The Lac Operon Quiz

This quiz can be used with the video https://www.youtube.com/watch?v=8WQmCpZkcOM

1. What is a gene?
2. What is transcription?
3. What is translation?
4. What is a transcription factor?
5. How is gene expression regulated by transcription factors in eukaryotes?
6. What is an operon?
7. What is the function of the promoter of the operon?
8. What is the function of the operator of the operon?
9. What is the function of the regulatory gene of the operon?
10. What 3 structural genes are found in the lac operon?

11. What does the *lac*I regulatory gene do?
12. Describe what happens in the lac operon when lactose is not present.

13. Describe what happens in the lac operon when lactose is present.

Answers

1. A gene is a short section of DNA that codes for a protein.
2. Transcription is when RNA polymerase makes a copy of the DNA code called mRNA.
3. Translation is when the mRNA goes to the ribosomes to be used to produce proteins.
4. A protein that alters the rate of transcription. Transcription factors can bind to DNA and act as either activators or repressors of transcription.
5. Transcription factors bind to DNA before the gene it controls the expression of. If it's an activator it will allow RNA polymerase to bind to the DNA so transcription can begin. If it's a repressor it will stop RNA polymerase from binding to the DNA so transcription can't occur.
6. An operon is a section of DNA that contains structural genes that are transcribed together, control elements (made up of a promoter and an operator) and sometimes a regulatory gene. Operons are found in prokaryotes.
7. The promoter of an operon is where RNA polymerase binds to the DNA.
8. The operator of an operon is where transcription factors bind to the DNA.
9. The regulatory gene of an operon codes for a transcription factor.
10. *LacZ* codes for β-galactosidase, *lacY* codes for lactose permease and *lacA* codes for β-galactoside transacetylase. *LacZ* and *lacY* code for proteins important in the breakdown of lactose so E.Coli can use the lactose for respiration. Less is known about the function of the protein coded for by *lacA*.
11. The *lacI* regulatory gene codes for a transcription factor that slows down the rate of transcription called the lac repressor.
12. When lactose is not present the lac repressor transcription factor can bind to the operator DNA region of the operon. This blocks the promoter so that RNA polymerase can't bind to the promoter. Therefore transcription can't occur (mRNA is not produced) and the 3 structural genes are not expressed (the proteins they code for are not produced).
13. When lactose is present it binds to the lac repressor transcription factor. This changes its shape so that it can no longer bind to the operator region of the operon. RNA polymerase is now able to bind to the promoter so transcription can begin. mRNA is produced so the proteins coded for by the 3 structural genes are produced.