

UNIVERSITY OF FORT HARE

**PEDOLOGY
AGS 221**

JANUARY SUPPLEMENTARY EXAMINATIONS

2019

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TIME : 3 HOURS

SUBJECT : AGS 221

MARKS : 100

This paper consists of 6 pages including the cover page

Internal Examiners

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INSTRUCTIONS

1. Answer ALL questions.
2. It is in your best interest to write clearly and legibly.

QUESTION 1 [20]

- (a) Alice and Hogsback are located in arid and humid regions, respectively. Discuss how a combination of RAINFALL AND TEMPERATURE is likely to influence soil formation at both sites. Use the following guidelines in your discussion: soil depth, biota, degree of weathering, and erodibility. [10]
- (b) Using examples and equations where possible, differentiate the following soil forming processes: (i) alkalization and solodization (ii) Hydration and hydrolysis (iii) reduction and oxidation. [6]
- (c) Discuss the following processes:
- (i) Podzolization [2]
 - (ii) Salinization [2]

QUESTION 2 [20]

- (a) Soil classification is carried out for various purposes. Discuss FIVE (5) of these objectives. [10]
- (b) Briefly describe the 5 main diagnostic subsurface horizons that exhibit young soil conditions in the South African Classification System. [10]

QUESTION 3 [20]

With reference to the attached soil profile description and analytical data, answer the following questions:

- (i) Indicate the drainage condition of the soil and justify your answer. [2]
- (ii) Is the B1 horizon luvic or non-luvic? Explain your answer and show calculation. [3]
- (iii) For each of the horizons calculate the S-value and the base saturation. [3]
- (iv) Classify the soil as dystrophic, mesotrophic or eutrophic. Show your calculations. [4]
- (v) Identify as closely as possible the diagnostic surface and subsurface horizons. Explain your answer. [4]

- (vi) Identify the soil form using the SOIL CLASSIFICATION KEY provided. [2]
- (vii) Comment on the agricultural potential of the soil. [2]

Question 4 [20]

- (a) The USDA Soil Taxonomy recognizes 6 levels of classification. Outline the levels recognized in the USDA soil classification system. [6]
- (c) Discuss the subsurface horizons of the USDA Soil Taxonomy System [10]
- (d) Describe briefly what is meant by the following WRB Reference Soil Group:

- | | | |
|-----------------|----------------|-----|
| (i) Ferralsols | (iv) Calcisols | |
| (ii) Solonetz | | |
| (iii) Leptosols | | [4] |

Question 5[20]

- (a) Outline the purposes of soil surveys. [8]
- (b) Discuss the information that is collected during the pre-survey stage of a soil survey procedure. [12]

PROFILE DESCRIPTION

Climate	Subhumid to humid
Landscape (shape)	Convex
Slope (position)	Lowerslope
Slope (%)	6%
Slope (aspect)	South
Land use	Hyparrhenia grassland
Parent material	Dolerite
Mode of accumulation	In-situ weathering
Weathering	Fairly weathered
Effective depth	>120 cm

DESCRIPTION:

0 - 32 cms	Slightly moist: dark brown (7.5YR 3/4): sandy clay loam: weak fine to medium subangular blocky; friable: many fine roots; moderate permeability: gradual transition to:
32 - 75 cms	Moist: dark reddish brown (5YR J14): clay loam; apedal; friable; hard (dry); few fine roots: rapid permeability: gradual transition to:
75 - 135 cms	Moist; red (2.5YR 4/6); clay; apedal; slightly firm; very few fine roots; rapid permeability; gradual transition:
135 - 150+ cms	Moist; red (2.5 YR 4/6); clay; apedal: slightly firm; rapid permeability; gradual transition:

ANALYTICAL DATA

Horizon Depth (cm)	A1 0 - 32	B21 32 - 75	B22 75 - 110	B23 110 - 135	B24 135 - 150+
Fine earth (%)	97	99	100	100	100
Particle size distribution (%)					
coarse Sand	6	2		2	2
medium Sand	6	2		2	"
fine Sand	38	32	22	26	26
Silt	24	26	22	20	18
Clay	26	38	52	50	52
Organic C (%)	1.2	0.7	0.4	0.2	0.1
pH (water)	5.0	5.4	5.6	5.8	5.6
Exchangeable cations (cmol(+)/kg					
Na	0.10	0.15	0.15	0.2	0.2
K	0.25	0.10	0.10	0.0	0.0
Ca	0.95	0.60	0.50	0.4	0.6
Mg	0.40	0.45	0.60	1.0	1.2
C.E.C. (cmol(+)/kg soil)	3.93	4.21	4.35	4.5	4.7

