

OLLSCOIL NA hÉIREANN
GAILLIMH

NATIONAL UNIVERSITY OF IRELAND
GALWAY

M.Sc. in Biomedical Science

Spring Examinations 2000

OPTICS and CELL BIOLOGY

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Time allowed: **TWO** hours

Answer **THREE** questions.

- Q.1 Describe quantitatively the role of a lens in image magnification. Discuss some of the shortcomings of a simple spherical lens and indicate, with examples, how these can be overcome.

Outline the various elements which affect the useful magnification of a microscope, paying particular attention to the roles of the objective and the image sensor.

- Q.2 Answer (a) or (b)

(a) Outline the operation of several different types of optical detectors. Discuss one type in detail paying particular attention to its benefits and shortcomings.

(b) Outline the main components of a bright-field compound microscope. Discuss in detail the components that must be added to this arrangement to produce an epi-fluorescence microscope.

- Q.3 Answer (a) or (b)

(a) Discuss the benefits and short-comings of confocal microscopy in cell biology.

(b) Outline the technique of flow cytometry and describe its application in the study of apoptosis or any other biological process.

(cont.....)

Q.4 Answer (a) or (b)

(a) Discuss the role of fluorescent probes in biology. Outline some of the biological parameters which can be measured with them.

(b) Describe the application of optical imaging to the detection of intracellular ion concentrations (Ca^{2+} , for example).

Q.5 Write notes on **two** of the following:

(a) The operation and application of Laser Tweezers and Scissors.

(b) The use of confocal microscopy in the study of the role of cell adhesion and the cytoskeleton in the developing embryo.

(c) The wave nature of light: its influence on optical imaging.