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

MATRICULATION CERTIFICATE EXAMINATION
ADVANCED LEVEL
SEPTEMBER 2005

SUBJECT:	BIOLOGY
PAPER NUMBER:	III
DATE:	6th SEPTEMBER 2005
TIME:	9.00 a.m. to 10.30 a.m.

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 in the spaces provided in 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. Unless otherwise specified, you are advised to list results to one decimal place.*
- *The use of electronic calculators is permitted.*

For examiners' use only:

Question	1	2	3	Total
Score				
Maximum	20	15	15	50

ADVANCED BIOLOGY III

1. This diagram in Figure 1 represents a light microscope.

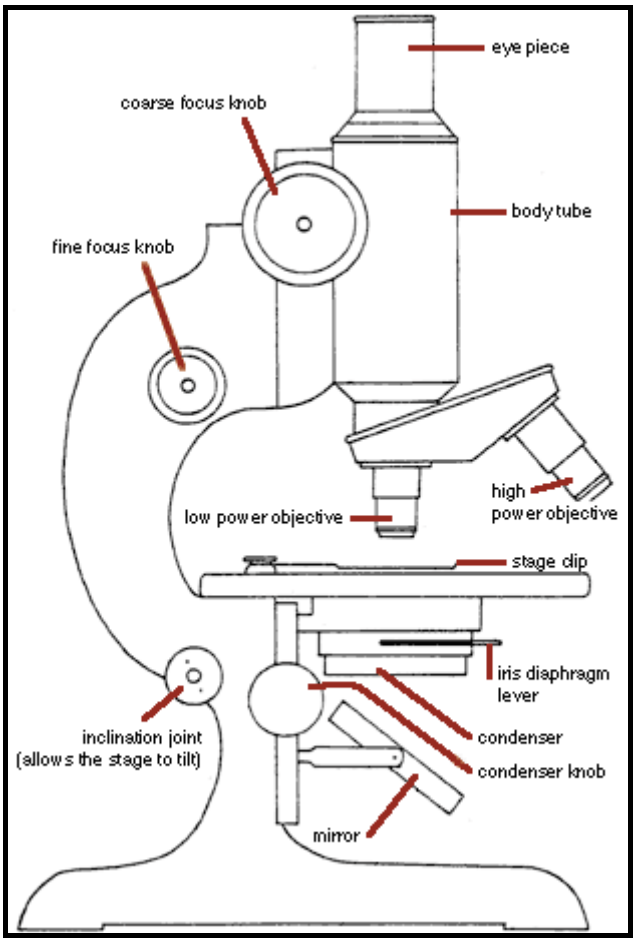

Figure 1

(Image source: http://www.lmpc.edu.au/resources/Science/research_projects/light_microscope/microscope_big.html)

1.1 Briefly describe how an observer may set up this microscope to observe a prepared slide under high power.

[five marks]

1.2 How may an observer calculate the magnification at which the slide is being viewed?

[three marks]

1.3 How would the brightness of the image observed at low power compare with that observed at high power?

[two marks]

1.4 Briefly describe how you would prepare a temporary slide showing a transverse section of a leaf.

[five marks]

1.5 Why would the microscope in Figure 1 not be considered suitable for counting the number of stomata on a leaf surface? Name a magnifying instrument that would be suitable for this purpose.

[three marks]

1.6 Why would the microscope in Figure 1 not be considered suitable for counting the number of mitochondria in a cell? Name a magnifying instrument that would be suitable for this purpose.

[two marks]

[total: twenty marks]

2. An investigator intends to estimate the size of five separate snail populations, each population occupying a separate garden. The five gardens are all part of the same residential complex and are therefore quite close to one another. The investigator decides to use the capture-recapture method for estimating population sizes.

2.1 Describe how the investigator may use this method to estimate the size of a snail population.

[five marks]

2.2 List TWO assumptions that the investigator is making when using this method.

[two marks]

2.3 List TWO practical problems that may arise when using this method.

[two marks]

After estimating the population size of snails in each garden, the investigator applies a pesticide that is toxic to snails. One week after the application of this pesticide, the investigator estimates the size of each snail population once again. The following results were obtained:

Garden Number	Population size BEFORE application of pesticide	Population size AFTER application of pesticide
1	103	57
2	12	9
3	343	200
4	93	12
5	16	5

2.4 Suggest the name of a **suitable** statistical test that may be used to determine whether the effect of the pesticide was statistically significant or not.

