Molecular Biology and Genetics
BEL 204
MAJOR EXAMINATION

Duration: 2 Hours
MM-40

Date: 9th May 2007

(Instructions in bold letters are strictly to be foll..d to avoid penalty)

1. Write the characteristics of prokaryotic promoter sequence. What will happen to transcription if the α-C terminal domain of RNA polymerase is mutated? (2+2=4)
2. What do you understand by abortive initiation of transcription? What could be the possible reason for such a wasteful process? (1.5+1.5=3)
3. i) Differentiate between Rho dependent and Rho independent transcription termination.

   ii) Briefly write about the two common post-transcriptional modification of mRNA. (3+5=8)

   OR

   Write short notes on (4x2=8)

a) σ-dependent initiation of transcription
b) Differential affinities of CI and Cro for operators
c) Transcriptional control by attenuation
d) Capping of RNA

4. Multiple choice questions (5x1=5)

a) The translation process in eukaryotes requires all of the following except: i)ribosomes; ii)RNA polymerase; iii) amino acyl t-RNA synthetase enzymes; iv)transfer RNA; v) elongation factors

b) An enzyme (lactic dehydrogenase) contains 4 identical subunits. The total molecular weight of the quaternary enzyme is 150,000 daltons. Assume that the average molecular weight of an amino acid in a typical protein is 100 daltons. How many nucleotides of exon DNA are required to code for one subunit of this protein?
i) 375; ii) 500; iii)1125; iv) 1500; v) 4500

c) An aminoacyl t-RNA synthetase enzyme must:
i) recognize a particular amino acid; ii) recognize different m-RNA ..ules; iii) distinguish 40s from 60s ribosome subunits; iv) bind to the anticodon site of a t-RNA molecule by ..lementary base pairing; v) all of the abov

d) Transcription is turned off by
i) induction; ii) activation; iii) repression; iv) all of the above

e) In regulation by repression
i) a sugar, such as lactose, acts as an inducer and combines with the repressor to prevent transcription; ii) an inducer activates the activator so that it binds to DNA and prevents transcription ; iii) an amino acid activates the repressor so that the repressor binds to the operator and prevents transcription ; iii) an amino acid binds to the operator, blocking the repressor, allowing transcription to proceed

5. What are the major events deciding lysogeny in lambda phage. Write just the major points with diagrams. (5)

6. a) What would be the % variation (increase or decrease) of the length of a $2X10^6$bp long B DNA if it were to take A form? (2)

   b) What would happen to a dsDNA if it is kept i) at pH12 and ii) in water? Why? (2)

7. a) The error rate of incorporation by DNA polIII is 1 per 10^5 bases but the rate of such misincorporation during entire replication process is 1 per 10^8 bases. What is the reason for this? Answer in not more than 2 sentences. (2)

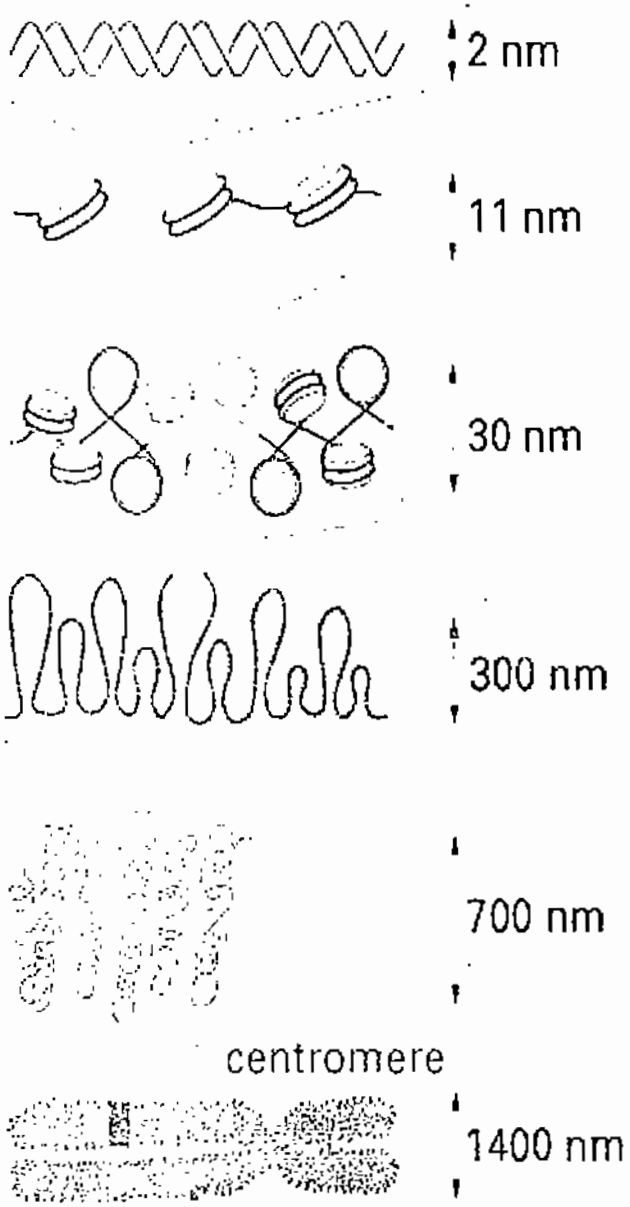
   b) What will happen to *E. coli* cells having temperature sensitive mutation in *dnaG* gene, i.e., the gene is nonfunctional at 37^0 C, if the growth temperature is raised to 37^0 C after replication has started? Explain in 2 sentences. (2)

P.T.O.

8. F2 progenies of the flies have the following characters

44 tan, long 14 tan, short 16 dark, long and 6 dark, short, where tan and dark refer to body colour and long and short to wing size. Which characters are dominant? What would be the genotypes of the parents of F1 progenies? (3)

9.



Name the stages shown above except the last but one. Assuming that the last stage comprises $1X10^8$ bp of DNA, what would be the packing ratio? If you isolate total protein from a chromosomal preparation, which of the following band pattern will you see and explain in 1 sentence what these bands represent and their role? (4)

Five bands, b) five major bands and many minor bands
