



Soil Sample Test Questions/Answers

1. What is the depth of the A horizon?(0-3 points)
 - a. 3points +/- 1 inch
 - b. 2points +/-2 inches
 - c. 0point+/->2inches

2. What is the texture of the second horizon? (1 point)
- 3.
4. What is the texture of the provided sample?(1 point)

5. What is the percentage of clay in the provided sample? (3 points)
 - a. 3 points +/- 3%
 - b. 2 points +/-5%
 - c. 1 point +/- 7%
 - d. 0 points >7%

6. What is the slope between the stakes? (2 points)
 - a. 2points +/- 1%
 - b. 1point +/-2%
 - c. 0 point >2%

7. If a soil has 28% clay and 23% sand, what texture is it? (1 point)

Clay loam

8. A soil sample is a taken in a ring that is 10 cm tall and 6 cm in diameter. The oven dry weight of the soil is 339.2 g. What is the bulk density of the soil? Show your work. (2 points)
 - a. $\pi r^2 h = (3.14 \times 9 \times 10) = 282.6$; $339.2 / 282.6 = 1.2 \text{ g/cm}^3$

9. An acre-furrow-slice weighs approximately 2 million pounds or 2241 tonnes. Estimate the amount of Organic matter per acre (0.4 hectares) if the surface horizon contains 3.1% organic matter. (2 points)
 - a. $2,000,000 \times 0.031 = 62,000 \text{ pounds/acre}$
 - b. $2241 \times 0.031 = 694.71 \text{ tonnes/hectare}$
 - c.

10. What is the bulk density of the 0 to 2 inch horizon for the Moonlight component of soil map unit 79? (2 points)
- 0.10-0.30 g/cm³
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11. What accounts for the low bulk density of the 0-2 inch horizon for the Moonlight component of soil map unit 79? (2 points)
- It is an organic horizon
12. Name 5 components of the rangeland soil-food web. (5 points)
- Plants
 - Bacteria
 - Fungi
 - Nematodes
 - Arthropods
 - Protozoa
 - Grazing animals
 - Small animals
 - Higher predators
 - Songbirds
 - Humans
13. Specify the difference between a biological crust and a physical or chemical crust.(3 points)
- Biological crust is made of living organisms and their byproducts.
 - Physical crust or chemical crusts are formed from inorganic features such as salt crust or platy surface from compaction.
14. Sage brush is a mycorrhizal-obligate. What two nutrients do the mycorrhizae assist in the uptake? (2 points)
- Nitrogen
 - Phosphorus
15. A biological soil crust is an indicator of good rangeland health. Name four functions that biological crusts perform? (3 points)
- Stabilize soil
 - Increase carbon absorption
 - Help the soil to retain moisture
 - Help native plants germinate
 - Keep invasive species from establishing
 - Increased water filtration
16. Name the 4 soil health principles (4 points)
- Keep the soil covered
 - Keep a live root in the soil year round
 - Increase plant diversity
 - Minimize disturbance
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17. Name the 5 soil forming factors (5 points)
- a. Climate
 - b. Topography
 - c. Parent material
 - d. Plant/Animal
 - e. Time
18. What are three indications of soil compaction? (3 points)
- a. Increased bulk density
 - b. Platy structure
 - c. Poor water infiltration
 - d. Increased erosion
 - e. Poor plant growth
19. Name 3 effects that overstocking rangeland for extended periods of time would have on the soil? (3 points)
- a. Increased compaction
 - b. Decrease biotic crust
 - c. Increased erosion
 - d. Decreased water infiltration
 - e. Decreased organic matter
20. If range or agricultural land has a history of poor management (i.e. overstocking, over tillage, etc.), resulting in soil health degradation and substantial soil loss due to erosion, how can this trend be reversed? Name 4 ways to regain a properly functioning soil and improve soil health. (4 points)
- a. Prevent further erosion
 - i. Plantings
 - ii. Conservation measures
 - b. Increase plant diversity
 - i. Seedings
 - ii. Controlling noxious and invasive weeds
 - c. Add organic matter to the system
 - i. Cover crops
 - ii. Managed grazing
 - d. Break up compaction
 - i. Cover crops
 - ii. Disking
 - iii. Planting.
 - iv.
21. Name 4 characteristics a hydric soil may have. (4 points)
- a. Gleyed matrix
 - b. Reduced matrix
 - c. Redoximorphic concentration
 - d. Redoximorphic depletions