_____

[two marks]

2.5 Why is the statistical test you suggested in your answer to Question 2.4 particularly suitable for analysis of the results obtained?

_____

_____

_____

_____

[four marks]

[Total: fifteen marks]

ADVANCED BIOLOGY III

3. The photomicrograph in Figure 2 shows part of Sunflower (*Helianthus anuus*) in transverse section.

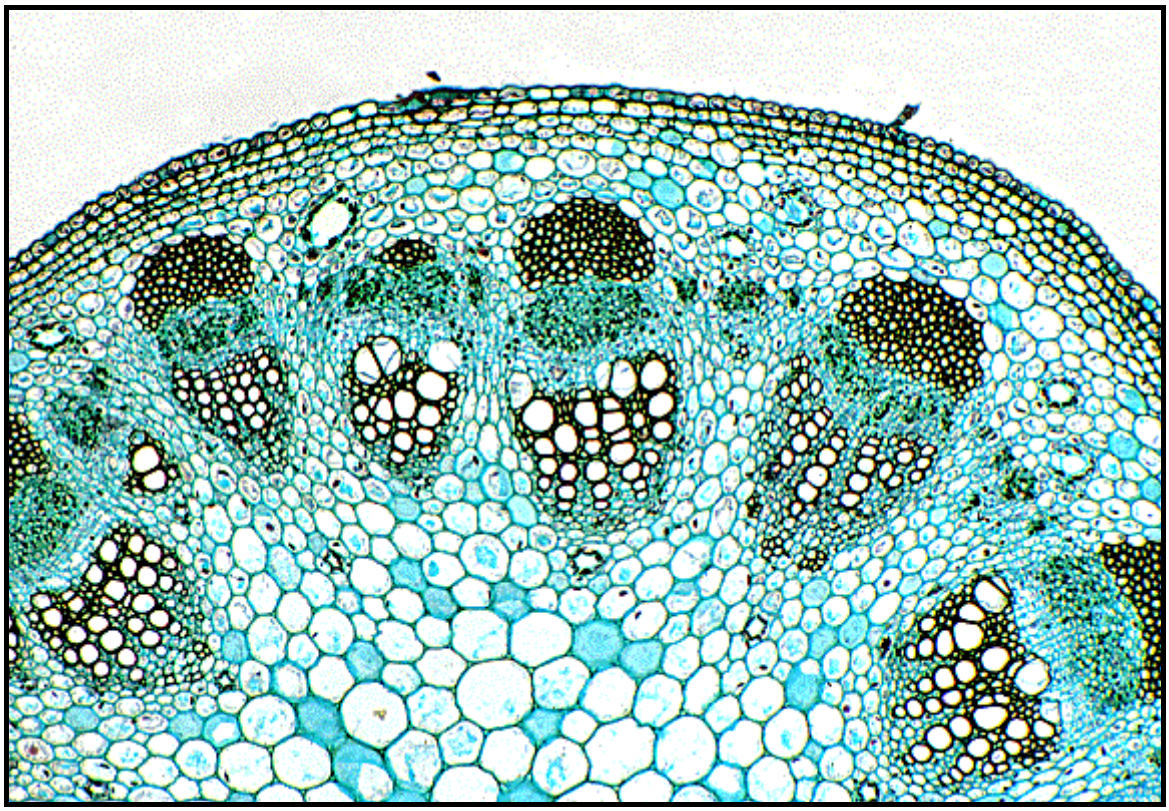

Figure 2: Transverse section through Sunflower (*Helianthus anuus*)

(Image source: http://www.uri.edu/artsci/bio/plant_anatomy/76.html)

3.1 Through which part of the plant has this section been taken?

_____

[two marks]

3.2 Label the photomicrograph in Figure 2 to indicate the following structures:
(a) Epidermis
(b) Collenchyma
(c) Xylem
(d) Phloem

[four marks]

3.3 Is *Helianthus anuus* a dicot plant or a monocot plant? Give a reason for your answer.

_____

_____

[two marks]

3.4 Draw a labelled low power map of the section shown in Figure 2. Use the space provided in the box below for your drawing.

[four marks]

3.5 Given that the magnification of the photomicrograph in Figure 2 is x30, calculate the **approximate** diameter of the original specimen. Show your working.

[three marks]

[Total: fifteen marks]