

## Engineering Geology



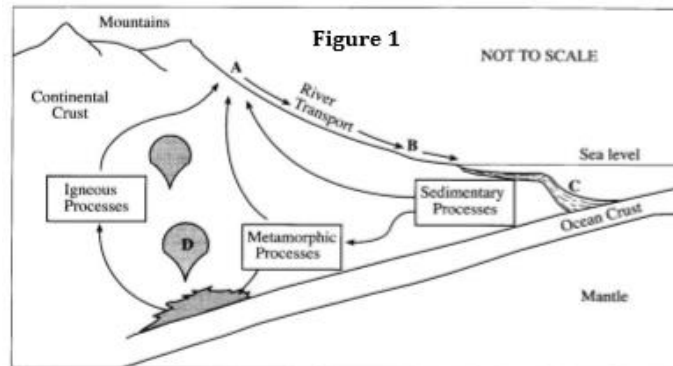
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**A. Figure 1, shows part of the Earth's crust and the locations where some Rock Cycle processes take place.**



**(a) Rock is broken down by frost, rain and sun at A. What name is given to this process?**

**Ans:** The name of the process is known as geological weathering.

**(b) How is sediment grains in a river changed during transport from A to B? State two differences in the likely appearance of the grains.**

**Ans:** Grain changes due to erosion. Grain size reduces and angularity decreases from B to C.

**(c) How do loose sediments at C become changed into solid rock?**

**Ans:** The continued deposition of rocks into sedimentary basins. The process that converts sediments into solid rock by compaction or cementation. The process in which minerals precipitate into pore spaces between sediment grains and bind sediments together to form rock.

**(d) Rocks that are deeply buried in the Earth's crust may undergo metamorphism. Describe two changes that happen in rocks during metamorphism & explain point D?**

**Ans:** Over very long periods of time, sedimentary or igneous rocks end up buried deep underground, usually because of the movement of tectonic plates. While underground, these rocks are exposed to high heat and pressure, which changes them into metamorphic rock.

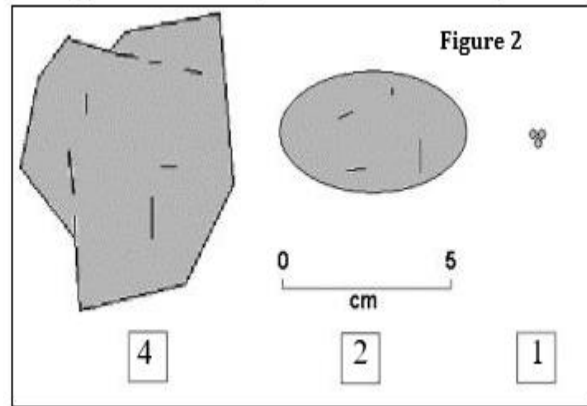
1. Contact metamorphism occurs when hot magma transforms rock that it contacts.
2. Regional metamorphism transforms large areas of existing rocks under the tremendous heat and pressure created by tectonic forces.

At point D with increased temperature molten rocks rise up in the form of plutons due to decreased density.

**B. Figure 2, below shows the size and shape of typical sediment particles from the deposit produced.**

**(i) In each box, write down the most likely number from the Deposit produced column in the table above.**

- 1. Clay mud
- 2. rounded pebbles and sand
- 3. Sloping sand layers
- 4. Angular boulders

