



FACULTY OF SCIENCE

DEPARTMENT OF BOTANY and PLANT BIOTECHNOLOGY

MODULE	ADVANCED PLANT TAXONOMY AND ECONOMIC BOTANY BOT0097
CAMPUS	APK
EXAMINATION	NOVEMBER 2016

DATE
28/November/2016

SESSION
08:30 – 11:30

EXAMINER:

PROF A. MOTEETEE

INTERNAL MODERATOR:

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EXTERNAL EXAMINER:

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DURATION: 3 HOURS

MARKS: 150

NUMBER OF PAGES: 6 PAGES

INSTRUCTIONS: ANSWER ALL THE QUESTIONS

QUESTION 1

[12]

- 1.1 Mention two (2) types of sources of macro-morphological characters that can be used for taxonomic purposes. (2)
- 1.2 Discuss how the following micro-morphological features can be used as sources of taxonomic data.

- 1.2.1 Secondary xylem (5)
 1.2.2 Leaf anatomy (5)

QUESTION 2

[15]

Discuss useful characters that can be obtained in palynology under the following headings:

(15)

- 2.1 Polarity
 2.2 Spore wall
 2.3 Apertures

QUESTION 3

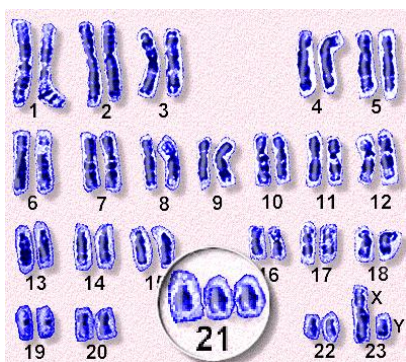
[10]

- 3.1 Discuss how megasporogenesis and megagametogenesis in flowering plants lead to several types of embryo sacs. (7)
 3.2 Which anther anatomy characters are of taxonomic value? (6 x ½ = 3)

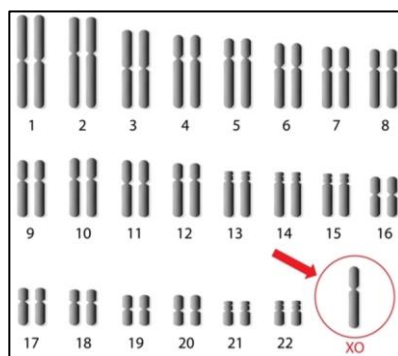
QUESTION 4

[10]

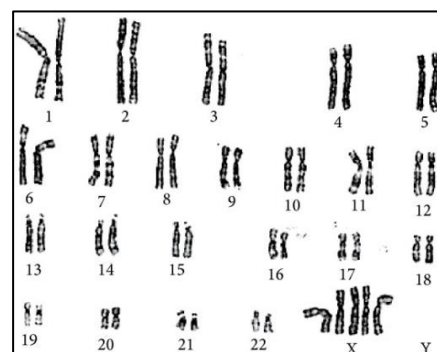
- 4.1 Given the karyotypes below, answer the questions that follow:



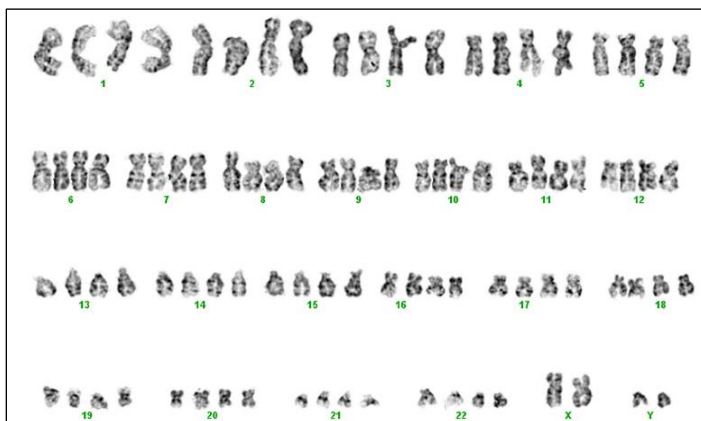
A



B



C



D

- 4.1.1 Which type of chromosome abnormality is exhibited by each of them? (4)
- 4.1.2 Which chromosome behaviour patterns have resulted in karyotypes shown in: (i) A-C and (ii) D? (2)
- 4.2 Distinguish between trisomy and triploidy. (1)
- 4.3 Make drawings to illustrate the three different positions at which the centromere can be located on a chromosome. (3)

QUESTION 5

[10]

- 5.1 Distinguish between biological species and taxonomic species concepts. (2)
- 5.2 Name and explain any four different spatial arrangements in which male and female reproductive organs can be organised on individual plants. (4)
- 5.3 Describe the following factors that prevent interbreeding in nature: (4)
- 5.3.1 Mechanical isolation
- 5.3.2 Ethological isolation

QUESTION 6

[10]

Discuss various classes of flavonoids as well as their chemical structures.

