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ANS = 1 :- Geology essential of civil engineering :-

civil engineers perform 99%(excluding table,wooden products) work on the earth (above the surface of the earth or below), whatever the structures are prepare ,whatever the buildings are made they all are touch with the earth, so it is very important to have decent knowledge about the place where the structure ls resting,

i think it is very important to do a complete geology test, before constructing any huge structure, like dams 'sky crappers ,tunnels etc ,

1. **It provides knowledge about materials used for construction.**
2. **Its knowledge is helpful for river control and shipping work.**
3. **Its knowledge is helpful for constructing dams.**
4. **Geotechnical engineers needs knowledge about this subject for digging work.**
5. **Its knowledge is required for foundation faults.**
6. **For design of highways and roads.**
7. **In construction of tunnels.**
8. **Soil tests are done before any project.**
9. **Economical design is advanced.**
10. **determining the earth quake prone areas.**
11. **determining the ground water table**

ROLE of geology in construction project :-

Abstract

As a prelude to the new case histories reported in this book, 17 cases of construction activities are cited that identify the ground responses to various types and methods of construction in the light of the geological age and relevant geological structure. In most cases, unexpected events occurred in spite of prior geological and geotechnical investigations. Whether new treatment is

seen in old examples or old treatment of new examples, the ultimate objective is to underline the value of case histories and the real need in site investigation reports to isolate and interpret those particular aspects of the geology relevant to the proposed engineering works, in the light of precedence, so that all concerned may be aware of the likely consequences of the construction operational types and steps up to completion.

2. Open Excavation Open excavation refers to the removal of material at the surface, within certain specified limits, for construction purposes. In order to accomplish this economically and without hazard the character of the rocks and soils involved, and their geological setting, must be investigated. Indeed, the method of excavation and the rate of progress are very much influenced by the geology on site. Furthermore, the position of the water table in relation to the base level of the excavation is of prime importance, as are any possible effects of construction operations on the surrounding ground and/or buildings. UNESCO – EOLSS SAMPLE CHAPTERS GEOLOGY – Vol. V – Geology and Construction - Bell F.G. ©Encyclopedia of Life Support Systems (EOLSS) Drillability in rock masses is influenced by their hardness, abrasiveness, and grain size, and the discontinuities present. The harder the rock, the stronger the bit that is required for drilling, since higher pressures need to be exerted. Abrasiveness refers to the ability of a rock to wear away drill bits. Bit wear is a more significant problem in rotary than percussive drilling. The size of the fragments produced during drilling operations also influence abrasiveness. For example, large fragments may cause scratching but comparatively little wear, whereas the production of dust causes polishing.

ANS :- 2 (A):-

POST - VOLCANIC CHANGES :-

There are several different causes for a volcano to erupt which all fundamentally come down to a pressure change within the volcano which forces the magma to overflow the chamber it is held in.

The most common type of eruption is caused by the movement of tectonic plates.

When one is pushed under the other the magma, sediment and seawater is forced into the chamber which eventually overflows and the volcano erupts spewing lava into the sky.

This kind of eruption produces sticky, thick lava at temperatures from 800 to 1,000C.

The second type of eruption caused by tectonic plates is when the plates move away from each other allowing magma to rise and fill the the gap, which can cause a gentle explosion of thin lava of temperatures between 800 to 1,200C.

Decreasing temperatures can cause old magma to crystallise and sink to the bottom of the chamber and this movement can force fresh liquid magma up and out - similar to dropping a brick in a bucket of water.

Finally a decrease in external pressure can trigger an eruption as it may minimise the volcano's ability to hold back by increasing the pressures inside the magma chamber.

The Ash Effect

Ash from volcanoes can do more than darken the skies, hurt air quality, contaminate water, coat highways, cover yards and ground airplanes. After an eruption, roofs on buildings may collapse and kill people if enough volcanic ash particles land on them. People can develop breathing problems, throat irritation and other respiratory issues when ash falls after a volcanic eruption.

Serious Catastrophic Effects

More serious problems may occur when fires start as a result of contact with hot lava. Flowing lava can kill people, animals and plants that lie in its path. For example, the Mount St. Helens eruption of 1980 killed about 24,000 animals. As plants and animals die, famine can arrive in areas where people rely on those food supplies. Powerful volcanoes, such as Krakatoa, can cause catastrophic damage. Exploding with the power of 13,000 nuclear bombs in 1883, Krakatoa destroyed entire villages and killed over 36,000 people. The shockwave was so powerful that it destroyed most of the island and instruments detected the blast thousands of miles away.

