

LS2202; Molecular genetics; Instructor: Arnab Gupta

1. State 2 differences in replication machinery between prokaryotes and eukaryotes. (2)
  2. Mention the function of (a) primase (b) SSBP (2)
  3. In a PCR the melting temperature of 93-95°C is used twice, once for 5 mins in the initial phase and the next time for 30sec – 1min for 30-35 cycles. Explain. (2)
  4. Why is Taq polymerase used in PCR rather than other DNA polymerases? (2)
  5. In a cloning and expression vector, why viral promoters are preferred over eukaryotic promoters? (2)
  6. State the cause of Transcriptional abortive initiation. (2)
  7. How would you design your primers to construct a cDNA of your interest from a HeLa cell mRNA pool? (2)
  8. In bacteria, even after replication, nascent DNA remains protected from Restriction Endonucleases. How?(2)
  9. In regards to restriction enzymes, what is a 'staggered cut'? Why are they preferred over 'blunt end' cuts in making a cDNA construct? (2)
  10. There is a single type of Methionine charged tRNA in *E. coli*. How it specifies the initiating and internal methionine residues in case of translation? (2)
  11. (A). How many reading frames are applicable in case of translation in 5' to 3' direction?  
a) 1 b) 2 c) 3 d) all of the above  
(B). Prokaryotes may have more than one ORF and are thus known as \_\_\_\_\_ mRNAs. (1+1 = 2)
  12. (A) Per cell, \_\_\_ types of tRNA would be required to provide a one-to-one correspondence between tRNA molecules and codons that specify amino acids.  
(B) What are the 3 binding sites of tRNA with the ribosome? (1+1 = 2)
  13. A cDNA clone containing gene 'abc' expresses the protein ABC in bacteria with ease. However it fails to get expressed in HeLa cell lines. Discuss 2 possible reasons. (2)
  14. What problem does a bacterium face after the complete replication of the two strands? How topoisomerases help to resolve this? (2)
  15. What is the difference between transformation and transfection? Write down only the name of procedure of each of these. (2)
  16. Suppose you have a plasmid, containing a specific antibiotic resistant gene. What will be the steps to confirm for which particular antibiotic the plasmid is resistant? (2)
  17. Using diagram annotate the upstream and downstream position of a transcribing gene. What is a start site? What is the binding position of polymerase (upstream/downstream)? (2)
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18. Design an experiment using PCR to distinguish between eukaryotic genomic DNA and a cDNA for the same gene. (3)
  19. Telomerase is an RNA-dependent DNA polymerase. True/False. Justify your answer in 2-3 sentences. (3)
  20. What is a polysome? Explain with figure.(3)
  21. Using only a figure, state the steps and regulatory components of protein insertion into ER membrane. (3)
  22. The human genome consists of ~20,000 genes. State a molecular regulatory mechanism of the 'central dogma' by which such a complex and evolved organism is shaped by such a few numbers of genes. (3)
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23. This strand of DNA is going through the transcription process, write down the complementary mRNA sequence-  
5' ATTGCAACCGTTCAAGC 3' (1)