QUESTION 7

[8]

- 7.1 Discuss the process of electrophoresis and how the results could be used for taxonomic purposes. (5)
- 7.2 Which are the three main sources of DNA available for DNA sequencing in plants? (3)

QUESTION 8

[10]

- 8.1 According to Raunkiaer, which are the basic life forms of plants? Give both a name and its description. (7)
- 8.2 Which of the following plant families occur exclusively in southern Africa? (3)
- Lanariaceae, Lemnaceae, Stilbaceae, Pedaliaceae, Achariaceae, Rhamnaceae

QUESTION 9

[40]

- 9.1 Name three of the four famous early herbalists who contributed to the development of the history of plant classification. (3)
- 9.2 In which genera are the following botanists commemorated? (3)
- 8.2.1 Andrea Caesalpino
- 8.2.2 Gaspar Bauhin
- 8.2.3 Joseph Pitton de Tournefort
- 9.3 Discuss Linnaeus' classification under the following headings (also indicate the publications in which they appeared): (6)
- 8.3.1 Sexual system
- 8.3.2 Binomial system
- 9.4 Name any three organisms that have names which commemorate Carl Linnaeus. (3)
- 9.5 What do Michel Adanson, Antoine-Laurent de Jussieu, J.B.P. de Lamarck, and Augustin Pyramus de Candolle have in common? (2)
- 9.6 Name three groups into which Bentham and Hooker divided the dicotyledons. (3)

9.7 Why were the Salicaceae regarded as primitive and the Asteraceae as advanced by Adolf Engler and Karl Prantl?

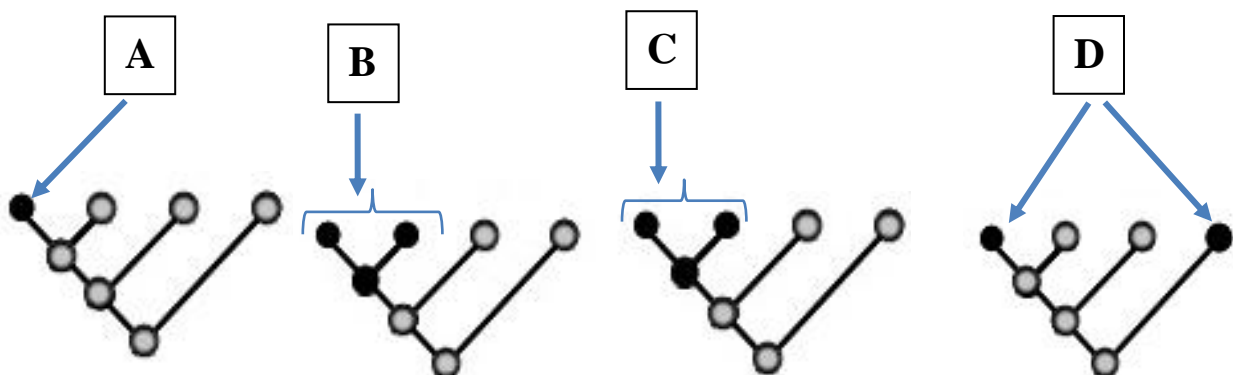
9.8 What are the basic principles of phenetic classification? (7)

9.9 Given the following data matrix, construct a similarity matrix using the coefficient of Gower (given below): (4)

$$S_{ik} = 1 - \frac{\sum_{j=1}^n \frac{|X_{ij} - x_{ik}|}{R_i}}{n}$$

	1	2	3	4	5
A	1	2	2	1	0
B	1	2	1	0	0
C	0	1	0	1	0
D	0	0	0	0	1

9.10 What type of evolutionary traits (indicated by arrows) are represented by the cladograms below? (4)



9.11 Outline the process of cladistic analysis, i.e. the steps that are followed. (5)

QUESTION 10

[15]

- 10.1 List five (5) principles of the International Code of Nomenclature for Algae, Fungi, and Plants. (5)
- 10.2 What are the alternative names for the following conserved family names? (3)
- 9.2.1 Compositae
 - 9.2.2 Labiatae
 - 9.2.4 Guttiferae
- 10.3 Explain the author citations in the following plant names: (3)
- 10.3.1 *Buxus natalensis* (Oliv.) Hutch.
 - 10.3.2 *Olea europaea* L. subsp. *africana* (Mill.) P.S. Green
 - 10.3.3 *Virgillia* Poir. in Lam.
- 10.4 Provide possible specific epithets for the plants described below: (4)
- 10.4.1 *Oxalis* with purple flowers
 - 10.4.2 *Carissa* with large fruits
 - 10.4.3 A tree-like *Aloe*
 - 10.4.4 The edible *Carpobrotus*

QUESTION 11

[10]

- 11.1 Discuss the works of William Henry Harvey and his contribution to South African plant collection. (5)
- 11.2 Name any four functions of a herbarium. (5)