How Does DNA Determine the Traits of an Organism?

Introduction: In this simulation, you will examine the DNA sequence of a fictitious organism - the Purple People Eater. Purple People Eaters were discovered on the planet Wooley in a distant solar system. The name comes from their desire to eat purple people, but not any that are too tough. Purple People Eaters only have one chromosome with ten genes on it. Your job is to analyze the genes of its DNA and determine what traits the organism has and then sketch the organism (You can be creative here).

For simplicity, the gene sequences are much smaller than real gene sequences found in living organisms. Each gene has two versions that result in a different trait being expressed in the Purple People Eater.

Task: Each of the following DNA samples was taken from volunteer people eaters. Your job is to analyze each DNA sample, transcribe it to RNA, and determine the phenotype (how the organism looks) based on the sequence.

Directions:

1. Write the name of your people eater on your paper. Your people eater is **Pan**.

2. Copy your **DNA Sequence** exactly as it is below.

   Gene 1: <u>CAT</u> <u>AGG</u> <u>GAG</u>   Gene 2 : <u>ATG</u> <u>GGG</u> <u>CTT</u> <u>GTC</u> <u>TTT</u>

   Gene 3: <u>AAT</u> <u>AAC</u> <u>GAC</u> <u>GGG</u>   Gene 4: <u>CGG</u> <u>CAG</u> <u>CAC</u>

   Gene 5: <u>GTA</u> <u>TAA</u>   Gene 6: <u>AGA</u> <u>GGA</u> <u>CAT</u>

   Gene 7: <u>TTG</u> <u>TAA</u> <u>GAG</u> <u>AAT</u> <u>GGA</u> <u>TGT</u>   Gene 8: <u>CAC</u> <u>TTG</u> <u>TTA</u> <u>CGG</u>

   Gene 9: <u>AAG</u> <u>AGC</u> <u>GTG</u>   Gene 10: <u>TCC</u> <u>TCT</u> <u>CTG</u> <u>TGA</u>

3. Transcribe your DNA Sequence into an **RNA Sequence**.

   a. **Example:** the first 3 DNA bases are CAT. The RNA sequence will be <u>GUA.</u>

4. Translate the RNA Sequence into an **Amino Acid Sequence** using your codon chart.

   a. **Example:** the first codon is GUC. The amino acid this codon codes for is valine, which can be abbreviated val.

5. After you have filled out your complete amino acid sequence, use the chart on the back to determine which **Characteristic** your people eater has. If your amino acid sequence does not match either trait, you made a mistake, you should double check your work.

   a. **Example:** if your amino acid sequence for Gene 1 is val-ser-leu your people eater is 1-eyed, but if the sequence is val-ser-lys, your people eater is 3-eyed.

   b. A few notes on the abbreviations: some of them have slightly different abbreviations

      i. Glutamine – gln

      ii. Asparagine – asn

      iii. Isoleucine – ile

      iv. Aspartate – asp

v. Glutamate – glu

6. Draw your people eater on the back of your answer sheet.

Genes	Amino Acid Sequence	Characteristic
Gene 1 - eyes	val - ser - leu	1 eyed
	val - ser - lys	3 eyed
Gene 2 - horn	tyr - pro - glu - gln - lys	Horn
	val - pro - thr - pro - lys	No horn
Gene 3 – flyer	leu - leu - leu - pro	Wings
	leu - leu - ser - ala	no wings
Gene 4 – pigment	ala - val - val	Purple
	val - ala - ala	Orange
Gene 5 – diet	his - ile	People eater (pointy teeth)
	his - his	Vegetarian (flat/no teeth)
Gene 6 – body covering	ser - pro - val	Fur
	val - phe - tyr	No fur
Gene 7 – ear shape	asn - ile - leu - leu - pro - thr	Rounded
	asn - ile - pro - pro - pro - thr	Pointy
Gene 8 – tail	val - asn - asn - ala	Straight
	asn - asn - asn - ala	Curly
Gene 9 – eye color	phe - ser - his	Yellow
	phe - phe - his	Red
Gene 10 - claws	arg - tyr - cys - lys	Long/sharp
	arg - arg - asp - thr	Short/smooth