AM 05/IV.04 **INDEX NUMBER: _____**

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD
UNIVERSITY OF MALTA, MSIDA

MATRICULATION CERTIFICATE EXAMINATION
ADVANCED LEVEL
MAY/JUNE SESSION 2004

Subject Title	**BIOLOGY**
Paper No./Title	**Paper 4 (Practical)**
Date	**June 2004**

Directions to Candidates

- *Write your index number in the space at the top right-hand corner of this page.*
- *Answer ALL questions. Write all your answers this answer booklet. Drawings of biological material and graphical representations of data are to be made on the appropriate pages within this booklet.*
- *The mark allocation is indicated at the end of each question. Marks allocated to parts of questions are also indicated.*
- *You are reminded of the necessity for good English and orderly presentation in your answers.*
- *In calculations you are advised to show all the steps in your working, giving your answer at each stage.*
- *The use of electronic calculators is permitted.*

For examiners' use only:

Question	1	2	3	Total
Score				
Maximum	30	30	30	90

ADVANCED BIOLOGY IV (Practical)

1. You are provided with specimens **A**, **B**, **C** and **D**:

1.1 For each of specimens A, B, C and D, name **TWO** major taxonomic groups (any two from Kingdom, Phylum/Division and Class) within which the organism is classified. Write your answers in the table below:

	First major taxonomic group	Second major taxonomic group
Specimen A		
Specimen B		
Specimen C		
Specimen D		

[eight marks]

1.2 For each of specimens A, B, C and D, list those structural features **visible in the specimen provided** which are diagnostic of the particular phylum or division to which it belongs.

Specimen A:

Specimen B:

Specimen C:

Specimen D:

[twelve marks]

1.3 Select any **TWO** specimens from **A, B and C** (do not use specimen D for this part of the exercise) and:

(a) Comment on the probable mode of life of the organisms you have selected as indicated by their visible structural adaptations.

[four marks]

(b) Compare and contrast the visible structural adaptations of the two organisms you have selected.

[four marks]

1.4 Write brief notes on the structural features visible in Specimen D.

[two marks]

[Total: thirty marks]

2. Examine the external and internal features of the biological material provided. Draw clear, carefully labelled and annotated figures to illustrate these features. Use the space provided in the box below and in any of the blank spaces on the following pages for your drawing.

[Total: thirty marks]

Title:

Blank space to be used in conjunction with Question 2.

Title:

Blank space to be used in conjunction with Question 2.

Title:

Blank space to be used in conjunction with Question 2.

Title:

3. Wild Oat (*Avena* spp.) is a common spring-flowering grass in the Maltese Islands. Although a number of species occur, only two (*A.sterilis* and *A.barbata*) are very common. The two species bear a close structural resemblance but may be distinguished according to the length of their spikelets. Spikelets belonging to *Avena barbata* are generally between 3cm to 6cm in length whilst those belonging to *Avena sterilis* range from 6cm to 9cm in length. Nonetheless, identification on the basis of spikelet length is problematic since the range of phenotypic variation within the same species is comparable to the range of variation between species. You are provided with four Wild Oat inflorescences, each bearing a number of spikelets. The meaning of the botanical terms used in this question is illustrated in Figure 1 and Figure 2.

3.1 What is an "inflorescence"?

_____

[two marks]

3.2 Calculate the number of spikelets, range of spikelet lengths, range of pedicel lengths, mean pedicel length, mean spikelet length for each inflorescence. The length of each spikelet should, in this case, be measured from the insertion of the pedicel to the tip of the glumes. Tabulate your results in the space below:

[four marks]

3.3 Calculate the range of spikelet length, range of pedicel length, mean spikelet length and mean pedicel length across all inflorescences.

Range of spikelet lengths	
Range of pedicel lengths	
Mean spikelet length	
Mean pedicel length	

[two marks]

3.4 Construct a bar graph showing the distribution of spikelet lengths across all inflorescences. **Use the squared paper at the end of this booklet**.

[four marks]

3.5 Suggest an interpretation for the pattern obtained in the bar graph drawn in your answer to Question 3.4.

_____

_____

[four marks]

3.6 Use your answers to question 3.2 to draw a scatter diagram showing mean spikelet length (y-axis) against mean pedicel length (x-axis) for all four inflorescences. **Use the squared paper at the end of this booklet.**

[four marks]

3.7 Use the scatter diagram drawn in your answer to Question 3.6 to comment on any possible relationship between mean pedicel length and mean spikelet length.

_____

_____

[four marks]

3.8 Compare the patterns of variation in pedicel length and spikelet length within a single inflorescence.

_____

_____

_____

[two marks]

3.9 Comment, based on the results obtained, on the suitability of spikelet length and pedicel length as criteria for differentiating between species.

_____

_____

_____

_____

[four marks]

[Total: thirty marks]

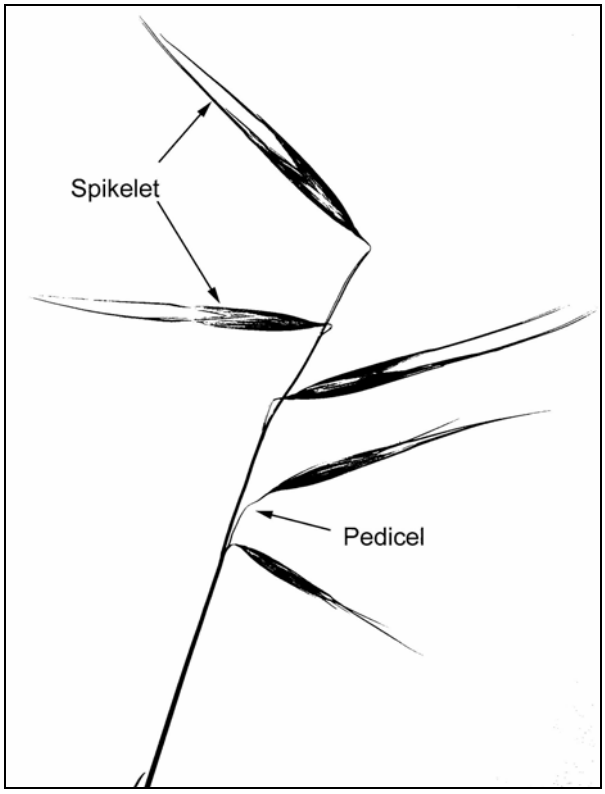

Figure 1: Inflorescence from *Avena* sp.

