



# THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

DEPARTMENT OF AGRICULTURE

SECOND SEMESTER FINAL EXAMINATION- 2020

**AG 126 INTRODUCTION TO SOILS**

First Year Bachelor of Science in Agriculture [B.Sc.(Ag.)]

TIME ALLOWED :- 2½ HOURS

Tuesday 27<sup>th</sup> October, 2020 12.50 pm

Venue: AG1-32

## INFORMATION FOR CANDIDATES:

1. You have 10 minutes to read the paper. You must not begin writing during this time.
2. Questions are in **THREE** parts. Answer **ALL** from three parts in numerical order.
3. Answers must be written in the book provided. No other written materials will be required.
4. Rules, calculators and correction fluids are required in the examination room. Notes and text books are not allowed.
5. Write your name and student number clearly on the front page of your answer book and examination attendance slip. **DO IT NOW.**
6. Total marks = 50.

## PART A

Choose the correct answer from the options given. (1 mark x 15=15 marks)

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- The master horizon \_\_\_\_\_ is considered as the bio mantle of the soil.  
a. C                      b. B                      c. A                      d. R
- The soil with pH greater than 8.5, electrical conductivity greater than 4 dS/m and exchangeable sodium percentage more than 15% is a \_\_\_\_\_.  
a. saline soil      b. saline-sodic soil                      c. sodic soil                      d. calcareous soil
- A soil with bulk density value of 1.25 g/cc and particle density value of 2.5 g/cc shall have a total porosity of \_\_\_\_\_.  
a. 50%                      b. 60%                      c. 75%                      d. 25%
- Limed, manured and fertilized soils have more CO<sub>2</sub> production than untreated. This is due to \_\_\_\_\_.  
a. increased microbial respiration      b. increased organic matter decomposition  
c. a and b                      d. none of them
- Tensiometers can be used to measure \_\_\_\_\_ of soil.  
a. oxygen content                      b. matric potential                      c. solute potential  
d. gravitational potential
- A soil with Munsell's colour notation of 2.5 YR  $\frac{5}{8}$  shall have a chroma of \_\_\_\_\_.  
a. 2.5 YR                      b. 5                      c. 8                      d.  $\frac{5}{8}$
- \_\_\_\_\_ is a free-living nitrogen fixing bacterium found in the soil.  
a. *Rhizobium* sp                      b. *Frankia* sp                      c. *Azotobactor* sp                      d. *Anabaena* sp
- \_\_\_\_\_ is the chief end product of organic matter decomposition in anaerobic conditions.  
a. CO<sub>2</sub>                      b. NO<sub>3</sub><sup>-</sup>                      c. CH<sub>4</sub>                      d. Well decomposed humus
- Chemoautotrophic microorganisms of the soil derive their energy from \_\_\_\_\_.  
a. sunlight                      b. inorganic chemicals                      c. organic matter                      d. all of them
- Detailed soil survey maps are prepared best at \_\_\_\_\_ scale on aerial photographs.

- a. 1: 15,000      b. 1: 100,000      c. 1: 200,000      d. 1:1,000,000
11. The number of hierarchical classes in the Australian System of Soil Classification are\_\_\_\_\_.
- a. six                      b. seven                      c. five                      d. four
12. Soils of the order \_\_\_\_\_ have a clear or abrupt textural B horizon and in which the upper part of the B horizon is strongly acid.
- a. Kurosols              b. Chromosols              c. Kandosols              d. Dermosols
13. \_\_\_\_\_ is a specific pedogenic process, wherein, except iron and aluminium oxides and hydroxides, all other bases leached out from profile.
- a. Podzolization      b. Gleization              c. Laterization              d. Calcification
14. Vermiculite is an example for \_\_\_\_\_ of silicate clay.
- a. 2:2 type              b. 1:1 type              c. 2:1:1 type              d. 2.1 type
15. \_\_\_\_\_ is a secondary silicate clay having the highest specific surface area.
- a. Montmorillonite      b. Kaolinite              c. Illite                      d. Chlorite

## **PART B**

**Define the following terms/ phrases**

**(1 marks x 10=10 marks)**

- |                               |                                    |
|-------------------------------|------------------------------------|
| 1. Soil profile               | 6. Particle density                |
| 2. Hue                        | 7. Base saturation percentage      |
| 3. Eh                         | 8. Field capacity                  |
| 4. Reconnaissance soil survey | 9. Soil tilth                      |
| 5. Soil texture               | 10. Cation exchange capacity (CEC) |

## **PART C**

**Answer the following questions.**

**(5 marks x 5=25 marks)**

1. Enlist the soil forming factors. Describe how each soil forming factor influences the soil formation process (Pedogenesis).
2. Briefly explain the beneficial roles of soil organic matter on plant growth?

3. A soil core was extracted with a core cutter of 5.1 cm height, 5 cm internal diameter and it weighed 25 g with the caps. Core cutter with the caps on (and soil) was weighed on a top loading balance and their moist weight was recorded as 200 g. One of the caps was later removed and the core cutter with soil core was oven dried and reweighed. The oven dry weight of core cutter with dry soil and caps was 175 g. Calculate the bulk density and volumetric water content given that specific gravity of water is  $1 \text{ g cm}^{-3}$ . Clearly show each step of calculation and the formulae used for calculations.

4. Sketch a hypothetical soil profile, label different horizons and explain the importance of each horizon in the soil classification.

5. Briefly explain any five factors that influence availability of soil water to plants.

---Good luck---