Climate Change and Volcanic Activity

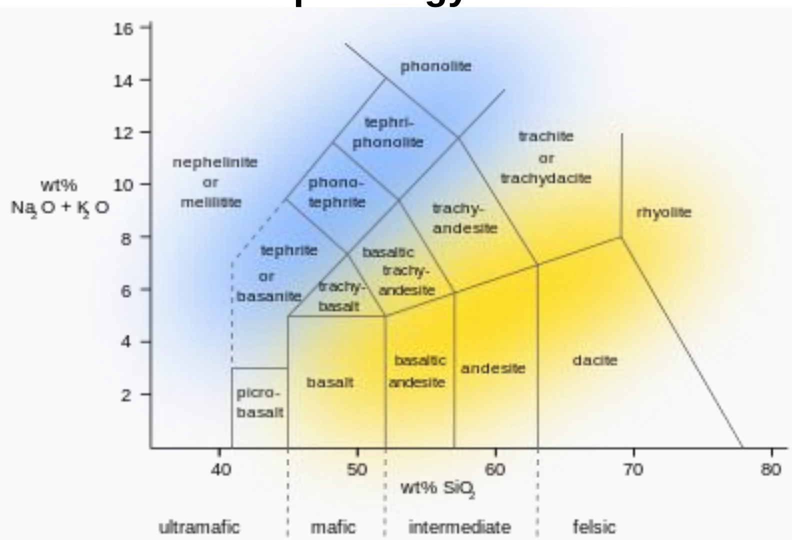
While greenhouse gases help warm the planet, volcanoes can make it cooler. Powerful volcanoes spew hydrogen chloride, sulfur dioxide, ash and other materials high into the stratosphere. Sulfate aerosols reflect some of the sun's energy back into space, resulting in a cooler atmosphere. These aerosols may also cause chemical reactions that produce chlorine monoxide, a substance that destroys the Earth's ozone layer. Paradoxically, the carbon dioxide that volcanoes release can augment global warming.

ANS:- 2 (B)

SIO2 ultimately effects the composition of igneous rocks:-

Igneous rock (derived from the Latin word *ignis* meaning fire), or **magmatic rock**, is one of the three main rock types, the others being sedimentary and metamorphic. Igneous rock is formed through the cooling and solidification of magma or lava. The magma can be derived from partial melts of existing rocks in either a planet's mantle or crust. Typically, the melting is caused by one or more of three processes: an increase in temperature, a decrease in pressure, or a change in composition. Solidification into rock occurs either below the surface as intrusive rocks or on the surface as extrusive rocks. Igneous rock may form with crystallization to form granular, crystalline rocks, or without crystallization to form natural glasses. Igneous rocks occur in a wide range of geological settings: shields, platforms, orogens, basins, large igneous provinces, extended crust and oceanic crust.

Chemical classification and petrology



Total alkali versus silica classification scheme (TAS) as proposed in Le Maitre's 2002 Igneous Rocks - A classification and glossary of terms[4]:237 Blue area is roughly where alkaline rocks plot; yellow area is where subalkaline rocks plot.

Igneous rocks can be classified according to chemical or mineralogical parameters.

Chemical: total alkali-silica content (TAS diagram) for volcanic rock classification used when modal or mineralogic data is unable to be determined due to the small grain size.

- *felsic* igneous rocks containing a high silica content, greater than 63% SiO_2 (examples granite and rhyolite),
- *intermediate* igneous rocks containing between 52–63% SiO_2 (example andesite and dacite),
- *mafic* igneous rocks have low silica 45–52% and typically high iron – magnesium content (example gabbro and basalt),
- *ultramafic rock* igneous rocks with less than 45% silica (examples picrite, komatiite and peridotite),
- *alkalic* igneous rocks with 5–15% alkali ($K_2O + Na_2O$) content or with a molar ratio of alkali to silica greater than 1:6 (examples phonolite and trachyte).

ANS :- 3 :-

Weathering occur:-

Weathering causes the disintegration of rock near the surface of the earth. Plant and animal life, atmosphere and water are the major causes of weathering. Weathering breaks down and loosens the surface minerals of rock so they can be transported away by agents of erosion such as water, wind and ice. There are two types of weathering: mechanical and chemical.

Mechanical Weathering

Mechanical weathering is the disintegration of rock into smaller and smaller fragments. Frost action is an effective form of mechanical weathering. When water trickles down into fractures and pores of rock, then freezes, its volume increases by almost 10 percent. This causes outward pressure of about 30,000 pounds per square inch at -7.6 Fahrenheit. Frost action causes rocks to be broken apart into angular fragments. Idaho's extreme temperature range in the high country causes frost action to be a very important form of weathering.

Exfoliation is a form of mechanical weathering in which curved plates of rock are stripped from rock below. This results in exfoliation domes or dome-like hills and rounded boulders. Exfoliation domes occur along planes of parting called joints, which are curved more or less parallel to the surface. These joints are several inches apart near the surface but increase in distance to several feet apart with depth. One after another these layers are spalled off resulting in rounded or dome-shaped rock forms. Most people believe exfoliation is caused by instability as a result of drastically reduced pressure at the earth's surface allowing the rock to expand.

Exfoliation domes are best developed in granitic rock. Yosemite National Park has exceptional examples of exfoliation domes. Idaho has good examples in the Quiet City of Rocks near Oakley as well as in many parts of the granitic Idaho Batholith. In fact, these characteristic rounded forms make rock exposure of the granitic Idaho Batholith easy to identify.

Another type of exfoliation occurs where boulders are spheroidally weathered. These boulders are rounded by concentric shells of rock spalling off, similar to the way shells may be removed from an onion. The outer shells are formed by chemical weathering of certain minerals to a product with a greater volume than the original material. For example, feldspar in granite is converted to clay which occupies a larger volume. Igneous rocks are very susceptible to mechanical weathering.

