Quiz Soil Components - Answers

1. Mineral Components

The proportion of sand, silt and clay in a soil defines its:

(c) texture

[Answer (c)]

A mineral particle that has a mean equivalent diameter between 0.05 - 0.002 mm is called:

(a) gravel

(b) clay

(c) silt

(d) sand

(e) cobblestone

[Answer is (c). Silt size particles have a mean equivalent diameter between 0.05 - 0.002 mm]

Clay sized particles have a proportionally greater impact on soil properties than silt and sand sized particles because:

(a) clay is sticky when wet and cloddy when dry.

(b) soil porosity is higher in clay dominated soils.

(c) clay particles have a high specific surface area

(d) soil pores are smaller in clay dominated soils.

(e) clay particles move through the soil

[Answer is (c). Clay sized particles (<0.002 mm diameter) have large surface area to volume ratio. Thus, clay content has a proportionally greater impact on soil properties than silt or sand sized particles.]

Using a textural triangle, determine the textural class name for three soils with the following particle size distribution:

Soil	% sand	% silt	% clay
1	22	60	18
2	38	17	45
3	59	13	28

[Answer: Soil 1 = silt loam; Soil 2 = clay; Soil 3 = sandy clay loam]

What is the difference between particle density and bulk density of soils?

[Answer: Particle density is the weight of solids divided by the volume of solids. Bulk density is the weight (oven dry) of soil divided by the total volume (solids plus pores). Since the bulk density includes pore space, which is generally about 50%, the bulk density of soils should be approximately ½ of the particle density.]

What is the relationship between the compaction of a soil and its bulk density?

[Answer: As a soil gets compacted its bulk density goes up. The more compaction, the greater the bulk density.]

Because of their greater surface area per unit of soil mass, clay loams generally have a greater capacity than loamy sand soils to ___.

(a) release nutrients by mineral weathering

(b) support bacterial growth

(c) adsorb gases

(d) adsorb pollutants

(e) all of the above

[The best answer is (e). All the properties are derived from the properties of the clay.]

Silicate minerals:

(a) have SiO_4 tetrahedron structure

[Answer is (a). Silicate minerals have SiO_4 tetrahedron structure. This is the fundamental property of silicate minerals]

Kaolinite and montmorillonite are similar in that they:

(b) are both secondary minerals

[Answer is (b). Kaolinite and montmorillonite are secondary minerals]

Isomorphous substitution in aluminosilicate minerals results in:

(d) increase of cation exchange capacity

[Answer is (d). Isomorphous substitution is the replacement of one atom by another of similar size in a crystal lattice with disrupting or changing the crystal structure of the mineral. The substitution of trivalent cation with a divalent cation results in the formation of a net negative charge in the mineral. Therefore, the mineral will have a greater cation exchange capacity]

As soils age and weather through the eons they may change from montmorillonite to kaolinite. Also, the amount of oxides increases. As soils age and follow this trend of weathering, the charge on the soil particles will:

(b) decrease

[Answer is (b)]

2. Organic Components

Give an example of an important member of macrofauna, mesofauna, and microfauna. Explain how their activities contribute towards an improvement of soil productivity.

[Answer:

Macrofauna- earthworms

Earthworms are very mobile within the soil/plant system. They bring organic material from the surface into the mineral soil where microorganisms are available to carry out decomposition. While earthworms do not really chemically alter organic matter, they decrease the particle size by grinding the material. This increases the surface area available for microbial attack. Humans benefit from the incorporation of organic matter into soils by earthworms. This increases fertility and promotes good physical properties.

Mesofauna- mites

Mites, like earthworms, physically alter the size of organic debris, facilitating microbial decomposition. Mesofauna tend to have lower N requirements than microorganisms. This results in the release of excess N when mesofauna feed on microbes.

Microfauna- nematodes

Nematodes are restricted to water filled pores and are not as active in the physical breakdown of organic matter as the macro and mesofauna. They do actively graze the microbial communities and by doing so release excess N.]

