

## **Chapter 5 - CASE STUDY QUESTIONS**

**DASNEEM BANU BINTI HAJA(A24CS0066)**

### **Question 1:**

Explain the role of telomerase in the maintenance of eukaryotic chromosomes. Why is it essential for cells with linear chromosomes?

- The telomeres at the end of the eukaryotic chromosomes consist of a six base pair sequences repeated about 2000 times.
- During each replication cycle the chromosomes are shortened due to loss of the RNA Primer.
- Telomerase cancels this loss out by adding a few of the six base pair chunks.
- Telomerase carries with it a small part of RNA complementary to the six base pair telomere repeat. This makes it to recognise the telomeres and reminds it what sequence to make.
- It is essential because for a circular DNA molecule, replication goes around the circle and fills the gap from behind where the primer used to be while a linear chromosome would get shorter by one primer length, each time it is replicated.

### **Question 2:**

Describe the differences between eukaryotic and prokaryotic transcription processes, focusing on the role of RNA polymerases and promoters.

- Prokaryotes use single RNA polymerase for all RNA synthesis while Eukaryotes use RNA polymerase I for large ribosomal RNAs, RNA polymerase II for genes which code for proteins and RNA polymerase III for tRNA, 5S Rrna and other small RNAs.
- Promoter in prokaryotic is simple with region -10 and -35 which is directly recognized by RNA polymerase while promoter in eukaryote more complex and consist of three region which is the initiator box, the TATA box and upstream element.

### **Question 3:**

What is the significance of RNA splicing in eukaryotic gene expression, and how does it differ from the transcription process in prokaryotes?

- RNA splicing is important for eukaryotic gene expression because it involved in producing functional mRNA which includes removal of introns that known as splicing, cutting out introns and joining the ends, recognised as a true mRNA molecules.
- In eukaryotic, pre-mRNA which contains introns and exons is produced while in prokaryotic, mRNA produced directly.
- In eukaryotic have RNA processing while in prokaryotic no RNA processing required.

### **Question 4:**

How do enhancers and transcription factors work together in the regulation of eukaryotic gene expression?

- Enhancers are the DNA sequences that increase gene transcription, and it works by binding to transcription factors.
- Transcription factors are protein that bind to enhancers to regulate gene expression.
- The transcription factors binds to the enhancers. When an enhancer is activated, the DNA between it and the promoter loops out.