- e. Sulfur smell
 - f. Organic surface
 - g. Dark color
22. An area in a cropped field has no plants growing in it. A field inspection of the site found that the soil had a pH of 9.2. The soil also had an Electrical Conductivity (EC) of 2.5 dS/m. What is the problem with the soil? What physical characteristics might the soil have? What are some possible solutions to the soil problem? (5 points)
- a. What is the problem—the soil is sodic, or the soil has a high concentration of sodium salts
 - b. Physical characteristics—degraded soil structure, crusting, salt crusts
 - c. Solutions—replace the sodium on the exchange sites by treating with CaSO₄ (gypsum) or other sulfur compound and leaching (deep irrigation).
23. I am an earthworm looking for a good home. Name 3 things I am looking for in a soil?(3 points)
- a. Average to low bulk density
 - b. Organic matter
 - c. Thriving plant community
 - d. Good soil biodiversity
24. What are the three types of wind erosion? Describe each types movement? (4 points)
- a. Saltation—bouncing
 - b. Suspension—airborne
 - c. Soil creep—rolling
25. What are the three stages of soil erosion? (3 points)
- a. Detachment
 - b. Transportation
 - c. Deposition
26. Name 3 essential functions that healthy soil performs.(3 points)
- a. Regulating water
 - b. Sustaining plant and animal life
 - c. Filtering and buffering pollutants
 - d. Cycling nutrients
 - e. Physical stability and support (plants and manmade structures)
27. What are some conservation measures that landowners can take to prevent both wind and water erosion? (3 points)
- a. Conservation tillage
 - b. Wind breaks
 - c. Cover crops

Using the soil pit at this site evaluation the following aspects (A-F) of the soil profile.

- A) What is the depth of the O horizon?
- b) What are the major components of the O horizon?
- C) What is the depth of the A horizon

- D) What is the texture of the A horizon
- E) What is the depth of the B horizon?
- F) What is the texture of the B horizon?

Answers A-F are dependent on the site.

Six-point question: one point for each correct answer.

Assumption: the station captain is able to dig a soil pit at the site. Labeling the horizons ahead of time will help to save time for the students taking the test.

2. Based on the color of the A and B horizons in the soil pit, does this soil have a greater amount of organic matter in comparison to the sample provided by the station captain? Explain your answer.

Answer is based on the site. Assuming that the two soils being compared have a similar texture in most instances (but not all) if the soil pit horizons A and B are darker than the sample provided then it has more organic matter than the sample. If it is lighter in color then it has less organic matter than the sample.

Four point question: a) two points for the correct analysis and b) two points for the justification.

Assumption: the station captain is able to dig a soil pit at the site. Labeling the horizons ahead of time will help to save time for the students. The station captain is also able to provide a sample of A and B horizons from another area.

3. The dry bulk density of soil is?

- A. it is the ratio of mass to the volume of dry soil**
- B. it is the difference in weight between wet and dry soil
- C. the difference in mass between dry and wet soil
- D. it is the volume of soil at one atmosphere of air pressure
- E. it is the ratio of the volume of soil to the volume of water in the soil

Two point question

4. (4 pts) Based on the characteristics of the soil and the location of the site would it be appropriate to put a septic field in at this site. Describe your soil evaluation and explain your answer.

Answer depends on the site. In general if the soil is very sandy or near a body of water then it might not be appropriate to build a septic field because of the likelihood of waste getting into the body of water.

Four-point question: a) two points for correctly evaluation the soil and b) two points for the explanation why.

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5. Rank the soil particles according to their relative size. Ranking is 1-7, 1 designating the smallest particle and 7 the largest particle.

Medium sand **4**

Clay **1**

Fine sand **3**

Soil Sample Test Questions – October 2019

Very coarse sand 6

Silt 2

Gravel 7

Coarse sand 5

Six-point question: one point for each correct answer

6. Rank the following soil particles according to the cation exchange capacity of each soil particle. Ranking is 1 – 4, having the highest cation exchange capacity (CEC) and 4 having the lowest CEC

Sand 3

Clay 1

Gravel 4

Silt 2

Four point question: one point for each correct ranking

7. Utilizing the soil survey for this county, name two tree species that are likely to grow here.

The answer depends on the site

Four-point question: a) two points for each tree species correctly listed.

Assumption: a soil survey is available to be used by the students.

8. Explain how soil filters out water. Describe two soil functions.

As water percolates through the soil profile toxins such as heavy metals are removed from the water by adsorption associated with clays and humus. Soil also traps physical debris.

Two points for filtering out solid particles and binding heavy metals.

9. Explain how soil colloids can bind heavy metals. Why this important?

Heavy metals (e.g. lead and mercury) are toxic in high quantities. Negatively charged soil colloids adsorb these metals and clean the water as it passes through the soil profile. This is important to keep our groundwater clean.

Four point question: a) two points for binding heavy metals to colloids and b) two points for keeping ground water clean.

10. Describe two ways that farmers can reduce water erosion in their fields. Why is this particularly important near streams and lakes?

Farmers can reduce water erosion by terracing, contour stripping, establishing no till areas, creating buffer strips, and orientating crop rows perpendicular to the slope of the hill. This is particularly important where the run-off from erosion will end up in lakes and streams.

Five-point question: a) two points for each solution and b) one point for the importance of erosion control near water.