thin so it can be split into flat sheets

3. Composition of the atmosphere

Modern atmosphere (Today)		Early Atmosphere (4 billion years ago)	
78%	Nitrogen	95%	Carbon dioxide
21%	Oxygen	4%	Water vapour
0.04%	Carbon dioxide	1%	Trace amounts of CO ₂ , CH ₄ and ammonia (NH ₃)
0.96%	Trace amounts of Ar, He, CH ₄ , NH ₃ , water vapour and other gases		

4. Why carbon dioxide levels decreased

Dissolved in oceans	As water vapour cooled and condensed the carbon dioxide in the air dissolved in the water becoming trapped in the ocean
Photosynthesis	Approximately 2.7 billion years ago algae formed and absorbed carbon dioxide from the atmosphere to produce glucose, plants evolved over the next billion years Carbon + water → Glucose + oxygen dioxide 6CO₂ + 6H₂O → C₆H₁₂O₆ + 6O₂
Trapped in sediments	Plants and animals died and became covered in mud that formed the layers in sedimentary rocks or became fossil fuels. This trapped the carbon dioxide from early life in the rocks

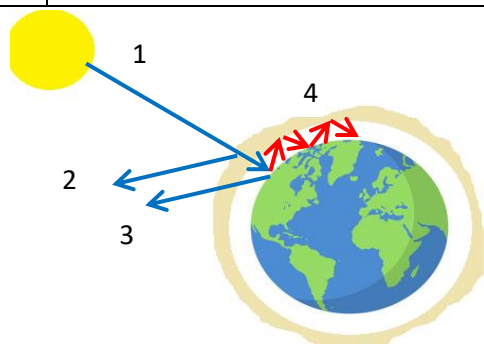
5. How the Earth and Atmosphere changed

Formation of oceans	As the Earth cooled the water vapour released from volcanic eruptions condensed and fell as rain. This pooled in valleys and crevices and formed the oceans
Increase in oxygen	As plants and algae began photosynthesising they released oxygen into the air.
Increase in nitrogen	The oxygen in the air reacted with ammonia to form nitrogen and water.

6. Greenhouse Effect

The greenhouse effect is an essential process that maintains the warm temperatures on Earth.

1	Radiation from the sun	The sun emits waves of energy with different wave lengths. These can travel through space to the Earth
2	Reflection of shortwave radiation	Short wavelength radiation such as x-ray and some UV is reflected back into space as it cannot pass through the atmosphere
3	Reflection of light from the Earth's surface	Visible light, UV radiation and other short wavelength radiation is reflected off the Earth's surface and passes through the atmosphere back into space
4	Trapping infra-red radiation	Radiation from the sun that is absorbed by the Earth is then radiated as a longer wavelength infra-red radiation back towards the atmosphere. This is then reflected it back to the Earth.



7. Human Activities that increase the levels of greenhouse gases

Greenhouse gases		
Carbon dioxide	Water vapour	Methane
What	How	Why
Deforestation	Large areas of forest are cut down to make way for farm land, houses, building materials and other resources	This reduces the amount of carbon dioxide absorbed by plants.
Burning fossil fuels	Fossil fuels are burned to generate electricity and power transport such as cars, trains and planes	When the fuels are burned they release carbon dioxide into the air

An increase in greenhouse gases can amplify the effects of the Greenhouse Effect, increasing the amount of IR radiation trapped in the Earth's atmosphere. This increases the average temperature of the Earth.

8. Climate change

Global warming	The gradual increase of average global temperatures due to an increase in greenhouse gases.
Global dimming	A decrease in the levels of light reaching the Earth's surface due to an increase in particulates in the atmosphere.
Acid rain	Acidic gases dissolved in rain water that can cause damage to buildings, statues, lakes and trees.

Consequences of Climate Change

Flooding, rising sea levels and melting polar ice caps	More frequent and intense storms	Drought and difficulty producing foods with changing weather patterns	Changes in distribution of species when habitats change or extinction
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