Shahjalal University of Science & Technology, Sylhet

Department of Biochemistry and Molecular Biology

3rd Year 2nd Semester B. Sc. (Hons) Final Examination, 2013

Course No. : **BMB -328** Course Title: **Genetic Engineering**

Credit: **3.0** Total Marks: **70** Time: **3** Hours

Instructions:

- *Number in the right side indicates the marks of the question.*
- *Marks for each question are same.*
- ***Answer any two (2) questions from each Part (A and B).***

Part-A

1. a) Define the term genetic engineering. Write down the applications of genetic engineering. 3.5
   b) Outline the general strategy of DNA cloning from any organism. 3.0
   c) Scientists use restriction enzymes isolated from bacteria for DNA cloning. How do bacteria prevent restriction enzymes from dicing up their own DNA? 2.0
   d) Describe how, plasmid pBR322 is used to clone foreign DNA in *Escherichia coli* (*E. coli*) cells. What are its special features? 6.0
   e) What combinations of DNA could result after treating the plasmid DNA and the gene of interest with restriction enzyme? 3.0

2. a) Write down the important features of *(E. coli)* for using it as a host in cloning system. 1.5
   b) What are type II restriction endonucleases? Write down the mode of action of reverse transcriptase and alkaline phosphatase. 6.0
   c) Explain the following statements in relation to selection of the recombinant DNA using different selectable markers: (any two) 2.0x2=4.0

      i. Antibiotics affecting cell wall synthesis
      ii. Antibiotics affecting translation
      iii. Insertional inactivation of antibiotic resistance
      iv. Insertional inactivation of enzymatic activity

   d) Describe how, HRT and HART techniques are used for the detection of translational product encoded by a cloned gene. 6.0

3. a) Describe the features of a eukaryotic expression vector. 3.0
   b) What criteria are used to decide for a particular recombinant protein production in mammalian cell? 3.0
   c) How would you avoid the problems associated with the limited amount of oxygen available to growing *E. coli* cells when a foreign protein is overproduced? 2.5
   d) Describe at least two strategies for expressing two different heterologous proteins in one mammalian cell. 6.0
   e) Write down the commercial and medical applications of gene manipulation. 3.0

Part-B

4. a) Define the term protein engineering. Give an outline of protein engineering cycle for enzyme production. 4.5
   b) What is mutagenesis? Describe the oligonucleotide-directed mutagenesis strategy for recombinant protein production 6.0
   c) Write down the principle of deletion mutagenesis and PCR mediated *in vitro* mutagenesis. 7.0

5. a) What is knockout mouse? Distinguish between transgenic and knockout mouse. 1.5
   b) Discuss how you could prepare the mouse Embryonic Stem (ES) cells with a knockout mutation? 5.0
   c) Explain how, transgenic mice could be generated with targeted gene disruption. 5.0
   d) Describe the production process of recombinant insulin in *Escherichia coli* (*E. coli*). 6.0

6. a) What is Cosmid? How can you use Cosmid as a cloning vector? 4.5
   b) Describe the process of developing a target specific drug. 4.0
   c) Write short note on the following (any three): 3.0x3= 9.0
      i. Gene therapy iii. Host system
      ii. M13 vector system iv. Isolation of recombinant DNA