

Name: **Solution**

GENETIC CHALLENGE WORKSHEET

1. From an extract of human cells growing in tissue culture, you obtain a white fibrous substance. By noting the differences in chemical structure, building blocks, etc. list the features by which you could distinguish whether it was DNA, RNA, or protein.

DNA	RNA	protein
double helix 2 strands deoxyribose sugar thymine	single strand ribose sugar uracil	amino acids MANY structures

2. If 35% of the nucleotide bases in a double-stranded DNA molecule are Thymine: what percentage of the bases are Cytosine, Adenine, and Guanine?

T = 35%	C = <u>15</u> %	A = <u>35</u> %	G = <u>15</u> %
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3. From a hospital patient afflicted with a viral disease, you isolate and culture some cells and then extract the DNA. You find that the DNA from the culture contains two different kinds of DNA, each placed in a different test tube: one is double-stranded human DNA and the other is single-stranded virus DNA. You analyze the percent base composition of the two DNA extracts with the following results:

	A	C	G	T	
Tube 1	22	28	28	22	human
Tube 2	35	15	30	20	virus

Which tube contains the single-stranded viral DNA? Explain how you know.

**adenine is not proportional to thymine,
 cytosine not proportional to guanine**

4. You have isolated some double-stranded dinosaur DNA from a biting insect preserved in fossilized amber! You then add the appropriate enzymes and manage to transcribe a strand of mRNA from one of the DNA strands. Below is the percentage composition of the bases for the DNA and mRNA:

	C	G	T	A	U
DNA strand 1	15	24	31	30	0
DNA strand 2	24	15	30	31	0
mRNA	24	15	0	31	30

Which strand of DNA is the strand from which the mRNA was made? Explain how you know.

**strand 1: guanine is proportional to cytosine in mRNA strand
 adenine is proportional to uracil in mRNA strand**

5. The following base sequence represents part of a normal mRNA strand:

U A C - A C C - A U C - G C G

Write the sequence of amino acids coded for by the mRNA codons.

aa's: **Tyr** - **Thr** - **Ile** - **Ala**

A mutation of a single base in the mRNA (called a "point mutation") produces the sequence of amino acids below, where one amino acid is now different. Circle the different amino acid. Write the mRNA sequence of codons that codes for these amino acids and circle the base that has undergone mutation.

tyrosine - threonine - **asparagine** - alanine

mRNA: **UAC** - **ACC** - **A A C** - **GCG**
U → A

Assuming that the change in the mRNA actually resulted from a mutation in the DNA (from which the mRNA is transcribed), what would the entire DNA sequence of triplets be? Circle the mutated DNA base.

DNA: **ATG** - **TGG** - **T T G** - **CGC**

6. Give the mRNA, DNA, and tRNA sequences that code for each of the following amino acids. If there is more than one sequence, just give one. **2 examples given**

	glutamine	serine	arginine
mRNA	GAA / GAG	UCU/UCC	GAU/GAC
DNA	CTT / CTC	AGA/AGG	CTA/CTG
tRNA	CUU / CUC	AGA/AGG	CUA/CUG

1st example

2nd example