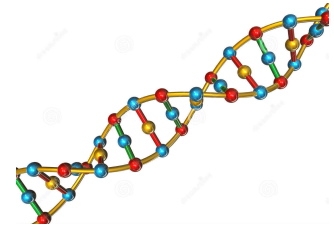(1) RNA "codons" are strings of 3 ordered nucleotide bases in which each nucleotide is one of adenine (A), cytosine (C), guanine (G), or uracil (U). Each codon "signals" or encodes one amino acid, but there are about three times as many codons as amino acids. For example, the codons UGU and UGC both encode the amino acid cysteine. Note that here order matters, so UGC is not the same as CGU.

Suppose two codons XYZ and PQR are "dollar-lated" if the number of Cs in one of XYZ or PQR differs from the number of As in the other codon by one, and write XYZ **$** PQR. That is, $ is a relation on the set of codons. For example, CUC $ AUG.

(a) Explain why $ is NOT an equivalence relation:

(2) Suppose two codons XYZ and PQR are @-related, and we write XYZ @ PQR, if they have the same kinds of bases. Thus, for example CUG and GUC are @-related, written CUG @ GUC, since they both have one cytosine C, one guanine G, and one uracil U; however CUG is not @-related to CGA, since both have a C and a G, but one also has an A and the other has a U. Similarly, GUG @ UUG. In this way @ is a relation on the set of 3-nucleotide codons.

(a) Explain why $ is an equivalence relation

(b) How many @ equivalence classes are there? _____
 Write one element for each equivalence class below: