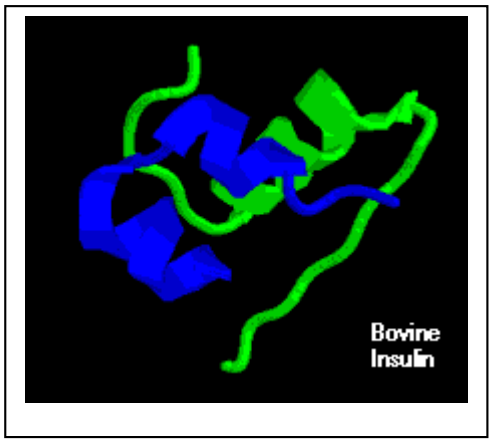
AP Biology
Mr. Ulrich

Making Insulin

Insulin is a hormone made in the pancreas, a gland located behind the stomach. It allows the body to use glucose for energy. Glucose is a type of sugar found in many carbohydrates. After a meal or snack, the digestive tract breaks down and changes carbohydrates into glucose. Once glucose releases into the bloodstream, insulin causes cells throughout the body to absorb this sugar and use it for energy.

Insulin also plays a key role in balancing blood glucose levels. When there's too much glucose in the bloodstream, insulin signals the body to store excess sugar in the liver. This sugar isn't released until your blood sugar drops, such as in-between meals or at times of stress when your body needs an extra boost of energy.



A strand of DNA is located in the nucleus of the room. It is the **mRNA**'s job to copy the strand into the base sequence of mRNA. Remember there are no thiamine in RNA. Only uracil bonds with adenine in RNA.

The **tRNA**s should determine the amino acids that the codons (groups of three bases that code for a particular amino acid) in the mRNA code for. Remember, they have to be converted in order! The tRNAs must then go to the cytoplasm and retrieve the proper amino acids from the cytoplasm of the room and bring them to the ribosomes.

The **ribosomes** are in charge of bonding the amino acids in order using tape. They must first, of course, remove the H and the OH from the amino acids so they can be bonded. The tRNAs have to bring the amino acids to the ribosomes in order one at a time.

1. What is the primary structure of your strand?

2. What is the waste product of protein synthesis? (What's on all of the left over scraps of paper?)

With the help of the endoplasmic reticulum of the room (Mr Ulrich), bond the proper cysteines together with disulfide bridges. You will have to coordinate with the other ribosomal team to do this.

More on the back

The rest may require some research.

3. Judging from the picture of insulin above (or online if the pic isn't visible) what is a secondary strucure found in your strand?

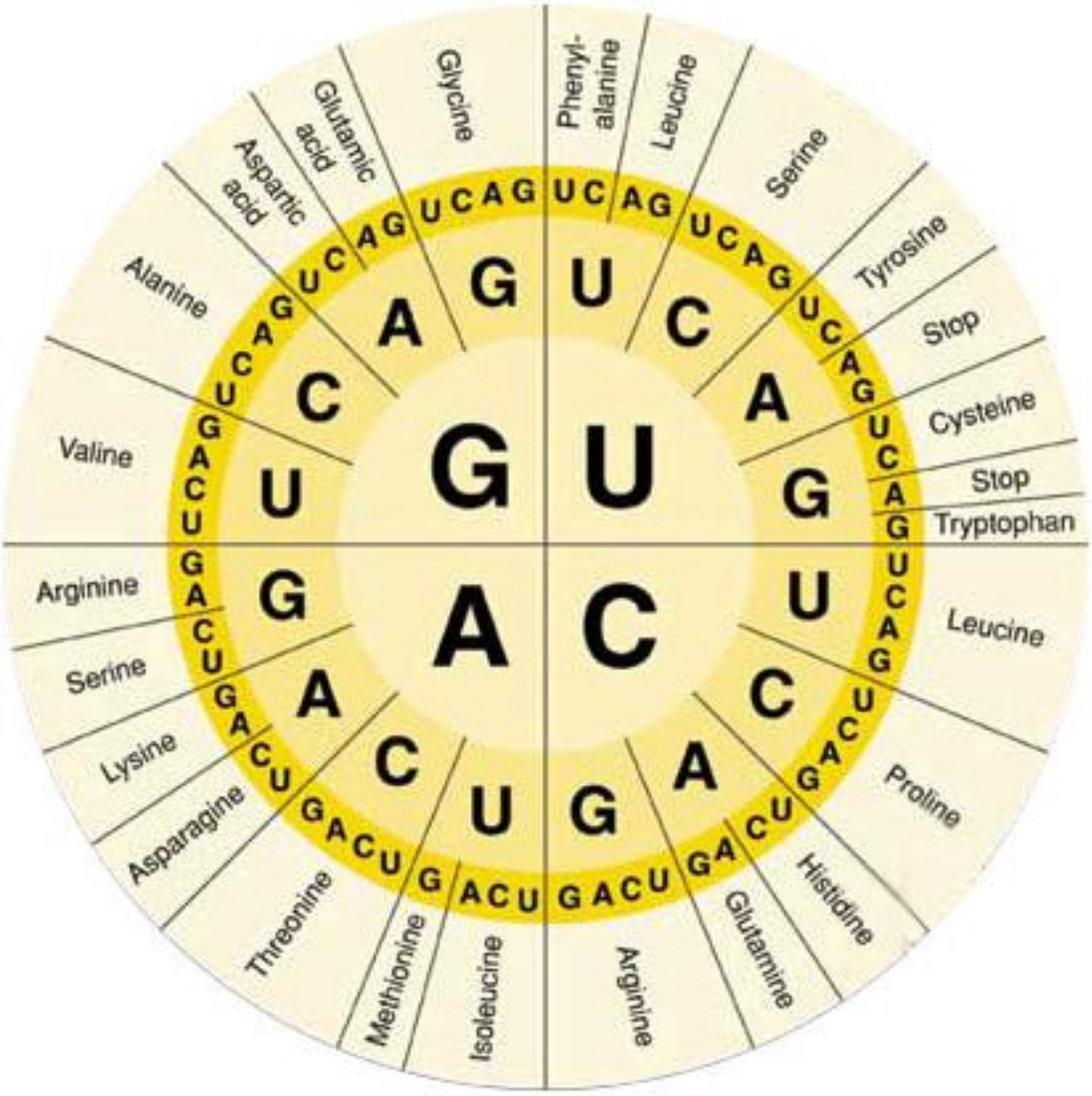
4. What types of bonds cause the tertiary and quaternary strucures?

5. Which strand did your ribosomal team synthesize? How can you tell them apart?

6. Of course, we know the original genes would not be single stranded in the nucleus as modeled here. It would have been annealed to its complement. Which side of the strand were you presented with in the nucleus here? Why is this important? (Certainly, you will have to review how the different strands of complementary DNA are referred to.)

7. There are several gaps in this modelling exercize. Other than the obvious that ribosomes, tRNA, tec., are not people, what other details of the process were either misrepresented or just plain missed? Identify at least two.

8. When did human insulin from GMOs first come on the market?


G
U
A
C
Phenyl-alanine
Leucine
Serine
Tyrosine
Stop
Cysteine
Stop
Tryptophan
Leucine
Proline
Histidine
Glutamine
Arginine
Isoleucine
Methionine
Threonine
Asparagine
Lysine
Serine
Arginine
Valine
Alanine
Aspartic acid
Glutamic acid
Glycine