The analysis of DNA can help researchers determine which polypeptides are produced by particular genes. Similarly, but in reverse, the analysis of polypeptides can provide information about the genes that are associated with them. In this activity, you will work backward from a polypeptide chain to construct a fragment of DNA that might code for it.

Procedure

The illustration shows an imaginary polypeptide produced by a bacterial cell.

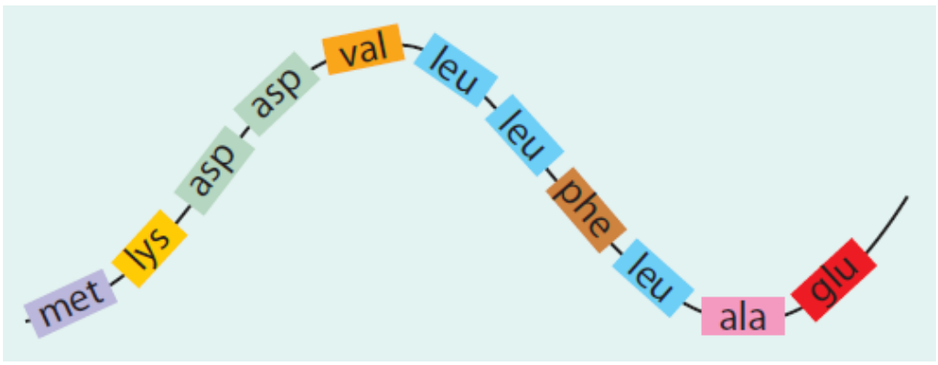

Table 15.3 Messenger RNA Codons and Their Corresponding Amino Acids

First Base	Second Base				Third Base
	U	C	A	G	
U	UUU phenylalanine UUC phenylalanine UUA leucine UUG leucine	UCU serine UCC serine UCA serine UCG serine	UAU tyrosine UAC tyrosine UAA stop** UAG stop**	UGU cysteine UGC cysteine UGA stop** UGG tryptophan	U C A G
C	CUU leucine CUC leucine CUA leucine CUG leucine	CCU proline CCC proline CCA proline CCG proline	CAU histidine CAC histidine CAA glutamine CAG glutamine	CGU arginine CGC arginine CGA arginine CGG arginine	U C A G
A	AUU isoleucine AUC isoleucine AUA isoleucine AUG methionine*	ACU threonine ACC threonine ACA threonine ACG threonine	AAU asparagine AAC asparagine AAA lysine AAG lysine	AGU serine AGC serine AGA arginine AGG arginine	U C A G
G	GUU valine GUC valine GUA valine GUG valine	GCU alanine GCC alanine GCA alanine GCG alanine	GAU aspartate GAC aspartate GAA glutamate GAG glutamate	GGU glycine GGC glycine GGA glycine GGG glycine	U C A G

* AUG is an initiator codon. It also codes for the amino acid methionine.
** UAA, UAG, and UGA are terminator codons.

Analysis

1.) Using Table 15.3 and the table below, write one possible nucleotide sequence for the DNA molecule that contains the gene for this polypeptide.

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2.) Draw a labelled diagram to show one codon from a mRNA molecule being transcribed from the DNA strand to form a polypeptide.

Over →

3.) Compare DNA molecules with your class. Write your DNA sequence on the board. How many different sequences did your class come up with? What advantage might this give a living cell?

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4.) The processes of transcription and translation consume a great deal of cellular energy. Why do you think the cell does not simply translate proteins directly from DNA?

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