Yeast are classified as _____:

(c) fungi

[Answer is (c)]

Describe an activity carried out by fungi, bacteria, and actinomycetes (one for each group) that is beneficial for soil productivity.

[Answer: Fungi- Decomposition of a variety of compounds including lignin (they are extremely important in forested ecosystems). They form symbiotic relationships with plants (mycorrhiza) which helps plants take up P and possibly water.

Bacteria- the great diversity of bacteria in soil is due to (1) their ability to survive long periods by producing spores and (2) their rapid reproduction. This diversity ensures that there will be microorganisms capable of degrading practically anything in any one soil. We have used this diversity to our advantage in the field of bioremediation. Some bacteria are also N-fixers.

Actinomycetes- are capable of degrading very complex natural and anthropogenic compounds. They are important N fixers in forested ecosystems and produce many antibiotic compounds that are used by humans.]

How does soil drainage affect organic matter accumulation?

[Answer: Decomposition is much more rapid under aerobic conditions. If the soil is poorly drained, water will accumulate in the pores and the oxygen level will fall. Decomposition, which is an oxidation process, will decrease and organic matter will accumulate.]

Greater microbial biomass will be found in a soil that is rich in:

(a) montmorillonite

(b) kaolinite

[Answer is (a). Clay soils, especially those rich in expanding montmorillonite type minerals, have large surface areas and support a large microbial biomass.]

Each soil organism has an energy source. Using the lecture notes and your textbook make a list including at least six organisms you would likely observe and determine whether the organism you list is heterotrophic, autotrophic, or can be

either.

[Answer: **Higher (vascular) plants** = autotrophs, **algae** = autotrophs, **bacteria** = both autotrophs and heterotrophs, **actinomycetes** = heterotrophs, **cyanobacteria** = both autotrophs and heterotrophs, **arthropods** = heterotrophs, **earthworms** = heterotrophs, etc.]

3. Soil Water

Water held in the soil between soil moisture potentials from -10 to -1500 kPa is _____ water.

(c) plant available

[Answer is (c). Plant available water is held between -10 to -1500 kPa and it corresponds to the available water storage capacity=AWSC.]

How does the structure of a water molecule influence its properties and behavior in soils?

[Answer: Water is a polar molecule. Polarity is the uneven distribution of charge within the water molecule while H-bonding is the attraction of the H atom of one water molecule to the O atom of another. These properties result in bonding of water molecules to charged sites on soil surfaces, and to charged materials such as cations and anions (adhesion) as well as to each other (cohesion). This bonding results in greatly lowered energy of water molecules.]

Two soil samples, P and Q, at different soil moisture levels are placed in contact with each other. Water will more likely move from soil P to soil Q if their water potentials, expressed in kPa, are:

(d) P= -30; Q= -40

[Answer is (d). Water flow in soil is controlled by changes in water potential. Water flows from soil areas, which has a higher water potential to those which have a lower potential. Soil at saturation has a potential of 0 kPa. In the above case, the water will flow from an area, which is at -30 kPa to that which is at -40 kPa. Please note that on a number scale -30 >-40.]

Which soil would exhibit a higher water content at a water potential value of -1/3 bar, a sand or a clay loam? Briefly explain your answer.

[Answer: Clay loam will have higher water content at the given water potential. The pore-size distribution of a fine-textured soil, such as clay loam, is mostly in the micropore range. Micropores hold water very tightly (matric force is inversely related to pore size) and would retain water at a matric potential of -1/3 bar. Coarse-textured soils (e.g. sand) consist primarily of macropores, which do not hold water tightly and hence would be drained out at a matric potential of -1/3 bar.]

Which soil would exhibit a greater hydraulic conductivity, a sand or a clay loam? Briefly explain your answer.

[Answer: Sand has greater hydraulic conductivity. The hydraulic conductivity is the ease with which water moves through a soil and is directly related to pore size. The macropores present in a sand result in high hydraulic conductivity and facilitate the rapid water movement observed in sands.]

