

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES
BACHELOR OF SCIENCE (HONOURS) DEGREE EXAMINATIONS
DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY
THEORY: BIOTECHNOLOGY OF PHARMACEUTICAL PRODUCTS SBB4208

May 2006

3 HOURS (100 marks)

INSTRUCTIONS

Answer **four** (4) questions only. Each question carries 25 marks. Where a question contains subdivisions, the mark value for each subdivision is given in brackets.

Illustrate your answer, where appropriate, with large clearly labeled diagrams.

1. The task of finding promising new drug candidates with optimized pharmaceutical properties is an on-going process, with hundreds of biopharmaceuticals either already on the market or in late-stage development.
 - a. Name five of the classes of pharmaceutical products in which research is either on-going or a pharmaceutical has been developed, giving one example in each class and its use.

(15 marks)
 - b. Many pharmaceutical products of non-human animal origin can be isolated directly from the animals that make them. Explain the reasons why recombinant human versions of those proteins are preferred.

(10 marks)
2. Consider the case where there has been the use of transgenic technology for the production of recombinant proteins in milk
 - a. Summarise the two methods of generating the transgenic goats (or mice).

(10 marks)
 - b. Describe, with the aid of a diagram, the structure and function of the plasmid that was invented to achieve this technology.

(15 marks)
3. Discuss, with suitable illustration(s) the different mechanisms of action of unmodified and conjugated monoclonal antibodies on a target tumour cell
4. Somatostatin was the first human polypeptide to be produced in bacterial cells.
 - a. In the body, where is it made and what are its functions?

(5 marks)
 - b. How was its gene constructed for incorporation into pBR322?

(15 marks)
 - c. What measures were taken to ensure easy recovery of the hormone?

(5 marks)

5. Improvements of *Penicillium chrysogenum* in fermentation technology have increased the yield of penicillins by more than a hundred thousand fold since its discovery.
- a. Name the techniques that have been employed to increase penicillin yields
(5 marks)
 - b. Although more sophisticated methods (like gene manipulation) are now available, why are classical methods still important in improving antibiotic yields?
(5 marks)
 - c. What are the reasons for side chain modification in beta-lactam ring antibiotics?
(5 marks)
 - d. Describe a fed-batch process and its application in the semisynthetic manufacture of penicillin
(10 marks)
6. Describe the Western blot assay in biopharmaceutical engineering. Include applications.

END OF EXAMINATION

