

Physical Geology

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Question 1

Metamorphic rock is formed when other types of rocks, such as igneous or sedimentary rocks are exposed to heat and pressure. The term metamorphic is derived from the Greek meaning to change form. The process through which rocks change from one form to another and vice versa is called the rock cycle. Literature will focus on defining metamorphism using geological terms, research on the primary factors that lead to the formation of metamorphic rock, and finally, find examples of metamorphic rocks and how they form based on the primary factors.

Metamorphism is the transformation of minerals in protoliths, without the protolith changing its state to liquid. Therefore, protoliths are the preexisting rocks. Metamorphic rocks can be formed through three primary factors, which are an increase in temperature, pressure, and chemical changes (chapter 7). The rise in temperature is instigated by the layers of sediments that are suppressed deeper into the ground. The deeper the object is contained in the field, the more temperature the object encounters because the temperature rises with around twenty-five degrees Celsius per kilometer when moving more in-depth on the surface of the earth. Moreover, the deep the layers are suppressed, the more temperature increases, and thus the prodigious weight the layers have resulted in an upsurge of pressure, which in turn intensifies temperature. The suppression of segments of the rock can lead to the formation of metamorphic rocks in different methods, such as through the shear result caused by the plates sliding past each other and hence having contact with other rocks leading to change. However, due to friction, some rocks will melt, thus forming igneous rock, while the one that will not have melted will be the metamorphic rock.

An increase in pressure can also lead to the formation of metamorphic rock; nonetheless, several factors may lead to a rise in pressure including, the strains triggered by plates striking in the process of mountain building and the massive weight of superimposing layers of the residues. Finally, chemical changes can lead to the formation of metamorphic rock. For example, when there is high pressure, hot fluid and vapor emerging can result in the chemical reactions which, over time, will make the rock to alter its chemical reactions and form metamorphic rock. Examples of metamorphic rocks and how they are created includes, Slate which is formed by comparatively low pressure and temperature, Gneiss is formed when the rock is exposed to more pressure and heat. At the same time, white marble is formed due to chemical changes because it is formed from both dolomite and limestone, which have a high concentration of calcium carbonate.

In summation, metamorphic rocks are formed through a process of metamorphism. Thus, metamorphism is the transformation of minerals in protoliths without the protoliths changing there solid-state to liquid. Several factors lead to the formation of metamorphic rock, including an increase in temperature, pressure, and chemical changes. Different metamorphic rocks are formed when other rocks are subjected to the factors, including Slate, Gneiss, and White marble.

Question 2

Earthquake is a very critical area of study. Seismicity is relevant in geology as it allows people to understand how certain natural events happen. This paper will focus on defining what seismicity is, describe the types of body waves and surface waves as well as their types. The paper will also describe Richter and the Mercalli scale and what they measure.

Seismicity is the relative frequency and distribution of earthquakes. Seismicity occurs due to several reasons, such as volcanic eruption and nuclear detonations. Seismic waves are usually of two types, that is body waves together with surface waves. Notably, body waves move in innermost part of earth, and they are two namely primary waves and secondary waves (chapter 8). P-waves are usually quickest waves and thus are always the first to arrive on seismology. They also small and have the highest frequency and can travel through liquids, solids, and gases. Alternatively, S-waves have a slower speed than p-waves, and therefore they cannot go through gases and liquids. S-waves travel by moving objects back and forth hence arriving after p-waves on seismology. Nonetheless, surface waves move along the ground's exterior. The waves are of two categories including Love and Rayleigh waves. The former are the biggest and reduce in amplitude with deepness. The speed of the Love waves depends on the frequency of the stream; when the tide has a low rate, there will be high velocity and high penetration. Besides, Rayleigh waves make the surface of the earth to ripple up and down like water, and the largeness of the wave reduces with deepness in the earth. Earthquake is measured in two measurements the Mercalli scale and the Richter scale. The Mercalli scale measurement uses roman numbers from I-XII, where damage reduces in strength with distance; hence harm happens in regions. Mercalli measures the strength of the quake through observation of the effect of the earthquake. Richter scale measures based on the logarithmic measurement and uses a seismometer at a precise distance. The scale uses numerals from 2.0-10.0+ with magnitude increasing as the scale number increases. The Richter scale on the other hand determines the energy released by the earthquake using a seismograph.

In conclusion, seismicity is very critical in understanding how the earthquake occurs. Seismicity is the approximate frequency and earthquake distribution. An earthquake occurs

based on seismic waves, which occur in two types. The types are the surface and body waves. Body waves have primary and secondary waves while the other category has love and Rayleigh waves. Quake is measured using two scales the Mercalli which determines the strength of the effect of the shaking, and the Richter that determines the degree of the trembling.

Question 3

The earth has transformed intensely over the years. The earth has changed from being enormously cold to being warm, water bodies, as well as continents, have moved. However, rocks are formed and keep on changing formations every time. Literature will discuss what a fossil is, the type of rock which fossil can be found in, types of fossilization, and the time measure that fossils provide.

Fossils are fragments or traces of prehistoric living creature that is currently conserved in the rock (Interlude E). Fossils are either remains of plants or animals' life which are preserved in sedimentary rock. The sedimentary rock contains fossils because of the nature of gentle pressure and lower temperature, which permits protection of past life forms. Besides, fossils become part of sedimentary rocks because the living organism is covered by sediments such as sand, pebbles, and shell, which makes the characteristics stay for a long time (chapter 10). There are several types of fossilization, including; body fossils that have dried or frozen, hence the full body is preserved. Another type is when an insect is preserved in amber or when the animal falls in the tar pit and dies the fossil will be found in full. The third type of fossilization is trace fossils where an animal may make a footprint in sand, and after some time, the prints are covered by sediments then becoming a rock, fourthly, is the molds and casts where mold is formed when hard part of an organism is buried in the sediment and dissolves over time forming a hollow section with the organism shape in the rock. The fifth type is the carbonized impression of

organisms where when an animal dies and is buried in sediment, the body will break down, and only carbon will remain on the rock. The sixth type is the fossilized tools that stick with the residue like the cassetticus Tapus. The seventh type is the permineralized organism and, finally, the preserved shells and teeth as well as preserved bones. Fossils provide a measure of relative time because they give approximate age by comparing it with similar rocks.

Generally, the transformation of the earth's surface over the years can have evidence from fossils. Fossils are traces of prehistoric living organisms preserved in rock surfaces. Sedimentary rocks contain fossils. There are different types of fossilization, such as body fossils that have dried or frozen, fossilized tools, trace fossils, and carbon films. Fossils are used to measure relative time and not absolute time because it determines the approximate age with the rock and not the precise age.

References

PHYS 3800 Physical Geology. Chapter 7:Metamorphism: A Process of Change

PHYS 3800 Physical Geology. Chapter 10: Deep Time: How Old Is Old?

PHYS 3800 Physical Geology. Chapter 8: A Violent Pulse: Earthquakes