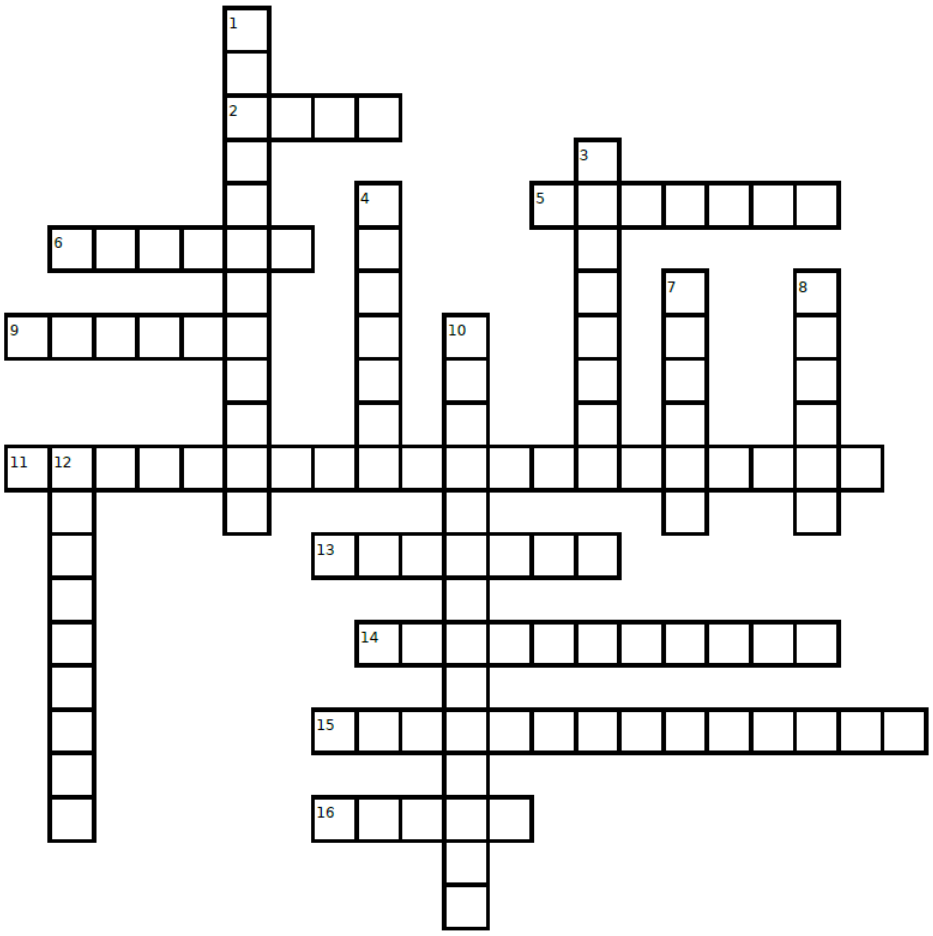
APBI 200 - Problem Set No. 3

Due: April 3, 2019 (by 5 pm)

1. Soil crossword puzzle



Down:

1. cations readily displaced by the mass ion effect are _____
3. earthworm castes contribute to aggregation and _____ soil structure
4. metallic ion is bonded to an organic molecule by means of multiple bonds
7. long threadlike filaments of fungi
8. Bf is a diagnostic horizon in which soil order
10. conversion of an element from the inorganic to organic form in microbial tissues
12. nitrogen fixing bacteria commonly associated with legumes

Across:

2. Bt horizon is enriched in _____
5. nitrogen-fixing, filamentous bacteria associated with alder
6. soils with EC > 4 mmho/cm are classified as _____
9. the type of soil acidity due to H+ and Al3+ ions in the soil solution
11. soil mixing due to shrink-swell clays
13. soil order with a B horizon enriched in clay
14. region in soil greatly influenced by root exudates and associated microbes
15. gaseous loss of NH3 from soil
16. secondary organic compounds formed by microbial decomposition known as ____ substances

[8 points]

Note: you will need to write your answers on a separate sheet, as you will not have enough space

2. Define the paired terms shown below.

Identify important distinctions between the paired terms. Explain how they differently affect what goes on in the soil and potential effects on plant growing conditions in the soil.

Biological nitrogen fixation & phosphate fixation

[6 points]

3. Consider the following data for four mineral soils that all have a clay loam texture:

Soil Property	**Soil #1**	**Soil #2**	**Soil #3**	**Soil #4**
pH	8.7	7.6	7.5	8.2
electrical conductivity (dS/m)	2.7	4.3	1.0	12.2
base saturation (%)	90	86	60	90
cation exchange capacity ($cmol_c/kg$)	12	9	18	11
exchangeable sodium (%) or ESP	16.6	2.5	2.1	15.8
Salinity classification				

a) Fill out the last row of the table indicating the salinity classification (i.e., saline, sodic, saline-sodic, or non saline) for each soil.

b) Which of the above soil(s) would most likely be in a dispersed state? Indicate why based on the information provided.

c) Briefly explain the role of sodium in dispersion.

d) What are the implications of a dispersed soil for plant growth?

[5 marks]

4. Identify the soil organism based on the descriptions provided. [Hint: consult lecture notes and your textbook]

   Who am I and what do I do?

   a) I can decompose organic matter
      I can produce antibiotics
      I am known to fix atmospheric N in forest ecosystems

   b) I associate with tree species (e.g. pine)
      I extend root systems
      I can interconnect trees below ground

[2 points]

5. Examine the soil profile found at this web address: https://monoliths.soilweb.ca/2-05/
   Describe any **1 soil formation factor** and any **1 soil formation process** that have likely occurred to produce this soil profile.

6. Identify the diagnostic horizon for the following soil orders

   a) Podzol
   b) Luvisol
   c) Gleysol

[3 points]

Total for problem set no.3 [26 points]