NEW DNA-RNA Protein Synthesis Model Kit

Part 1 DNA Replication

36 Phosphates - white tubes
36 DNA sugar - black pentagons
3 RNA sugar - blue pentagons
18 Hydrogen bonds - whitish clear rods

Bases

10 black tubes Cytosine (C)
10 red tubes Guanine (G)
8 blue tubes Thymine (T)
8 green tubes Adenine (A)
2 white tubes Uracil (U)

Build the following 18 nucleotides: 5 C and 5 G and 4 A and 4 T
Next, use those 18 nucleotide to build a randomly sequenced 9 rung DNA ladder. Make sure your DNA strand is anti-parallel and be able to identify the following; sugar phosphate backbone, the bases, hydrogen bond, where of the DNA the genetic code is found, a single nucleotide, and the 3 components of each nucleotide. Now have your entire team take your DNA to Mr. Wick to get it "approved" and to be grilled with questions.

DNA Oral Assessment Questions

1. Show me where on your DNA molecule the actual **genetic code** is stored.
2. Show me where the **hydrogen bonds** are found.
3. Point to the entire **sugar phosphate backbone** on one side of your DNA.
4. Remove one **nucleotide**.
5. How many **DIFFERENT** DNA nucleotides are there?
6. Show me one **sugar**.
7. Show me one **phosphate**.
8. Show me one **base**.
9. Show me where on your DNA molecule is a **BASE PAIR**.
10. How many **base pairs** are there in total in **your** model of DNA?
11. How many **nucleotides** are there in total in **your** model of DNA?
12. Finish this statement. A pairs with ____. ____ pairs with ____.
13. Show me what makes your DNA molecule is anti-parallel.

Now would be a great time to take some selfies of you and your team holding your DNA molecules. Be sure to post them on your favorite social media. Also be sure to send to me (d.wickenheiser@rcsd.ca) and I'll post some on our O'Neill social media. Also if you have Mr. Marin as a teacher be sure to show him the pic and remind him that DNA is the single most important biological molecule on the earth!!!

Next, build 18 more nucleotides (5 C 5 G and 4 A 4 T) but DO NOT connect them yet. These will be used for your DNA replication video.
Build 3 RNA nucleotides to be used as RNA primers (1 for the leading strand and 2 for the lagging strand).

Next prepare a script detailing how DNA replicates. Then go through the script and the entire DNA replication process with your model. At this point you might want to take your DNA model up to Mr. Wick and do a quick run through of the process with him BEFORE you roll the cameras.

Part 2 Protein Synthesis
9 Blue pentagons RNA sugar
1 of each of 3 black amino acids (square, V and U shaped)
1 of each of 3 blue tRNA (square, V and U shaped)
1 Blue Ribosome

Use 1 of your 2 DNA strand from part 1. Your second DNA strand will need to be used for parts.

Transcription
Build 9 RNA nucleotides that are complimentary to ONE side of your DNA strand. DO NOT attach these 9 RNA nucleotides to each other but USE THEM as the building pieces to SHOW how mRNA is made in your video.

Translation
Build 3 tRNA units that are complimentary to your mRNA strand you will build in transcription (the previous step).
Be sure each tRNA is holding on to the correct amino acid.

Next prepare a script detailing how protein synthesis occurs. Then go through the script and the entire protein synthesis process with your model. At this point you might want to take your model up to Mr. Wick and do a quick run through of the process with him BEFORE you roll the cameras.

End of Activity Group Questions

Submit 1 copy per group with all group members names on it.

1. **Compare the phosphate, sugar and bases of DNA and RNA.**
2. **How many RNA primers did you need on the leading strand as compared to the lagging.**
3. **Given that RNA primers are used both on the leading and lagging strand why is there no RNA nucleotides in actual DNA after it has been replicated?**
4. **What is the end result of DNA replication?**
5. What is produced in transcription?
6. What is produced in translation?
7. If the DNA codons were TAC GGG CATwhat will the complimentary mRNA codons be?
8. If the mRNA codons were AUG GGU CAG what will the tRNA codons be?
9. What is the role of the mRNA?
10. What is the role of the tRNA?
11. What is the source of the free amino acids in the cytoplasm that we use to build our proteins?
12. If DNA was analyzed and had 20% A, what would be the % of T,G,C and U?
13. List the following by order of size from smallest to largest: gene, cell, chromosome, atom, nucleus, base subunit, nucleotides