

Chemguide – answers

DNA: PROTEIN SYNTHESIS

1. a) The tRNA molecule has to attach to the mRNA molecule where the mRNA has the code for methionine. In order for that to happen, the sequence of bases at the bottom of the tRNA molecule must be exactly complementary to those in the mRNA. The mRNA code for methionine is AUG. The anti-codon UAC will be an exact fit for that. (Remember U and A are complementary to each other and so are G and C.)

b) Tyrosine (Tyr) will be coded by either UAU or UAC on the mRNA. The anti-codon will be complementary to those – either AUA or AUG.

c) Tryptophan (Trp) is coded by UGG. The anti-codon will be ACC.

d) Starting at the 5' end of the mRNA chain, the smaller part of the ribosome moves along the chain until it recognises a sequence of bases just before the true beginning of the coding part of the chain with the AUG code.

e) The next three bases on the mRNA chain are GGU which codes for glycine. A tRNA molecule carrying a glycine attaches to the chain next door to the molecule carrying the methionine. Its anti-codon will be CCA.

The ribosome now moves along the chain to the next codon – GUA. At the same time a peptide bond is formed between the methionine and the glycine, and the methionine breaks away from its tRNA molecule. That tRNA molecule then leaves the ribosome.

The codon GUA codes for valine, and a tRNA molecule carrying valine attaches to the chain next door to the one carrying glycine. Its anti-codon will be CAU.

Then the ribosome moves along again to the next codon, a peptide bond is formed between the glycine and the valine, and the glycine tRNA molecule leaves the ribosome.

And so on!

At the point we have stopped the description, we have a chain Met.Gly.Val with the Met.Gly only attached to the valine, and the valine still attached to its tRNA.

- f) The ribosome reaches a stop codon which doesn't code for an amino acid. At that point the protein molecule is released by the ribosome, and folds itself into its final shape.