Shahjalal University of Science and Technology

Department of Biochemistry and Molecular Biology
B.Sc. (Hons) 3rd year 1st semester examination, 2013
Course No. 323, Course name: Molecular genetics
Credit 3, Total marks: 70, Time: 3 hrs.

Instructions:

- Numbers in the right side indicate the marks of the questions.
- Marks for the each question are same
- Answer any two (2) of each part

Part-A

1. a) Define genetics and epigenetics. 2
   b) What do you mean by bacterial conjugation? Describe the Hfr (high frequency recombinant) conjugation with a diagram. 1+4=5
   c) Describe the role of the following proteins of bacteriophage lambda regulatory system that control lytic and lysogenic development: 4
   i) cI, ii) cII, iii) cIII, iv) Q
   d) Discuss the genetic basis of lysogeny with a suitable diagram. 6.5

2. a) Distinguish between spontaneous and induced mutation? 3
   b) What is mutagen? Write down the names of different mutagenic agents. 1+3=4
   c) What is Ames test? Describe the methodology of this test. 4.5
   d) Define the following terms with example: 3x2=6
   i) Frameshift mutation, ii) Nonsense mutation, iii) Missense mutation

3. a) "Genetic recombination is catalyzed by many different enzymes" -justify the statement. 5
   b) What are the different types of genetic recombination in bacteria? 2.5
   c) Describe the mechanism of homologous genetic recombination. 6
   d) Write down the significance of genetic recombination in bacteria. 4

Part-B

4. a) What is the difference between DNA damage and DNA mutation? 3
   b) Write down the different types of DNA damage with an example of each. 4
   c) Describe the prokaryotic SOS response. 5.5
   d) DNA damage, DNA mutation, DNA repair are connected with the genome evolution, discuss. 5

5. a) What is an operon? Describe the positive and negative control of an operon. 1+5=6
   b) Draw the *lac* operon and show its components. 3
   c) What are the functions of each of the following in *lac* operon of *E.coli.* 4
   i) Regulator, ii) promoter, iii) *lacZ*, iv) *lacY.*
   d) Discuss that the repressor is controlled by a small molecule inducer. 4.5

6. a) Discuss the causes of point mutation. 3.5
   b) Mention the functions of the following enzymes with special reference to their role mutation repair. 3x2=6
   i) DNA glycosylase, ii) DNA photolyase, iii) Topoisomerase.
   c) Write down the properties of transposable genetic elements. 4
   d) Write short note on "Holiday model of DNA recombination" 4