

The University of Melbourne
Semester 1 Assessment 2005

School of Botany

606-303 Systematics of Plants and Fungi

Reading time: 15 minutes

Exam duration: 3 hours

This paper has 5 pages.

Authorised Materials:

No materials are authorised.

Instructions to Invigilators:

Students require 2 script booklets (each 16 pages). The examination paper may be removed from the examination room.

Instructions to students:

Answer all questions in the booklets provided.

Answer section A in one booklet and section B in a second booklet.

Note that there are internal choices for some questions. Plan answers carefully.
Marks and suggested time per question are indicated.

This paper may be held in the Baillieu Library

SECTION A**Question 1 (10 marks, 10 minutes)**

- (a) Define the term homology and explain its relationship to the term synapomorphy as used in cladistic analysis.
- (b) Give an example of homology that relates to plant morphology.
- (c) Give an example of homology at the molecular level in plants.

Question 2 (10 marks, 10 minutes)

- (a) Explain how ontogeny can be useful in cladistic analysis, giving an example.
- (b) Explain how an outgroup is used to determine primitive and advanced characters. If you were doing an analysis of all living species of cycads, what outgroup would you use and why?

Question 3 (10 marks, 10 minutes)

- (a) Define the term parsimony and explain how it is used in cladistics.
- (b) The following is a sample data set of amino acid sequences for four taxa. A letter represents the type of amino acid (character) present at each of 10 positions in the sequence and a dashed line represents absence of an amino acid at a position.

Assume that "absence" is the plesiomorphic condition. Construct the most parsimonious cladogram for these four taxa and plot the character evolution (letter symbols for the amino acids) on the cladogram.

Taxon	Amino acids at positions 1-10 (characters)									
	1	2	3	4	5	6	7	8	9	10
A	-	G	L	S	A	D	G	V	L	V
B	M	E	L	S	-	D	Q	V	L	-
C	-	-	-	-	A	G	A	V	L	-
D	-	-	-	-	-	-	T	V	N	V

Question 4 (15 marks, 15 minutes)

The species complex of the highly variable plant water ribbons, *Triglochin procera*, was analysed by sampling populations across its geographic range. Why was the researcher justified in using phenetic methods to analyse the pattern of morphological variation? In your answer explain what is “phenetics” and the advantages of using the method at this taxonomic level.

Question 5 (15 marks, 15 minutes)

Choose one or the other of the following.

EITHER

Outline the application of phylogenetic systematics in the study of historical biogeography. Use examples from the Australian flora to illustrate your answer.

OR

Outline the application of phylogenetic systematics in studying the evolution of pollination syndromes. Use examples to illustrate your answer.

Question 6 (25 marks, 25 minutes)

Choose one or the other of the following.

EITHER

Discuss the use of molecular data in the discovery of the phylogeny of large genera in the Australian flora. Include in your discussion the impact these studies are having on the classification of these plant groups.

OR

Discuss, using examples, how the development of the Polymerase Chain Reaction (PCR) and associated methods have revolutionised molecular systematics. You should comment on what benefits the PCR-based techniques have over isozymes, DNA/DNA hybridisation and RFLPs.

SECTION B**Question 7 (25 marks, 25 minutes)**

Choose one or the other of the following.

EITHER

Explain the possible homologies of ovulate reproductive structures in Mesozoic seed-ferns and Angiosperms. Discuss how different interpretations affect hypotheses of seed-plant phylogeny and the implications for other significant characters.

OR

Briefly outline the ANITA hypothesis for the phylogeny of basal angiosperms and the main evidence on which it is founded. How does it differ from the long-held “ranalean” hypothesis explicit in the classification of Cronquist? What implications does the ANITA hypothesis have for the evolution of wood anatomy, carpel morphology, and the evolution of the female gametophyte.

Question 8 (25 marks, 25 minutes)

Using a simple cladogram, show the distribution of monoaperturate and triaperturate pollen. What does the Cretaceous fossil record tell us about the appearance and diversity of plants with these pollen types?

Question 9 (10 marks, 10 minutes)

- (a) What key characteristics are evidence of the monophyly of the Eumycota (true fungi)
- (b) Outline the distinguishing characteristics of the four phyla of the Eumycota (true fungi)
- (c) How do fungoid organisms in other kingdoms differ from the Eumycota?

Question 10 (10 marks, 10 minutes)

- (a) Define the following terms as applied to fungi: holomorph, anamorph, teleomorph and synanamorph
- (b) Where do anamorphs fit in the current classification of fungi; provide an example.

Question 11 (25 marks, 25 minutes)

Choose one or the other of the following.

EITHER

Discuss the types of data and analyses that can be used to delimit species of fungi. Outline problems in integrating the different types of data.

OR

- (a) Is the macro- and micro-morphology of the fungal fruit-body a good guide to evolutionary relationships? In your answer, include some examples from the following groups: truffles, boletes, puffballs, euagarics (mushrooms) and coral fungi.
- (b) Discuss one ecological or developmental feature that can be used to explain the variation observed in fruit-body morphology within clades of fungi.

End of examination