4. Soil Air

To increase soil aeration, it is necessary to use soil materials with:

(d) A low content of clay and silt size particles, but high content of sand.

[The **best answer** is (d). To increase aeration, sand has to be added. This material has a low content of clay and silt size particles.]

In an ideal agricultural soil in good physical condition, approximately what proportion of the total volume is comprised of pores?

[Answer: 50% solids, 50% pores. Solids consist of mineral (~45%) and organic (~5%). Pores are either filled with air or water.]

How are the proportions of soil air and soil water related?

[Answer: They are inversely related. There is a finite amount of pore space that is either filled with air or water. As the water content increases, air is displaced]

If a soil has a bulk density of 1.4 Mg/m3 and a particle density of 2.6 Mg/m3, what portion of the soil volume is pores and what portion is solid particles?

[Answer: % pores = 100% – (Db/Dp ´ 100%) = 46%, and % solid particles = 54%]

How are soil aeration, water content and microbial activity related?

[Answer: Microbial respiration uses oxygen and produces carbon dioxide. As the water content increases, oxygen has a harder time moving into the soil and may become depleted. Carbon dioxide will also build up. This will decrease microbial respiration and organic matter decomposition.]

Quiz - Interactions Answers

1. Soil Structure

What is the difference between soil texture and soil structure?

[Answer: Soil texture is the fineness or coarseness of a soil. It describes the proportion of sand, silt and clay particles present in the soil. Soil structure refers to the *arrangement* of these soil particles into clusters or aggregates of various sizes and shapes.]

Which would be more likely to change as a result of soil compaction, bulk density or particle density? Why?

[Answer: Bulk density (r_b) - because r_b is a measure of both the solid volume and the pore volume. As a soil is compacted, pore volume (particularly macropores) is decreased. The result is the same soil weight packed into a smaller volume and, hence, a higher r_b. Particle density does not include pore volume and therefore is not subject to change as a result of compaction.]

An unit of non-structure in which there is no bonding between adjacent particles is called:

[Answer: B] (b) single grained

Connect the type of structure with the word that most accurately describes its shape:

[Answer: granular=spherical, blocky=cubical, prismatic=tall, platy=wide]

In the space between peds

[Answer: F] both b and c - air is exchanged between the soil and the atmosphere, root growth occurs

How are aggregates formed?

[Answer: Aggregation = Flocculation + Cementation. Flocculation occurs when primary particles remain close together due to interactive forces. Cementation is the stabilization of these floccules by a cementing agent.]

Name two different cementing agents.

[Answer: organic compounds, carbonates, Fe and Al oxides and clays all act as cementing agents.]

Why is soil structure important?

[Answer: Soil structure determines the porosity, strength and stability of the soil. This influences a) water movement and storage, b) the roots ability to penetrate, grow and withdraw water and nutrients, and c) the ability of a soil to resist erosion]

What problems would you expect to encounter for a housing development if you observe mottled soil color near the soil surface?

[Answer: Mottled soil color indicates a zone of seasonal soil saturation (alternate oxidizing and reducing conditions). This would cause problems for basements, septic leach fields, muddy yards, and poor aeration for landscape plantings.]

2. Chelates

What is a chelate?

[Answer: An organometal complex in which an organic molecule combines with a metal atom by way of two or more chemical bonds.]

Name three types of organic molecules that chelate with metals.

[Answer: 1) substances that are synthesized by roots, 2)various humic substances that have multiple carboxyl groups, and 3) synthetic substances.]

Describe the importance of chelates

[Answer: Dispersed and dissolved chelates readily release metal ions and contribute to nutrient metal availability. Fulvic acids form chelates which provide nutrients to plants. Undispersed (flocculated) and undissolved or excessively stable chelates, contribute to nutrient deficiency. Humic acids and humins form very stable chelates.]

What is a siderophore?

[Answer: Under Fe-deficiency conditions certain microbes and roots produce chelating ligands called siderophores. These ligands bond with Fe^{3+} and maintain relatively high concentrations of soluble iron]

3. Adsorption of Ions

Why are soils with high CEC more fertile than soils with low CEC?

