

CH 114 DNA Practice **KEY**

Original Strand: 5' CAT ATG GGC CGG ATG AAG AGC 3'

- 1) What is the sequence of the daughter or template strand formed from the original strand of DNA?

3' GTA TAC CCG GCC TAC TTC TCG 5'

- 2) What is the sequence of mRNA formed from the original strand of DNA?

5' CAU AUG GGC CGG AUG AAG AGC 3'

This matches the original DNA exactly, except all T's in the DNA have been replaced with U's.

- 3) How many amino acids are coded for if the original strand contains no start or stop codons?

21 bases, codons are 3 bases long so $21 / 3 = 7$ amino acids

- 4) What is the sequence of amino acids coded for by this DNA?

CAU histidine, AUG methionine, GGC glycine, CGG arginine, AUG methionine, AAG lysine, AGC serine

- 5) If in a different strand of DNA a mutation occurred that changed the original sequence of base pairs. What, if any, changes would result in the amino acid sequence for each of the mutations listed below? Briefly explain each answer. All codons are written with the 5' end on the left and the 3' end on the right.

- a) TTA became TTC

TTA in DNA is UUA in mRNA, UUA codes for leucine

TTC in DNA is UUC in mRNA, UUC codes for phenylalanine

Changing one base pair changed the amino acid and could change the protein structure.

- b) AGA became CGA

The DNA sequence and the mRNA sequence are the same. AGA codes for arginine and so does CGA so there is no effect when the first base changed.

- c) AAA became AAC

AAA codes for lysine while AAC codes for asparagine. Here again, a change in one base changes the amino acid.

Use the developed gel to answer the following questions. As a result of years of war and conflict in a South American country, many children have been separated from their families. An attempt is now being made to return the children to their families using DNA profiles.

The absence of matching alleles at one single location is enough to exclude a child from each set of parents. Even if alleles match at 7 of 8 loci, the one missing match is sufficient to conclude that the children do not genetically match either set of parents.

- 6) Are either children (labeled Child 1 and Child 2) a genetic match to Julio and Maria? Explain your answer citing specific allele matches from their DNA profiles.

Child 1 belongs to Julio and Maria. At each loci, A through H, the child shares an allele (band) with each parent. Child 2 does not belong to Julio and Maria because at locus B, child 2 is homozygous meaning the child inherited the same allele from both parents. Julio and Maria do not share an allele at this location.

- 7) Are either children (labeled Child 1 and Child 2) a genetic match to Ernesto and Eva? Explain your answer citing specific allele matches from their DNA profiles.

Neither child belongs to Ernesto and Eva. Child 1 has already been matched to Julio and Maria. Child 2 is heterozygous at locus E. One of the child's alleles matches Ernesto however the second allele at locus E does not match Eva's allele. Also at locus F, child 2 does not share an allele with Eva.