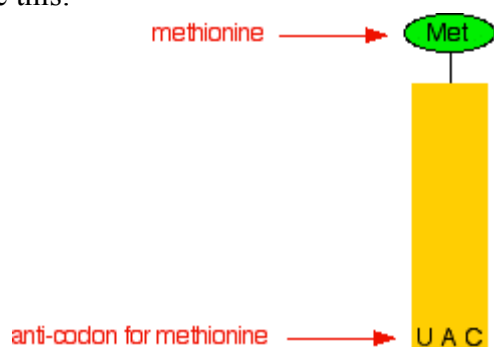# Chemguide – questions

DNA: PROTEIN SYNTHESIS

You will need to refer to the table below (taken from the Chemguide page) showing the three-base combinations used in messenger RNA chains to code for the various amino acids.

second base in codon

	U	C	A	G	
U	UUU Phe UUC Phe UUA Leu UUG Leu	UCU Ser UCC Ser UCA Ser UCG Ser	UAU Tyr UAC Tyr UAA stop UAG stop	UGU Cys UGC Cys UGA stop UGG Trp	U C A G
C	CUU Leu CUC Leu CUA Leu CUG Leu	CCU Pro CCC Pro CCA Pro CCG Pro	CAU His CAC His CAA Gln CAG Gln	CGU Arg CGC Arg CGA Arg CGG Arg	U C A G
A	AUU Ile AUC Ile AUA Ile AUG Met	ACU Thr ACC Thr ACA Thr ACG Thr	AAU Asn AAC Asn AAA Lys AAG Lys	AGU Ser AGC Ser AGA Arg AGG Arg	U C A G
G	GUU Val GUC Val GUA Val GUG Val	GCU Ala GCC Ala GCA Ala GCG Ala	GAU Asp GAC Asp GAA Glu GAG Glu	GGU Gly GGC Gly GGA Gly GGG Gly	U C A G

first base in codon (left axis) — *third base in codon* (right axis)

1. Messenger RNA (mRNA) produced from a gene on the original DNA can't interact directly with the amino acids needed to produce a protein chain. Instead it needs transfer RNA (tRNA) to help. Each tRNA molecule can carry just one type of amino acid.
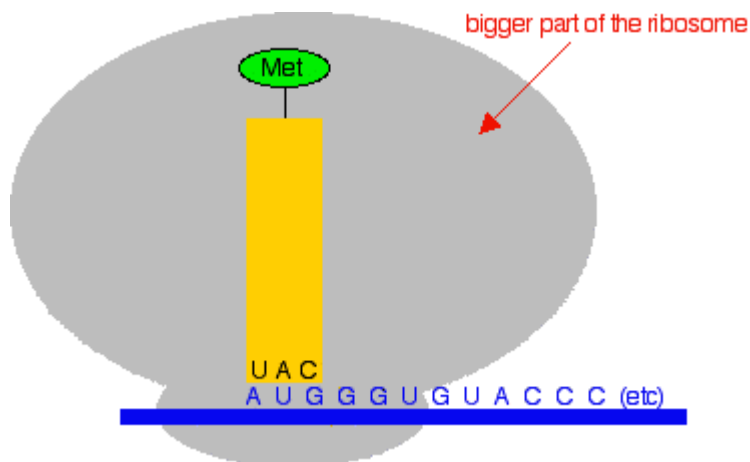
    a) A very simplified diagram of the tRNA molecule which carries the amino acid methionine looks like this:

methionine → Met

anti-codon for methionine → U A C

Explain the significance of the anti-codon.

b) Give the two possible anti-codons for the amino acid tyrosine (Tyr).

c) Give the anti-codon for the amino acid tryptophan (Trp).

d) Protein synthesis is controlled by a ribosome which comes in two parts – a smaller part and a bigger part. The smaller part is involved in finding the start of the actual code for the protein on the mRNA chain. How does it do that?

e) The bigger part of the ribosome then attaches as well as the tRNA carrying the methionine molecule:

Describe what happens next to produce the beginnings of a protein chain containing the first three amino acid residues. You should name the other two amino acids involved using the coding on the mRNA chain in this diagram.

f) How does this process come to an end?