[Answer: High CEC soils can adsorb more exchangeable cations, and therefore can store more plant nutrients than soils with a low CEC]

A purple cationic dye is filtered through 3 different soils. The filtrate for each appears as follows:

Soil A	light purple
Soil B	almost clear
Soil C	light pink

Which soil:
Has the greatest net negative charge?
Most likely is a clay or clay loam?
Is likely to have the greatest percentage of sand?

[Answer: The soil with the filtrate that is almost clear would be expected to have the greatest net negative charge. That same soil would most likely have the greatest percentage of clay relative to the other two soils, so could be clay or clay loam. The soil with the darkest filtrate could be expected to be high in sand (little charge, small surface area by volume of soil)]

Which of the following chemical equations represents the cation exchange process in soils?
(a) NH4+ + H-soil ----> NH4-soil + H+
[Answer: A]

What is the significance of CEC?

[Answer: CEC 1) contributes to soil buffering, 2) contributes to nutrient retention in available forms, and 3) contributes to retention of various contaminants]

How does DDL affect whether colloidal particles are dispersed or flocculated?

[Answer: A colloidal particle with a thick DDL tends to stay dispersed, because it strongly repels other such particles. On the other hand, colloidal particle with a thin (collapsed) DDL is susceptible to flocculation]

4. Soil Acidity

Liming is necessary to neutralize:

[Answer: **C.** When lime is added, hydrogen ions in soil solution are neutralized. The hydrogen ions on the exchange complex are in equilibrium with those in soil solution replenish the ions in solution. Thus, liming reduces active and reserve acidity.]

What processes can lead to acidification of the soil?

[Answer:

- In forested or parkland areas, the decomposition of vegetation releases carbon dioxide. This combines with soil moisture to form carbonic acid.
- Acid rain is formed by water combining with the emissions of certain gases such as sulphur dioxide. Soils can be affected, depending on the source, prevailing wind directions and velocities.
- Some chemical fertilizers applied to the soil produce acidic compounds when they enter into solution.]

5. Interaction between soil water and soil air

Which would exhibit a higher water content at saturation - a sand, silt loam, or clay loam?

[Answer: The clay loam because it is a fine-textured soil. In a non-compacted clay loam the particles will be organized into highly porous granules that have greater total porosity than either a silt loam or a sand. The greater the porosity, the greater the water content at saturation]

Which could store the most water in plant available form - a sand, silt loam, or clay loam?

[Answer: The silt loam. Even though the clay loam has a greater total porosity, the silt loam has pore size distribution most favourable for storing water in plant available form.]

As soil pore space increases, particle density

[Answer: C –remains unchanged. Particle density does not include pore volume and therefore is not subject to change when pore space increases or decreases.]

What practices can increase both thermal admittance and diffusivity?

[Answer: a) adding sand to organic soil, b) cultivation (mixing organic layers and mineral subsoil), c) adding water to dry soil, and d) removal of organic surface layer (scalping, burning)]

What is one reason that mineral matter is a better conductor than organic matter?

[Answer: Organic matter is more porous and can therefore hold more air. Air is a poor conductor of heat.]

6. Interaction between organic matter and soil air

What accounts for variation in soil organic matter decomposition both within a site and between sites?

[Answer:

1. Chemical structure of SOM: some structures are more easily decomposed than others
2. Stabilization by minerals: Clay colloids attract and stabilize organic matter. Minerals may also react with SOM.
3. Aggregation: SOM held in aggregates decomposes slowly.
4. Climate: Precipitation and temperature can affect the rate of decomposition.
5. Disturbance: Cultivation reduces inputs (harvest) and increases outputs (erosion).]

What function does organic matter decomposition serve in the soil?

[Answer: Decomposition provides energy for microbial growth as well as carbon for the formation of new cell material]

Quizzes - Nutrient Cycle Answers

Draw a rough sketch of the carbon, nitrogen, sulphur, phosphorus and potassium cycles.

