Reviewing ideas and using concepts: p.258-259

Science, Genetics

Reviewing Ideas and Using Concepts: P. 258-259 Reviewing Ideas: 1. Describe the function of tRNA, mRNA, and rRNA. The function of tRNA is to delivers amino acid to ribosomes during translation in the order specified by the mRNA. The function of mRNA is to specify which amino acids must be placed during protein synthesis or translation. The function of rRNA is just to become part of the ribosomes. 2. In what situation does RNA play a role similar to enzymes? RNA is like an enzyme when it is a catalyst and helps assist in the reduction of the activation energy which relates to tRNA when it attaches its amino acid to the rightful place. This helps construe a faster translation. 3. Are all genes expressed at all times? Explain your answer. In order to have specialized cells that have different functions and structure, genes cannot be expressed at all times. Otherwise, we'd have cells with the same function. 4. What are the major steps in processing primary RNA transcripts into mRNA, tRNA, and rRNA? Transcription is the process that processes primary RNA transcripts into mRNA, tRNA, and rRNA. Gene expression begins with RNA synthesis. The transcription enzyme RNA polymerase joins RNA nucleotides according to the base sequence in DNA. Prokaryotes have one type of RNA polymerase. Transcription has four major processes Template recognition, Initiation, Elongation, and Termination. First RNA polymerase binds to duplex DNA. Then, DNA is unwound at promoter and then chain 2-9 bases are synthesized and released. Next, RNA polymerase moves, RNA is synthesized by base pairing with one strand of DNA and once RNA polymerase reaches end of gene it is released at the terminator and DNA duplex reforms. 5. Why does each codon have three nucleotides instead of two or one? It takes three nucleotides to construct an

amino acid, because one or two nucleotides become considered non-coding or introns. 6. Describe the major steps of protein synthesis on the ribosome. Protein synthesis translates the codon sequence of mRNA into the amino-acid sequence of a protein. This happens on ribosomes, where tRNA acts as a molecular adapter. One end of a tRNA molecule carries a specific amino acid. The corresponding anticodon is at the opposite end of the tRNA molecule. In turn, the anticodon pairs with mRNA codon that encodes the particular amino acid. The amino acids together synthesize the protein. 7. What are the possible biological roles of the cap and poly-A-tail of mRNA? The biological roles of the cap are to signify the start of the mRNA sequence. The poly-A-tail essentially does the same thing that marks the end of the mRNA strand. 8. Describe the mechanism by which proteins that are destined to become a membrane or secreted are packaged and transported after translation. Many proteins must be folded into an active tertiary structure. The protein must be transported to where it will function otherwise known as the signal sequence. Sometimes the protein must move out of the cell. A small membrane vesicle contains the protein fuses with the cell membrane. The protein is than released outside through exocytosis and the proteins that are destined to become a part of membrane are made on ribosomes that are bound to the endoplasmic reticulum. 9. Why is the primary structure of a protein so important in cell function? The primary protein structure is coded by DNA and it provides information for the protein structure and its functions. 10. Explain the difference between transcription and translation. Transcription is the process in which DNA is translated into mRNA. Translation is the process in which the mRNA is taken to the ribosome

and is read and tRNAs come and attach the amino acid specified by the mRNA sequence. 11. What are the steps in tRNA charging, and why is it needed for gene expression? The molecule that brings amino acids to the ribosome so that the amino acid can be added to the growing polypeptide chain is called tRNA. It has an anticodon loop that matches pairs with the codon on the mRNA so that the right amino acid is added. The tRNA remains attached to the peptide chain until the peptide and mRNA shift to the P site of the ribosome, and another tRNA comes into the A site to add a new amino acid. The new amino acid is added to the polypeptide chain due to the ribosome, thus releasing a free tRNA, continuing the process of translation. This tRNA needs to be “ recharged" with the right amino acid again, so that it can be used again. by recognizing the shape of the tRNA molecule as well as the anticodon, it places the correct amino acid onto the tRNA, so that it can be added onto the growing peptide chain by the ribosome again. Without having recharged tRNAs, then the translation would not have any more tRNAs with amino acids, and this translation would stop. Using Concepts: 1. Explain the possible advantage of having more than one form of RNA polymerase. The advantage of having three forms of RNA polymerase is the rate of transcription is faster than having only one. Having three different RNA polymerases, (tRNA, mRNA, rRNA) speeds up the rate of transcription because one RNA polymerase does not have to do all the work. It is like having one person shovel all the snow, salt the driveways, and clear out all the ice or having three people divide those jobs, Having three people would be much quicker and this is the same with RNA polymerases. 2. Give the sequence of an mRNA molecule that is the complement of the following

coded sequence of DNA: ATTACGCGGTCAGTA. UAAUGCGCCAGUCAU. 3. What could you measure with radioactive phosphorus? Explain your answer. With radioactive phosphorous, you'd be able to measure the rate of transcription due to the fact that RNA contains phosphorus but proteins do not. The amount of phosphorous will determine the rate. 4. Would the proteins manufactured by a polyribosome be different or the same? Explain your answer. They would be not all be the same due to the fact that each of the proteins has a variety of functions and with different amino acid structure. 5. How is the need for gene regulation in multi-cellular organisms different than in single-celled organisms? 6. What would happen to translation if a ribosome skipped one or more codons? Explain your answer. If in translation, the ribosome skips one or more codons, you'll get a frame shift in which a different amino acid sequence will arise. 7. What would happen to translation if a ribosome skipped one nucleotide? Explain your answer. If in translation, a nucleotide is skipped, then a frame shifts occurs. A nucleotide can change which can result in a codon becoming a stop codon and translating could terminate partway of the message.