BIO 184 - PAL Problem Set Lecture 5 (Brooker Chapter 13)
Translation of mRNA

Section A. Experiments supporting the one gene-one enzyme hypothesis

Briefly describe the Beadle and Tatum experiment:

What agent(s) did Beadle and Tatum use to specifically change (mutate) *Neurospora crassa*'s DNA?

What is the difference between minimal and rich media?

What type of mutants did Beadle and Tatum isolate?

Why was it important for Beadle and Tatum to use a haploid organism compared to using a diploid organism?

What were the main conclusions taken from the Beadle and Tatum experiment?

What are the exceptions to the one gene-one enzyme hypothesis?

Section B. Translation

What does it mean that the genetic code is degenerate?

What does it mean that the genetic code is nearly universal?

What is a reading frame?

How does tRNA serve as an "adaptor" for translation?

What does it mean when tRNA is charged or uncharged?

Where are codons located?

Where are anticodons located?

What is the purpose of the anticodon sequence?

Is there a tRNA for stop codons?

What are the structural features of tRNAs?

How does the structure of the different tRNAs vary?

How does the tRNA structure contribute to wobble?

What two molecules do the wobble rules describe the interaction between?

Which base wobbles?

What are two purposes of modified bases in tRNA?

How does wobble allow for the genetic code to be degenerate?

What is the difference between synonymous and nonsynonymous mutations?

How are synonymous mutations explained by wobble?

Section C. Proteins

On average, how long are polypeptides? How big are genes?

How does a polypeptide have directionality?

How does a polypeptide's directionality correspond to the 5' and 3' ends of the mRNA and DNA (template and coding strands)?

How are nucleic acids similar to polypeptides? What are the important differences?

What are the different types of side groups on amino acids?

Where are these side groups likely to be found on the protein within the cell, on the surface or interior?

What are the different functional categories of proteins?

Give an example of a protein primary structure.

Give an example of a protein secondary structure.

Describe the definition of a protein tertiary structure.

Do all proteins have quaternary structure? Why or why not?

Can a protein only consist of one subunit?

Section D. Ribosome components

How does the composition of ribosomes differ between bacteria and eukaryotes?

Which organisms have 16S rRNA?

Why is 16S rRNA sequence used to determine the species of bacteria?

Where are the ribosomal subunits assembled in eukaryotic cells?

Section E. Translation mechanisms

What are the three stages of translation?

What components are involved?

What marks the beginning and end of each stage?

How does each stage compare with transcription?

Where does the ribosome first attach to the mRNA?

What is a Shine-Delgarno sequence? Where is it found? What is its purpose? What does it interact with?

What are Kozak's rules?

How does translation initiation differ in bacteria and eukaryotes?

What is the first amino acid added during protein synthesis? Why?

When is a modified version of methionine added at the start codon?

How does translation elongation and termination differ in bacteria and eukaryotes?

What are the EPA sites on the ribosome?

How does tRNA migrate through the ribosome during translation?

When does the polypeptide bond form?

What are the 5' and 3' UTRs? What does each contain?