[Answer: See diagrams in "Nutrient Cycle" section]

The conversion of glucose and oxygen to water and carbon dioxide is called _____.

The nitrogen cycle
Photosynthesis
The phosphorus cycle
Respiration
The carbon cycle

[Answer: D - respiration]

Why is carbon considered to be the building block of life?

[Answer: Carbon is essential to life on earth. It is found in all living organisms, in the atmosphere, in sediments on the ocean floor, in fossil fuels. It is required for photosynthesis.]

Nitrates produced through the process of nitrification can be a problem for the water supply. Why?

[Answer: Nitrate (NO_3^-) as negatively charged ion does not get adsorbed by soil colloids, which are common in a temperate region. These soil colloids (silicate clay minerals, organic colloids, and some Fe/Al oxides and hydroxides) predominantly carry negative charge. Hence, NO_3^- ions stay in soil solution and are easily leached from the soil to groundwater.]

What is nitrogen fixation?

[Answer: Nitrogen fixation is a biochemical reduction of atmospheric nitrogen (N_2) to ammonia. The site of N_2 reduction is enzyme nitrogenase, which is two-protein complex containing Mo and Fe. Nitrogen fixation can be carried out by either free-living soil organisms (e.g. cyanobacteria and bacteria such as Azotobacter sp. and Clostridium sp.) or symbiotic organisms (e.g. bacteria Rhizobium sp., actynomicetes Frankia sp., bacteria Azospirillum sp.) that live in specific associations with vascular plants.]

What is ammonium (NH_4^+) fixation?

[Answer: Ammonium fixation is a way through which an available N form i.e. NH_4^+ is lost from the soil solution. Interlayer spacing of some phyllosilicate clays (illite or fine-grained mica) are just large enough to hold ammonium ions. The ammonium ions tend to hold together the adjacent layers of illite minerals (due to charge sharing and the attraction of opposite charges). Since these layers are held together so strongly ammonium ions cannot readily escape again. This trapping is called ammonium fixation (which has nothing to do with biological N-fixation). The fixed ammonium is not exchangeable, thought it can be gradually released by weathering.]

Why do plants require phosphorus?

[Answer: Phosphorus plays a number of important functions in plant development and growth. It helps during photosynthesis and respiration, provides energy transfer and storage, and helps with efficient use of water.]

Why do plants require potassium?

[Answer: Potassium is used in photosynthesis, helps plants metabolize, controls absorption of water into plant pores, and helps control chemicals and water inside the plant that help it function well.]

How does sulphur enter the atmosphere?

[Answer: Through the combustion of fossil fuels, volcanic eruptions, gas exchange at ocean surfaces and decomposition of organic compounds.]

Distinguish between mineralization and immobilization.

[Answer: Mineralization is process of conversion of an organic form of an element to an inorganic state as a result of microbial decomposition. Inorganic forms of elements are forms that plants take up from the soil solution. Immobilization is process of conversion of an element from the inorganic to organic form in microbial tissues, thus rendering the element unavailable to higher (vascular) plants. Immobilization is also mediated by soil microorganisms. Mineralization leads to reduction of the soil organic matter and increase of the available forms of nutrients, while immobilization increases soil organic matter content and reduces available forms of nutrients.]

Quizzes - Soil Classification Answers

1. Factors of Soil Formation

What are factors of soil formation?

Answer: climate, biota, topography, parent material, and time.

List human activities (other than agriculture and forestry) that can have direct impact on soil formation

Answer - Road building, excavation and construction of various buildings and mining.

Why are A horizons more common in grassland soils than forest soils?

Answer: In grasslands, most of the organic matter is added directly to the mineral soil through dead roots and a significant amount of biomass is found underground. In forested ecosystems, above-ground biomass is much larger than below ground, while organic material is added to the surface of the soil where it tends to decompose before it is incorporated into the soil.

How deep would be the layer of topsoil on the hilltop as compared to the valley?

