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Answer – Because pollution in the form of eroded dust can be transported by wind to various locations and deposited on the soil. In contrast, water in the form of rain, surface water flow and groundwater flow can transport pollutants through and on top of the soil.

1.11 What are acid rains? How do acid rains affect steel and concrete structures?

Answer –

Acid rain is generated by the emission of various pollutants into the air with the principle sources being fossil fuel power plants, automotive exhausts, and industrial facilities. These emissions and exhausts contain sulfur dioxide, nitrogen, and other gases. The gases combine with oxygen, and water vapor in the air to form sulfuric acid, nitric acid, hydrochloric acid etc. These acids effect pavement structures, foundations of structures, and lead to corrosion of both concrete and steel structures.

1.12 How does acid water affect concrete mixtures?

Answer – Concrete mixtures are composed typically of gypsum (calcium sulfate dihydrate), Portland cement (limestone) and sand. Addition of acid water will react with the calcium sulfate and limestone. This will affect the workability and durability of the concrete.

CHAPTER 2 PROBLEMS

2.1 Why do ground pollution problems challenge current soil mechanics concepts and methods for effectively analyzing soil behavior under various environmental conditions?

Answer –

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Current soil mechanics concepts are based primarily on mechanics (i.e. body forces) and not on physio-chemical approaches (i.e. surface forces). In the case of pollution problems the involvement surface forces as reflected by the double layer theory becomes very important.

2.2 Comment on particle-energy-field theory as proposed in the text.

Answer –

A force field is said to exist at a point if a force due to either gravitational, electrical, radiological, mechanical or combination source is exerted on a particle at a point in space. An extension of this concept is too consider the amount of work or energy done on the particle by multiplying the force by distance.

2.3 What is the fundamental basis for development of the particle-energy-field theory?

Answer – The fundamental basis for the particle-energy-field is the collection or assemblage of individual particles in space which interact and exhibit surface and/or body forces.

2.4 Why is mechanical energy considered a short-term process and why are thermal, electric, and magnetic energies considered long-term processes?

Answer –

Mechanical energy is the capacity to do work using one or a combination of springs, dashpots, or friction element. This is considered a short-term process lasting from seconds to possibly days depending upon the characteristics of the dashpot element. In contrast, thermal, electric and magnetic energies can do work over a period time possibly ranging from seconds to decades or longer.

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2.5 Define the energy, energy field, particle energy field, and particle systems.

Answer –

a. energy – the capacity for doing work and overcoming resistance.

b. energy field – defined as the area of influence in the vicinity of a point of energy.

c. particle systems – The physical world consists of three states of matter: solid phase, liquid phase, and gaseous phase. The micro-structure of these three phases and their combinations (i.e. air-solid, air-liquid, liquid-solid etc.) can be modeled as particles.

2.6 Explain surface and body forces.

Answer –

a. Surface forces are due to the lattice structure of a mineral comprising the soil.

b. Body forces – forces due to the mass of the particle.

2.7 Scientists reveal secrets of top quark — what are the secrets?

Answer –

Protons and neutrons are composed of triplets of quarks. Quarks come in 6 different types: up, down, strange, charm, and bottom. The protons and neutrons are built up from a combination of the up and down quarks. The remaining quarks have been recreated by modern accelerators.

2.8 How would you define the term ‘environment’?

Answer –

All the conditions, circumstances, and influences surrounding, and affecting the development of an organism, or group of organisms.

2.9 Discuss the similarity between environmental phenomena and energy fields.

Answer –

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Each energy field (mechanical, thermal, electrical, magnetic, and radiation) has its own distinct character and identity. Energy sources are either naturally inherited or man-made. In comparison, environmental phenomena involve the interaction between soil-water-gas whose behavior is controlled by one or more of this energy fields.

2.10 Discuss the energy flow in the changes of state matter of acid rain.

Answer –

The energy flow of acid rain is from a gaseous phase to the liquid phase to the solid phase. The gaseous phase sulfur dioxide and nitrogen oxide combine with oxygen and water vapor in the air to form sulfuric acid, nitric acid, hydrochloric acid and other acids. This combination of acids fall to the earth in the form of rain and reacts with both natural and man-made materials.

CHAPTER 3 PROBLEMS

3.1 Distinguish clearly between soil identification and soil classification systems. To which of these does the Unified Soil System belong and why?

Answer –

a. soil classification – a system to communicate information concerning a soil in a brief manner without the necessity of a lengthy description.

b. soil identification - assignment of a specific unique classification to a soil. An example would be CL (clay with low plasticity)

c. Unified Soil System is a classification system

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