SAY IT WITH DNA: PROTEIN SYNTHESIS WORKSHEET: Practice Pays

Having studied the process by which DNA directs the synthesis of proteins, you should be ready to decode some DNA "secret" messages. To do this, you must follow the procedure of protein synthesis as this is taking place right now in your cells; no short cuts! Practice these steps by following and finishing the **partially solved message** below.

STEP 1: "Build" the mRNA molecule, matching the RNA nucleotides to the DNA nucleotides properly, letter by letter.
(For purposes of simplicity, it will be assumed that this mRNA is bacterial; there are no introns to cut out!)

STEP 2: Figure out the tRNA triplets (codons) which would fit the mRNA triplets (letter by letter).

STEP 3: Look up each tRNA codon in the **tRNA Dictionary** (below), and find the corresponding symbol and amino acid abbreviation for that codon. Record that one-letter symbol (and its amino acid) below each codon. "Spc" = "space". If you have done this correctly, the symbols should spell out a meaningful message in English.

Remember, C always pairs with G, G always pairs with C, A pairs with T (in DNA) or U (in RNA), Tpairs with A, and U (in RNA) pairs with A (in DNA). Clues: C & G are curved letters; A & T are angular; U is used in RNA in place of T.

When you finish the sample message below, decode the special message assigned to you (from the sheet with many messages). Be sure to show the details of your solution on the **Practice Sheet** provided, and hand it in. In your DNA exam, you will be expected to do this from memory (provided with the tRNA Dictionary).

PARTIALLY SOLVED MESSAGE

GIVEN: DNA code message --> GAA TAG AAA CTT ACT TAG AGC ATT CCT GCC CTT CGA TGC ATC

SOLUTION (steps 1-4)

1. **mRNA** (built to match the DNA message, letter for letter----------> CUU AUC UUU GAA UGA AUC UCG ... ...

2. **tRNA** (determined by matching letters (bases) with those in mRNA)----------> GAA UAG AAA CUU ACU UAG ... ...

3. **Amino acids** carried by each tRNA (according to dictionary, below)----------> L I P G | I
e s h l l s
u o e u o

4. **Symbols** of amino acids:----> L I F E I . . . . . .

DICTIONARY OF tRNA CODONS & THEIR AMINO ACIDS (SYMBOLS & ABBREVIATIONS)

tRNA	sym	AA
AAA	F	Phe
AAC	L	Leu
AAG	F	Phe
AAU	L	Leu
ACA	C	Cys
ACC	W	Trp
ACG	C	Cys
ACU	-	spc
AGA	S	Ser
AGC	S	Ser
AGG	S	Ser
AGU	S	Ser
AUA	Y	Tyr
AUC	-	spc
AUG	Y	Tyr
AUU	-	spc

tRNA	sym	AA
CAA	V	Val
CAC	V	Val
CAG	V	Val
CAU	V	Val
CCA	G	Gly
CCC	G	Gly
CCG	G	Gly
CCU	G	Gly
CGA	A	Ala
CGC	A	Ala
CGG	A	Ala
CGU	A	Ala
CUA	D	Asp
CUC	E	Glu
CUG	D	Asp
CUU	E	Glu

tRNA	sym	AA
GAA	L	Leu
GAC	L	Leu
GAG	L	Leu
GAU	L	Leu
GCA	R	Arg
GCC	R	Arg
GCG	R	Arg
GCU	R	Arg
GGA	P	Pro
GGC	P	Pro
GGG	P	Pro
GGU	P	Pro
GUA	H	His
GUC	Q	Glu
GUG	H	His
GUU	Q	Glu

tRNA	sym	AA
UAA	I	Iso
UAC	M	Met
UAG	I	Iso
UAU	I	Iso
UCA	S	Ser
UCC	R	Arg
UCG	S	Ser
UCU	R	Arg
UGA	T	Thr
UGC	T	Thr
UGG	T	Thr
UGU	T	Thr
UUA	N	Asn
UUC	K	Lys
UUG	N	Asn
UUU	K	Lys