Answer: Soil at the top of a hill would be much more thin than in a valley because sediments move down slope.

2. Soil Formation Processes

What are the four soil forming processes?

[Answer: The four soil forming processes are:

(1) Additions - the addition of organic material, ie: addition of dead root mass in grassland ecosystems.

(2) Transfers - the downward movement of soluble material in water. ie: redistribution of calcium carbonate in a soil profile. Note that while the distribution of material with depth has changed, the material hasnot been completely lost from the soil.

(3) Transformations - the weathering of primary minerals to secondary minerals or the decomposition of organic matter.

(4) Removals- The complete loss of material from the soil profile. ie the loss of calcium carbonate in a soil forming in a humid environment.]

If all four processes are active in all soils, why aren't all soils alike?

[Answer: All four processes can and do occur at the same time in any given soil. It is the balance of these processes that determines the type of soil that forms. The balance of the four processes is controlled by the five soil forming factors.]

3. Soil Horizons

The Ae horizons are more commonly present in soils that are under a vegetative cover of trees, rather than grasses. Can you think why this might be?

[Answer: Grasses tend to grow more quickly than trees in the spring and soak up more of the snow melt and early rainfall. Hence, more leaching takes place in soils under a vegetative cover of trees than grasses leading to formation of an Ae horizon]

What is the difference between eluviation and illuviation?

[Answer: Eluviation is the process by which clay is removed and illuviation is the process by which clay is deposited. Distinct eluvial and illuvial horizons may develop over time as water moves clay particles through the profile. The upper Ae (eluvial) horizon is depleted of clay and the lower Bt (illuvial) horizon is enriched with clay. Therefore, we can say that the eluviation of clay from the surface horizon created an Ae horizon, a horizon which is depleted of clay.]

What does the lower case 'g' indicate about a horizon?

[Answer: the 'g' describes a horizon is gleyed or mottled and is usually characterized by gray colouring. This indicates the soil is permanently or periodically under intense anearobic conditions.]

List the major organic and mineral horizons.

[Answer: Mineral – A, B, C

Organic – L, F, H, O]

4. Canadian System of Soil Classification

A possible sequence of horizons starting at the ground surface for an Gleysol is

[Answer: (a)] (a) LFH-Ah-Cg

A possible sequence of horizons starting at the ground surface for an Luvisol is

[Answer: (c)] (c) LFH-Ae-Bt-Ck

A possible sequence of horizons starting at the ground surface for an Solonetz is

[Answer: (d)] (d) Ah-Ae-Bn-Csk.

What is the major factor limiting land use possibilities for each of the following soil orders?

[Answer:

(a) Solonetz – low soil moisture levels; high pH and salts

(b) Vertisols – high shrink swell potential, poor for construction of homes and roads; difficult to till

(c) Gleysol – wet for most parts of the growing season, poor aeration

(d) Cryosol – low soil temperatures; permafrost

(e) Podzol – low pH and base saturation, P sorption

(f) Organic soils - oftentimes they are wet and make poor foundations]

Identify the Great Group and Order of these soil profiles:

a. Answer: Dystric Brunisol]

b. Answer: Black Chernozem]

c. [Answer: Dark Brown Chernozem]

d. [Answer: Turbic Cryosol]

e. [Answer: Grey Luvisol]

f. [Answer: Fibrisol (Organic)]

g. [Answer: Ferro-humic Podzol]

Quiz - Soil Management Answers

1. Soil Degradation

What are the four major forms of soil degradation?

[Answer: Erosion, physical degradation, chemical degradation, biological degradation]

Name five different types of soil contamination.

[Answer: (1) salinization, (2) acidification (3) radionuclides, (4) accumulation of heavy metals, and (5) accumulation of toxic organic chemicals]

Why is soil biodiversity important?

[Answer: Soil organisms are a key component in a number of processes that affect the functioning of entire ecosystems. They play a role in nutrient cycling, development of soil structure, nutrient retention, disease suppression, carbon sequestration and pollutant degradation. Each different type of organism has a different role to play and as such the diversity of organisms in the soil is as important as the total number.]