KEY TO THE SOIL FORMS

DIAGNOSTIC HORIZONS AND MATERIALS			SOIL FORM	PAGE
TOPSOIL	SUBSOIL			
Organic	unspecified		CHAMPAGNE	48
Humic	yellow-brown apedal B	red apedal B	KRANSKOP	50
Humic	yellow-brown apedal B	unspecified	MAGWA	52
Humic	red apedal B	unspecified	INANDA	54
Humic	pedocutanic B	unspecified	LUSIKI	56
Humic	neocutanic B	unspecified	SWEETWATER	58
Humic	lithocutanic B		NOMANCI	60
Vertic	G horizon		RENSBURG	62
Vertic	unspecified		ARCADIA	64
Melanic	G horizon		WILLOWBROOK	66
Melanic	pedocutanic B	unspecified	BONHEIM	68
Melanic	soft carbonate horizon		STEENDAL	70
Melanic	hardpan carbonate horizon		IMMERPAN	72
Melanic	lithocutanic B		MAYO	74
Melanic	hard rock		MILKWOOD	76
Melanic	unspecified		INHOEK	78
Orthic	G horizon		KATSPRUIT	80
Orthic	E horizon	G horizon	KROONSTAD	82
Orthic	E horizon	soft plinthic B	LONGLANDS	84
Orthic	E horizon	hard plinthic B	WASBANK	86
Orthic	E horizon	yellow-brown apedal B	CONSTANTIA	88
Orthic	E horizon	podzol B + placic pan	TSITSIKAMMA	90
Orthic	yellow-brown apedal B	soft carbonate horizon	MOLOPO	122
Orthic	yellow-brown apedal B	hardpan carbonate horizon	ASKHAM	124
Orthic	yellow-brown apedal B	unspecified	CLOVELLY	126
Orthic	red apedal B	soft plinthic B	BAINSVLEI	128
Orthic	red apedal B	unspecified material with signs of wetness	BLOEMDAL	130
Orthic	red apedal B	soft carbonate horizon	KIMBERLEY	132
Orthic	red apedal B	hardpan carbonate horizon	PLOOYSBURG	134
Orthic	red apedal B	dorbank	GARIES	136
Orthic	red apedal B	unspecified	HUTTON	138
Orthic	red structured B		SHORTLANDS	140
Orthic	podzol B + placic pan		JONKERSBERG	142
Orthic	podzol B	unconsolidated material with signs of wetness	WITFONTEIN	144
Orthic	podzol B	unconsolidated material without signs of wetness	PINEGROVE	146
Orthic	podzol B	saprolite	GROENKOP	148
Orthic	prismacutanic B		STERKSPRUIT	150
Orthic	pedocutanic B	unconsolidated material with signs of wetness	SEPANE	152
Orthic	pedocutanic B	unconsolidated material without signs of wetness	VALSRIVIER	154
Orthic	pedocutanic B	saprolite	SWARTLAND	156
Orthic	neocutanic B	unspecified material with signs of wetness	TUKULU	158
Orthic	neocutanic B	soft carbonate horizon	ETOSHA	160
Orthic	neocutanic B	hardpan carbonate horizon	GAMOEP	162
Orthic	neocutanic B	dorbank	OUDTSHOORN	164
Orthic	neocutanic B	unspecified	OAKLEAF	166
Orthic	neocarbonate B	unspecified material with signs of wetness	MONTAGU	168
Orthic	neocarbonate B	soft carbonate horizon	ADDO	170
Orthic	neocarbonate B	hardpan carbonate horizon	PRIESKA	172
Orthic	neocarbonate B	dorbank	TRAWAL	174
Orthic	neocarbonate B	unspecified	AUGRABIES	176
Orthic	soft carbonate horizon		BRANDVLEI	178
Orthic	hardpan carbonate horizon		CÓEGA	180
Orthic	dorbank		KNERSVLAKTE	182
Orthic	lithocutanic B		GLENROSA	184
Orthic	hard rock		MISPAH	186
Orthic	stratified alluvium		DUNDEE	188
Orthic	regic sand		NAMIB	190
Orthic	man-made soil deposit		WITBANK	192