THE STRIVING

MUSLIM ACADEMY

Islamic and Academic Education

YEARS 7 TO 9 · SCIENCE

Earth and atmosphere

Three kinds of rock and how each forms, the rock cycle, and where the air came from.

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The Striving Muslim Academy

1 sets · a hint on every question

Written for a parent teaching at home. No training assumed, and nothing else to buy.

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Three kinds of rock, and how each forms

Read this, then answer the questions on it.



THREE KINDS OF ROCK, AND HOW EACH FORMS

The British Geological Survey classifies rocks by how they are sourced and formed, not by how they look. A rock is a solid collection of minerals.

Igneous rock forms when molten rock cools and crystallises. An intrusion cooling very slowly deep below the surface allows the crystals to become quite large, as in granite, while rock that cools quickly at the surface is fine grained, with crystals usually very small.

Sedimentary rock forms when weathering and erosion gradually break up rocks into sediments which are then laid down and compressed. Metamorphic rock forms when existing rock is changed by heat or pressure without melting.

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The atmosphere now and then

Read this, then answer the questions on it.



THE ATMOSPHERE NOW AND THEN

Air is a mixture. At the surface the atmosphere is 78 per cent nitrogen and 21 per cent oxygen, with 1 per cent argon and traces of water vapour, carbon dioxide and other gases. Those three figures come to 100. Nearly all of the air is two gases.

That composition is not original. The atmosphere of early Earth contained abundant carbon dioxide and some methane, but no oxygen gas at all. Blue-green algae developed, taking in carbon dioxide and releasing oxygen as a waste product, and that process is photosynthesis.

The oxygen did not pile up straight away. The atmosphere lacked abundant free oxygen until about 2 billion years ago, despite plants releasing it all that while, because chemical reactions with the crust removed the oxygen as quickly as it formed. Only when plant life grew numerous enough did free oxygen start to accumulate. The air you breathe is the waste product of plants, and it took about two billion years to arrive.

A greenhouse gas absorbs infrared radiation as heat and re-emits it in all directions, which warms the surface and the lower atmosphere. How much any one gas contributes depends on three things: how much heat it absorbs, how much it re-radiates, and how much of it is in the atmosphere. In descending order the largest contributors are water vapour, carbon dioxide, nitrous oxide, methane and ozone.

Methane absorbs and re-radiates 23 times as effectively as carbon dioxide, and nitrous oxide 296 times as effectively, yet carbon dioxide still contributes more, because there is far more of it up there. All three of the things listed above go into the answer, and the amount present is enough to outweigh the effectiveness here.

How each one is answered

Mark it together. Where a question asks for a list, the order does not matter.



ROCKS, THE ROCK CYCLE AND THE ATMOSPHERE

1. How does the British Geological Survey classify rocks, and what is a rock?

1. Rocks are classified by how they are sourced and formed.
2. A rock is a solid collection of minerals.

Answer: **by how they are sourced and formed, and a rock is a solid collection of minerals**

2. Name the three kinds of rock and say how each forms.

1. Igneous: molten rock cools and crystallises.
2. Sedimentary: weathering and erosion break rock into sediments, which are laid down and compressed.
3. Metamorphic: existing rock is changed by heat or pressure without melting.

Answer: **igneous from cooling molten rock, sedimentary from compressed sediments, metamorphic from heat or pressure**

3. Granite has large crystals and lava rock has very small ones, though both are igneous. Explain the difference.

1. Granite cooled slowly, underground, which gave crystals time to grow large.
2. Rock that cools quickly at the surface is fine grained, with crystals usually very small.
3. Crystal size records the rate of cooling.

Answer: **granite cooled slowly underground giving large crystals, lava rock cooled fast at the surface giving small ones**

4. Explain why the rock cycle is a cycle and not a sequence.

1. All the parts of the cycle are connected to each other.
2. Igneous weathers to sediment, sediment compresses to sedimentary, and deeply buried rock is changed by intense heat and pressure into metamorphic.
3. A change in one part produces a change in another, which is what makes it continuous.

Answer: **because every part is connected to the others, so a change in one produces a change in another and the cycle continues**

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