The pedogenic regime associated with the tropical moist climates is _____.

[Answer: C] (c) laterization

2. Soil Quality

What is soil quality?

[Answer: Soil quality is the capacity of a soil to function in such ways as to sustain biological productivity and diversity, maintain environmental quality, and promote plant, animal and human health.]

How is soil quality measured?

[Answer: It is measured through a series of indicators (physical, chemical, and biological soil properties) of a soil's ability to perform given desirable functions (e.g. the accommodation of water entry, resistance to aggregate degradation, and the sustenance of plant growth).]

Of what importance is soil quality to all organisms that live in or on the soil?

[Answer: Soil quality is of vital importance to humans and all other organisms that depend upon the soil in any way. It is especially important to efforts to maintain biological diversity and sustainability of all soil functions.]

Why is soil quality of greater societal concern today than it was 100 years ago?

[Answer: Over 100 years ago most of the world's potentially arable land was covered with natural forests or grasslands, nutrients were being recycled, and the soil was protected from erosion. The quality of most soil was not being degraded.

The dramatic expansion in cultivated land needed to feed the growing human population has replaced natural vegetation with crop plants, which remove nutrients, leave the soil bare much of the year, and decidedly reduce biological diversity. This has resulted in widespread erosion, nutrient depletion and soil quality deterioration. If the quality of our soils declines further, the ability of the world to feed itself will also decline, as will the welfare of humans and all other organisms that depend on the soil.]

3. Soil Erosion

Erosion is:

[Answer: B] (b) movement of soil

What are some human activities that may lead to accelerated erosion?

[Answer: Activities that can lead to accelerated erosion include, but are not limited to, cutting forests, overgrazing, plowing hillsides, recreational activities (including ATV use), indiscriminate or arbitrary burning, construction of roads and buildings.]

Erosion can be caused by which of the following:

(a) rain falling on steeply sloping land

(b) a very hard rainfall

(c) rain falling on bare soil

(d) all of the above

[Answer: D]

How do individual raindrops lead to increased surface runoff?

[Answer: Splashing raindrops destroy soil structure. When a raindrop hits the soil surface, it detaches particles from soil aggregates and then places the loosened particles in suspension. When these particles are redeposited they plug soil pores and consequently reduce water intake. Once the soil dries, a crust develops at the surface and runoff is increased.]

Through which of the three types of water erosion is more soil lost?

[Answer: Although gully erosion looks more catastrophic, far more soil is lost by sheet and rill erosion.]

Give an example of why seasonal distribution of rainfall is an important factor in erosion.

[Answer: Little erosion will be caused by a rainfall in the early spring because the soil is still frozen, while the same amount of rain a few months later may cause substantial soil loss.]

Which of the factors below influences the erodibility of soil?

(a) slope of land surface

(b) loss of vegetative cover

(c) soil texture

(d) all of the above

(e) only A and B are factors influencing erodibility

[Answer: D]

What is the main purpose of a windbreak?

[Answer: Windbreaks and shelterbelts are used to control wind erosion. A windbreak may be a single row of trees along the windward side of a field, or a planting of number of species in several rows. They vary widely in composition and layout as a result of wide differences in soils and climate. Windbreaks also act as wildlife habitat, a shelter for natural predators (ie: woodpeckers and flickers

that consume cutworms, grasshoppers and beetles), provide fuelwood and act as recreational areas.]

Are there any negative consequences to creating windbreaks?

[Answer: Yes. Windbreaks can harbor various pests and they occupy space otherwise available for crop production. Also, the land on either side of a windbreak has reduced forage production as a result of increased shading and root competition.]

Farmers can protect their soil from erosion by:

[Answer: B] (b) building terraces and contour plowing

The Dust Bowl of the 1930's was largely caused by:

[Answer: A] a) wind erosion

Top soil is the most productive layer because:

[Answer: C] c) it is where most organic matter is found