



# NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED BIOLOGY AND BIOCHEMISTRY

BACHELOR OF SCIENCE HONOURS DEGREE

## **THEORY: ADVANCED BIOTECHNOLOGY OF PHARMACEUTICAL PRODUCTS SBB 4208**

AUGUST 2009

3 HOURS (100 MARKS)

### **INSTRUCTIONS**

Answer Four (4) Questions. 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 labelled diagrams

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- 1.(a) (i) Define heterologous protein expression. [1 mark]
- (ii) State the advantages and disadvantages of using *E.coli* as a production system for recombinant biopharmaceuticals/pharmaceutical proteins. [12 marks]
- (iii) Outline the advantages and disadvantages of using transgenic plants as recombinant protein production systems. [12 marks]
- 2.(a) (i) Define hybridoma technology. [2 marks]
- (ii) Describe in detail the production of monoclonal antibodies. [14 marks]
- (b) (i) Define phage display. [2 marks]
- (ii) Give a simplified overview of the stages involved in phage display technology. [7 marks]
- 3.(a) List the advantages of using recombinant DNA technology in vaccine production as compared to traditional vaccine production methods. [8 marks]
- (b) The hepatitis B virus surface antigen (HBsAg) gene has been cloned and expressed in a variety of expression systems, including *E. coli*; *S. cerevisiae* and some mammalian cell lines.
- (i) Describe briefly the characteristics and composition of a specific recombinant hepatitis B vaccine you have studied [7 marks]

(ii) Give an overview for the production of another recombinant HBsAg vaccine, different from the one you mentioned in (i).

[10 marks]

4.(a) (i) Define the term interferon.

[2 marks]

(ii) Give an overview of the manufacture of a specific recombinant human INF- $\beta$  you studied.

[6 marks]

(b) (i) Insulin is a peptide hormone produced by the beta cells of pancreatic islets of

Langerhans. State the ways in which insulin orchestrates an appropriate metabolic responses to absorption of glucose and other nutrients.

[3 marks]

(ii) Describe the production of a specific recombinant insulin pointing out the challenges encountered and the purification steps undertaken.

[14 marks]

5.(a) State the medical challenges associated with the development of an AIDS vaccine.

[10 marks]

(b) Outline the advantages and disadvantages of DNA-based vaccines

[15 marks]

6.(a) Gentamicin belongs to a class of antibiotics called aminoglycosides. Describe in detail the stages involved in the industrial production of gentamicin.

[20 marks]

(b) Explain the mode of action of aminoglycosides.

[5 marks]

**END OF EXAMINATION**

