

### **DNA close up**

A look at the structure of DNA. Notice the “anti-parallel orientation of DNA, (one strand goes “up” while the other strand goes “down”). The directions are referred to as 3’ (“Three Prime”) and 5’ (“Five Prime”). So, one strand runs from 3’ to 5’, the other strand goes from 5’ to 3’.

Q1 – How many hydrogen bonds exist between a cytosine to guanine base pair? Adenine to thymine?

### **DNA replication**

On overview of how DNA is replicated, or copied. Pay close attention to the following components: helicase, primase, DNA polymerase, but have a look at them all.

Q1 – What is meant by “semiconservative” replication? Q2 -Which enzyme is responsible for unzipping the double stranded DNA? Q3 – To which end of DNA (3’ or 5’) are new nucleotides (bases) added? Q4 – What is the purpose of the RNA primer?

### **Transcription**

Overview of transcription, making RNA from DNA.

Q1 – To which part of the DNA does RNA polymerase bind? Q2 -To which end of RNA (3’ or 5’) are new nucleotides (bases) added? Q3 – What is the RNA product of transcription called?

### **Translation**

Overview of translation in prokaryotes. Pay attention to the third segment, which details the process of translation. Notice that many Ribosomes attach to one mRNA strand.

### **Transfer RNA (tRNA)**

Structure of a tRNA molecule. View the “simple diagram.” Note how the tRNA contains information for interacting with nucleic acids (the anticodon) and proteins (amino acid attachment site).

Q1 – How many possible codons are there in the genetic code? Q2 – What is the sequence of the start codon? What is its anticodon? Q3 – A tRNA doesn’t bind to the stop codon. What does?

### **Mutations**

Overview of mutations, what they are, how they occur. Watch the “Mutations and mutagens” animation. You do not need to about DNA repair, but it is interesting.

Q1 – What is a mutation? Q2 -How do mutations occur, ie, during what process do they occur? Q3 – How does ionizing radiation differ from nonionizing radiation? Q4 – Why are frameshift mutations so damaging? Q5 – Which type of base substitution mutation is the most harmful? Why?

### **Horizontal Gene Transfer**

Overview of horizontal gene transfer, with a focus on transformation and transduction. Observe both the transformation and transduction animations.

Q1 – In the Griffiths experiment, how did he conclude that transfer of DNA from the S strain to the R strain occurred? Q2 – What is a competent cell? Q3 – In the Griffiths experiment, how were the bacteria killed? Q4 – What happened to the mice when they were injected with live R strain? Live S strain? Killed S strain? Live R strain and killed S strain. Q5 – What is the first step of a bacteriophage infection? Q6 – What is a transducing phage? Q7 – How are transducing phage produced? Q8 – What step is required for an infected bacterium to become a recipient bacterium?

### **Microbial Conjugation**

Overview of conjugation using the F plasmid of *E. coli* as an example. You don't need to know about "chromosome mapping," but view the other animations. Note the difference between "normal" conjugation vs Hfr conjugation.

Q1 – What feature of conjugation is different when compared to transduction and transformation? Q2 – What structure is required for conjugation to occur? Q3 – What can you say about F+ and F-cells with respect to the F plasmid? Q4 – In conjugation, which cell copies the plasmid, ie, how does 1 plasmid end up in 2 cells? Q5 – Both F+ and Hfr cells can form conjugation pili to initiate conjugation. How are they different? Q6 – After conjugation from an Hfr donor to an F-recipient, why is the recipient still F-?

### **Eukaryotic translation**

Overview of translation in eukaryotes. Notice how similar the two processes are. There is a small exercise at the end involving tRNA and anticodons.

### **Protein synthesis movie**

Watch how proteins are made in a cell. It can be helpful to see transcription and translation proceed from the nucleus in to the cytoplasm, from RNA polymerase to ribosomes.

### **Operons**

Overview of operons. You can turn on an inducible operon and turn off a repressible operon in this animation.

Q1 – What is the function of the promoter? Operator? Structural genes? Q2 – How does the inducer turn on transcription? Q3 -How does the repressor turn off transcription?