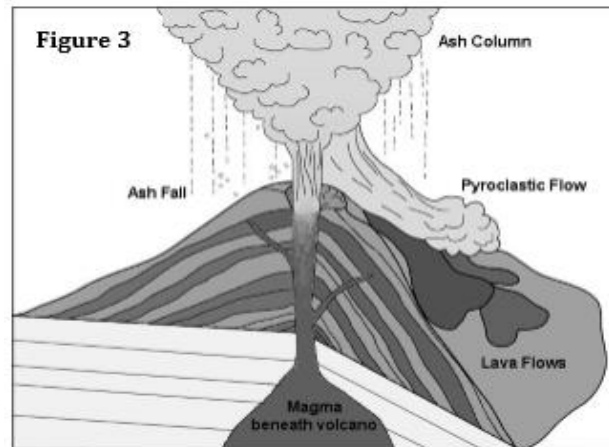


**(ii) In your own words, explain how sediment particles change as they are transported downstream by a river.**

Sediments are moved by streams in different ways. Fine grained particles and dissolved components are carried in suspension called the suspended load. With increasing turbulence, the suspended load increases. Particles that are too heavy to be carried in suspension roll, bounce, and hop along the stream bed; this process is called saltation. This moving mass of solid material is called the bed load. During floods it is often possible to hear the roar created by rocks cracking into each other as they tumble along the stream bed.

The shape of a stream channel and the stream gradient controls the amount of sediment that can be transported down stream. In straight channels, stream water moves as laminar parallel vectors, but with increasing speed and when objects hinder flow, the water becomes turbulent, constantly mixing. With increasing speed and turbulence stream water can carry more sediment (and larger particles) in suspension and as bedload.

**C. Figure 3, shows the structure of a volcano and the rock layers beneath.**



**(I) What type of volcano is shown in the figure by shape and if eruption is more often, which category it fits?**

**Ans:** It is a composite volcano and if eruption is more often, it will convert to stratovolcano. They both are same but it has a smoother, lower profile than composite volcano.

**(II) The eruption shown in Figure 3 is producing an “Ash Column” that rises thousands of meters above the volcano summit.**

**(a) Explain how gases trapped in the magma help produce the ash column.**

**Ans:** It is produced due to volcanic eruption. When dissolved gases in magma expand and escape violently in the atmosphere. The force of gases shatters the magma into the atmosphere.

**(b) Many people around the World live close to volcanoes so, when a volcano erupts, thousands of lives may be at risk.**

**(i) Suggest ONE sign that might indicate if a volcano is about to erupt.**

**Ans:** Signs may include very small earthquakes beneath the volcano, slight inflation, or swelling, of the volcano and increased emission of heat and gas from vents on the volcano.

**(ii) Suggest TWO dangers that might result from Ash Fall near a volcano.**

**Ans:** Volcanic ash consists of tiny jagged particles of rock and natural glass blasted into the air by a volcano.

- Ash can threaten the health of people and livestock, pose a hazard to flying jet aircraft.
- Damage electronics and machinery, and interrupt power generation and telecommunications.

**D. Answer the following questions?**

- (i) **In the table below are statements that refer to either Weathering or Erosion. Complete the table by writing Weathering or Erosion in the spaces provided.**

<b>Statement</b>	<b>Weathering OR Erosion</b>
Breakdown of rock without it being moved	Weathering
Wearing a way of rock during transport of rock particles	Erosion
A process caused by wind, running water and moving ice	Erosion
An effect of plant roots growing in rock joints and fractures	Weathering

- (ii) **A statue was made from limestone. Rain makes limestone weather more quickly than sandstone. What substance in the rainwater causes this?**

**Ans:** Rain has a major impact on karst scenery through chemical weathering. Ordinary rain is naturally acidic because it contains dissolved carbon dioxide that forms weak carbonic acid. When this weak acid comes into contact with calcite, the limestone begins to dissolve.

- (iii) **Why igneous rocks never contain fossils?**

**Ans:** Igneous rocks do not contain any fossils. This is because any fossils in the original rock will have melted when the rock melted to form magma.

- (iv) **Granite takes much longer to cool deep underground than basalt lava at the Earth's surface. How and why is the size of the crystals in granite different from the size of the crystals in basalt?**

**Ans:** Igneous rocks contain randomly arranged interlocking crystals. The size of the crystals depends on how quickly the molten magma solidified: magma that cools slowly will form an igneous rock with large crystals. Lava that cools quickly will form an igneous rock with small crystals.

- (v) **Describe one process that might be responsible for producing the large, angular, poorly sorted fragments in the Scree sediment collecting at the bottom of the cliff?**

**Ans:** Scree sediment at the bottom of a cliff are large, angular and poorly sorted because of the process known as alacial transport