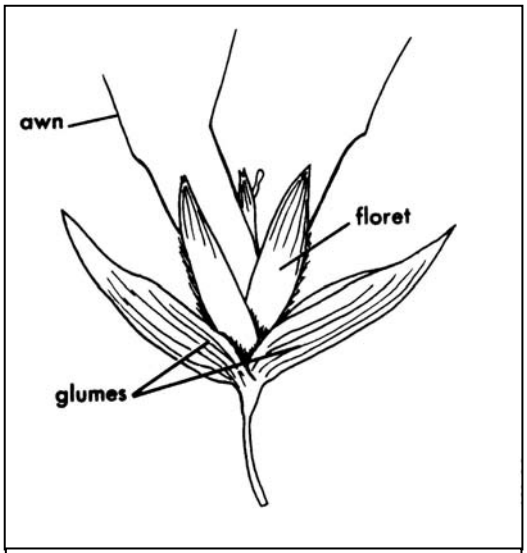

Figure 2: Detail of a single spikelet

ADVANCED BIOLOGY IV (Practical)

Squared paper to be used in conjunction with Question 3.

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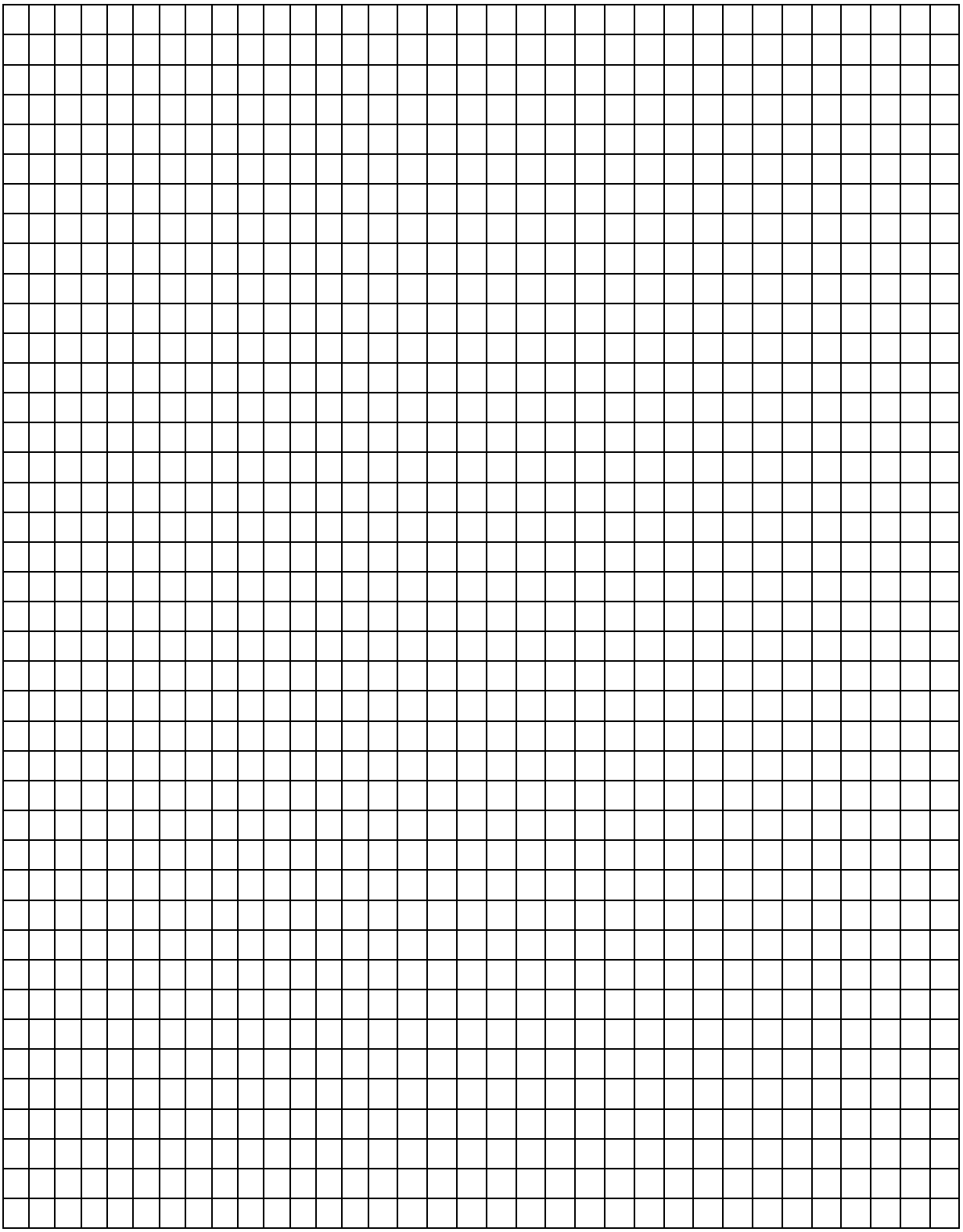

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Squared paper to be used in conjunction with Question 3.