



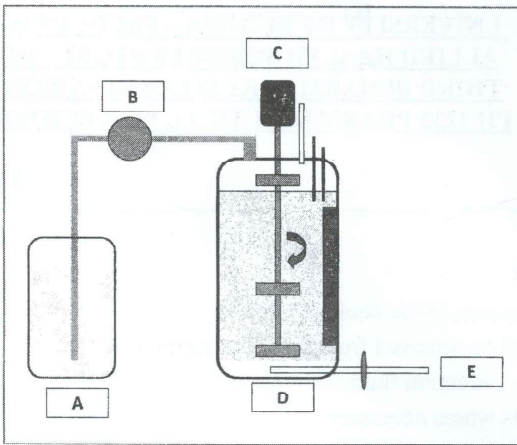
**UNIVERSITY OF RUHUNA – FACULTY OF MEDICINE**  
**ALLIED HEALTH SCIENCES DEGREE PROGRAMME**  
**THIRD BPHARM PART II EXAMINATION – JUNE 2017**  
**PH 3233 PHARMACEUTICAL BIOTECHNOLOGY- (SEQ)**

**TIME: TWO HOURS**

**INSTRUCTIONS**

- Answer **all** questions in the books provided.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.
- Use illustrations where necessary.

1. Recovery of the therapeutic protein from its producer cell source to the final product format is called downstream processing.
  - 1.1. Water for injection is used in downstream processing. Briefly describe the steps in the preparation of water for injection. (25 marks)
  - 1.2. Cell disruption is important in extracting intracellular proteins of microbes.
    - 1.2.1. State **five** methods used in cell disruption. (10 marks)
    - 1.2.2. Briefly describe **one** method mentioned in 1.2.1. (15 marks)
  - 1.3. Briefly describe ultra filtration method. (25 marks)
  - 1.4. Briefly describe ion exchange chromatography. (25 marks)
  
2. Human blood consists of plasma, in which cells are suspended.
  - 2.1. List **five** different types of blood components. (10 marks)
  - 2.2. State **five** advantages of separation of blood in to components. (10 marks)
  - 2.3. Briefly describe the preparation of platelet concentrate. (25 marks)
  - 2.4. State **two** conditions that indicated transfusion of platelet concentrate. (10 marks)
  - 2.5. Briefly describe the preparation of cryoprecipitate. (25 marks)
  - 2.6. State **two** conditions that indicated transfusion of cryoprecipitate. (10 marks)
  - 2.7. State **two** conditions that indicated transfusion of packed red blood cells. (10 marks)
  
3.
  - 3.1.
    - 3.1.1. Name **five** different fermented products available in the market and their conversion from the initial source. (15 marks)
    - 3.1.2. Schematically explain the production of Single Cell Proteins (SCPs). (10 marks)
  - 3.2.
    - 3.2.1. Name the process shown in the following diagram and its main parts A, B, C, D and E. (15 marks)



3.2.2. Graphically describe the variation of Biomass production, accumulation of the desired product and depletion of the energy source against the fermentation time. **(20 marks)**

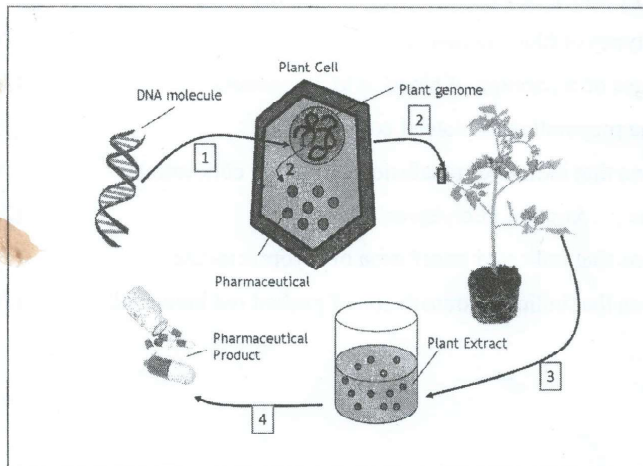
3.3. Briefly explain the factors that should be considered in the selection of raw material for fermentation process. **(15 marks)**

3.4. Briefly discuss the overall process of the production of novel microbial product with pharmaceutical application. **(25 marks)**

4.

4.1. Discuss the benefits of the production of plant based pharmaceuticals over other methods. **(20 marks)**

4.2. Explain **four** main steps involved in molecular farming shown in the following diagram. **(30 marks)**



4.3.

4.3.1. What is animal bio-technology? **(05 marks)**

4.3.2. State the importance of animal bio-technology. **(05 marks)**

4.3.3. Indicate key steps of making transgenic knockout mice using embryonic stem cells. **(40 marks)**

@@@@@@@@@@