Chemical Weathering

Chemical weathering transforms the original material into a substance with a different composition and different physical characteristics. The new substance is typically much softer and more susceptible to agents of erosion than the original material. The rate of chemical weathering is greatly accelerated by the presence of warm temperatures and moisture. Also, some minerals are more vulnerable to chemical weathering than others. For example, feldspar is far more reactive than quartz.

Differential weathering occurs when some parts of a rock weather at different rates than others. Excellent examples of differential weathering occur in the Idavada silicic volcanic rocks in the Snake River Plains. Balanced Rock and the Gooding City of Rocks are outstanding examples of differential weathering.

Physical weathering[edit]

Physical weathering, also called **mechanical weathering** or **disaggregation**, is the class of processes that causes the disintegration of rocks without chemical change. The primary process in physical weathering is abrasion (the process by which clasts and other particles are reduced in size). However, chemical and physical weathering often go hand in hand. Physical weathering can occur due to temperature, pressure, frost etc.

For example, cracks exploited by physical weathering will increase the surface area exposed to chemical action, thus amplifying the rate of disintegration.

Abrasion by water, ice, and wind processes loaded with sediment can have tremendous cutting power, as is amply demonstrated by the gorges, ravines, and valleys around the world. In glacial areas, huge moving ice masses embedded with soil and rock fragments grind down rocks in their path and carry away large volumes of material. Plant roots sometimes enter cracks in rocks and pry them apart, resulting in some disintegration; the burrowing of animals may help disintegrate rock. However, such biotic influences are usually of little importance in producing parent material when compared to the drastic physical effects of water, ice, wind, and temperature change.

Thermal stress[edit]

Thermal stress weathering, sometimes called **insolation weathering**,[2] results from the expansion and contraction of rock, caused by temperature changes. For example, heating of rocks by sunlight or fires can cause expansion of their constituent minerals. As some minerals expand more than others, temperature changes set up differential stresses that eventually cause the rock to crack apart. Because the outer surface of a rock is often warmer or colder than the more protected inner portions, some rocks may weather by exfoliation – the peeling away of outer layers. This process may be sharply accelerated if ice forms in the surface cracks. When water freezes, it expands with a force of about 1465 Mg/m^2, disintegrating huge rock masses and dislodging mineral grains from smaller fragments.

Thermal stress weathering comprises two main types, thermal shock and thermal fatigue. Thermal stress weathering is an important mechanism in deserts, where there is a large diurnal temperature range, hot in the day and cold at night.[3] The repeated heating and cooling exerts stress on the outer layers of rocks, which can cause their outer layers to peel off in thin sheets. The process of peeling off is also called exfoliation. Although temperature changes are the principal driver, moisture can enhance thermal expansion in rock. Forest fires and range fires are also known to cause significant weathering of rocks and boulders exposed along the ground surface. Intense localized heat can rapidly expand a boulder.

The thermal heat from wildfire can cause significant weathering of rocks and boulders, heat can rapidly expand a boulder and thermal shock can occur. The differential expansion of a thermal gradient can be understood in terms of stress or of strain, equivalently. At some point, this stress can exceed the strength of the material, causing a crack to form. If nothing stops this crack from propagating through the material, it will result in the object's structure to fail.

Frost weathering[edit]

A rock in Abisko, Sweden fractured along existing joints possibly by frost weathering or thermal stress

Main article: Frost weathering

Frost weathering, also called **ice wedging** or **cryofracturing**, is the collective name for several processes where ice is present. These processes include frost shattering, frost-wedging and freeze–thaw weathering. Severe frost shattering produces huge piles of rock fragments called scree which may be located at the foot of mountain areas or along slopes. Frost weathering is common in mountain areas where the temperature is around the freezing point of water. Certain frost-susceptible soils expand or heave upon freezing as a result of water migrating via capillary action to grow ice lenses near the freezing front.[4] This same phenomenon occurs within pore spaces of rocks. The ice accumulations grow larger as they attract liquid water from the surrounding pores. The ice crystal growth weakens the rocks which, in time, break up.[5] It is caused by the approximately 10% (9.87) expansion of ice when water freezes, which can place considerable stress on anything containing the water as it freezes.

Freeze induced weathering action occurs mainly in environments where there is a lot of moisture, and temperatures frequently fluctuate above and below freezing point, especially in alpine and periglacial areas. An example of rocks susceptible to frost action is chalk, which has many pore spaces for the growth of ice crystals. This process can be seen in Dartmoor where it results in the formation of tors. When water that has entered the joints freezes, the ice formed strains the walls of the joints and causes the joints to deepen and widen. When the ice thaws, water can flow further into the rock. Repeated freeze–thaw cycles weaken the rocks which, over time, break up along the joints into angular pieces. The angular rock fragments gather at the foot of the slope to form a talus slope (or scree slope). The splitting of rocks along the joints into blocks is called block disintegration. The blocks of rocks that are detached are of various shapes depending on rock structure.