Problem #4. The four polypeptides in the example consist of 24, 10, 3 and 25 amino acids, and the mRNA sequence contains $195 = ((24 + 10 + 3 + 25) + 3) \times 3$ nucleotides. It appears probable that three nucleotides (a triplet) denote one amino acid or are a separator between polypeptides (in reality a signal to terminate synthesis). However, since there are $4^3 = 64$ possible triplets (all but two of which are present in the example) and only 20 different amino acids, some triplets have the same meaning.

	...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*
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*
A...	AUU → *Ile* AUC → *Ile* AUA → *Ile* AUG → *Met*	ACU → *Thr* ACC → *Thr* ACA → *Thr* ACG → *?*	AAU → *Asn* AAC → *Asn* AAA → *Lys* AAG → *Lys*	AGU → *Ser* AGC → *Ser* AGA → *Arg* AGG → *Arg*
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 → *?*

All mRNA sequences start with AUG → *Met*.

     AUG UUA ACG UUC   UAA   AUG UGG GGG GGA CAC CAG
      ↓   ↓   ↓   ↓   ↓   ↓   ↓   ↓   ↓   ↓   ↓

(a) *Met-Leu-?Thr-Phe* STOP *Met-Trp-?Gly-Gly-His-Gln.* The sequence contains both nucleotide triplets that were absent from the example, so we cannot be sure in the answer, but it will be confirmed when we have solved the problem to the end.

(b) $Met\text{-}Lys\text{-}Cys\text{-}Ile \leftarrow$ AUG $\left\{ \begin{matrix} \text{AAA} \\ \text{AAG} \end{matrix} \right\} \left\{ \begin{matrix} \text{UGU} \\ \text{UGC} \end{matrix} \right\} \left\{ \begin{matrix} \text{AUU} \\ \text{AUC} \\ \text{AUA} \end{matrix} \right\}$ $(1 \times 2 \times 2 \times 3 = 12$ possibilities$)$.

(c) A root XY is strong if XYA, XYG, XYC and XYU encode the same amino acid (UC, CC, CG, GC). A root is weak if this is not the case (UU, CA, AG, GA).