Name: _____ **Date:** _____

Biology 30 – Mutations Worksheet

The genetic code is the instruction manual that the cell uses to translate the DNA sequence of a gene into an amino acid chain. Each three-letter DNA sequence, or "codon," encodes a specific amino acid.

Most genetic information follows the Central Dogma of gene expression:

DNA --> RNA --> protein

Background on mutations

A mutation is a change in the base sequence of DNA. Mutations have several causes. Exposure to radiation or DNA-damaging chemicals can cause mutations. Also, when DNA replicates (makes new copies), bases can be paired incorrectly. Normally these errors are caught and corrected by various DNA repair mechanisms. However, occasionally, an error goes un-repaired, changing the base sequence of DNA in that cell and any of its daughter cells.

Mutations are the ultimate source of all genetic variability in all populations. Since the DNA nucleotide sequence is being changed by a mutation, this means that the sequence of amino acids and possibly also the function/ shape of the protein can be changed. A mutation may be deleterious (= BAD), beneficial (= GOOD), or silent/neutral (no change in protein function). The rate at which mutations occur in a gene sequence vary.

There are two major types of mutations: Point mutations and frameshift mutations.

Point mutations

Point mutations are single nucleotide base changes in a gene's DNA sequence.
This type of mutation can change the gene's protein product in the following ways.

(a) Missense mutations are point mutations that result in a single amino acid change within the protein.

(b) Nonsense mutations are point mutations that create a premature "translation stop signal" (or "stop codon"), causing the protein to be shortened.

(c) Silent mutations are point mutations that do not cause amino acid changes within the protein.