GX2211

OLLSCOIL NA hEIREANN, GAILLIMH
NATIONAL UNIVERSITY OF IRELAND, GALWAY

SUMMER EXAMINATIONS 2001

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 WHICH **MUST** INCLUDE QUESTION 1.

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

1. An organism was cultured in a 1-litre fermenter. You are supplied with a set of culture densities (540 nm) and product titres (mg/l) for the fermentation. Produce suitable plots of these, and answer the following questions:

   (i) What is the Maximum Specific Growth Rate (μMax) of the strain?

   (ii) At what stage does the exponential phase of growth finish?

(iii) Ignoring turn-around time, when would you harvest to maximise (a) Product Titre, and (b) Volumetric Productivity?

(iv) If the turn-around time per batch is 9 hours and the culture is harvested 12 hours after inoculation, what is the overall Volumetric Productivity?

Time (hours)	O.D. (540 nm)	Titre (mg/l)
1	0.06	0
2	0.06	0
3	0.06	0
4	0.06	0
5	0.06	16
6	0.08	50
7	0.11	60
8	0.14	80
9	0.20	110
10	0.26	200
11	0.35	300
12	0.47	450
13	0.62	550
14	0.84	600
15	0.80	650
16	0.79	635

NOTE: Graph paper (both semi-logarithmic and linear) is available.

2. Describe in detail the procedures for assembly, sterilisation and inoculation of the Applikon 2L jacketed Bioreactor Z61103CT012 where temperature control is performed through the glass jacket. What precautions should be taken when autoclaving the reactor with *in situ* pH, antifoam and D.O. probes? Briefly outine calibration procedures for these probes.

3. Describe the various phases involved in penicillin production using *P. chrysogenum* grown in submerged fermentation. List the desirable attributes of an ideal production strain.

4. Describe the various approaches used for sterilisation of large bioprocessors and their contents. What are the advantages and disadvantages of each approach?

5. Why do agitation and aeration typically cause problems during scale-up? Discuss the approaches used to overcome these problems.

6. Discuss the advantages and disadvantages of continuous processes (simple and complex) for industrial bioprocesses.

7. Discuss the provision of inocula for bioprocesses. Why does this sometimes cause problems on scale-up?