

OLLSCOIL NA hEIREANN, GAILLIMH
NATIONAL UNIVERSITY OF IRELAND, GALWAY

SUMMER EXAMINATIONS 2000

M. Sc. Biotechnology

First Year

First Paper

EXTERN EXAMINER Professor C M Brown

INTERN EXAMINER Internal Examiners

TIME ALLOWED: **3 hours**

ANSWER **FOUR** QUESTIONS IN TOTAL.

PLEASE USE **SEPARATE** ANSWER BOOKS FOR EACH QUESTION.

1. "The production of citric acid by *Aspergillus niger* requires a high degree of process control." Discuss.
2. Write notes on three of the following:
 - (i) Oxygen electrodes.
 - (ii) Dialysis cultures.
 - (iii) The use of exhaust gas analyses in bioprocessor monitoring.
 - (iv) Yields and theoretical yields.

3. Write an essay on bioreactor systems used for Soy Sauce production.
4. When scaling up a bioprocess, in which areas do most problems occur? Discuss the reasons for these problems, and for one problem only, describe the approaches used to overcome them.
5. Discuss approaches to the sterilisation of large bioprocessors and their contents.
6. What do you consider to be the three main quantitative criteria to be optimised when developing an industrial fermentation? Why? Discuss how simple continuous (chemostat) cultures perform with respect to these criteria, when compared with batch cultures. What advantages might continuous cultures with cell recycle/retention have in these respects?