

**Supplemental Figure 2.** Examples of formative and summative questions used to discuss the difficult concept of mutation. The correct answer is highlighted in bold.

**Clicker question:**

A type of human dwarfism results from the production of mutant SHR-1 protein. You look at the length of the mutant SHR-1 and the normal (wild-type) SHR-1 protein, and discover that the mutant SHR-1 protein has fewer amino acids. What do you expect to find when you examine the DNA sequence?

- A. nucleotides were deleted
- B. additional nucleotides were added
- C. one nucleotide was changed
- D. without additional information, any of the above are possible**

**Homework question:**

Mutations in the adenomatous polyposis of the colon (*APC*) gene predisposes a person to colorectal cancer. Below is the DNA nucleotide sequence of the *APC* gene on the non-template strand from a normal individual and an individual who was diagnosed with colorectal cancer.

What type of mutation occurred in the individual that has colon cancer?

Note this sequence is from the middle of the *APC* gene, so use the first 3 nucleotides for the first codon of this part of the *APC* gene.

Coding strand of a normal individual:

5'-GAG GCG GGT TCA CGA GAG -3'

Coding strand of an individual with colorectal cancer:

5'-GAG GCG GGT TGA CGA GAG -3'

- A. Missense
- B. Nonsense**
- C. Silent
- D. Frameshift

**Exam questions:**

One form of cystic fibrosis is caused by a mutation in the middle of the DNA sequence of the *CFTR* gene. If you look at the protein produced from this mutated sequence, and the protein is the normal length, what type of mutation is most likely?

- A. Frame shift
- B. Silent
- C. Missense**
- D. Nonsense
- E. Either answer B or C could be true

A mutation has been found in the DNA sequence below, indicated with the box. Comparing this sequence to the normal sequence, what effect will this mutation have on the protein ultimately produced from this gene, and why?

Normal:

5'GGGTATAAT3' template

3'CCCATATTA5' coding

Mutation:

5' GGGTAG **G**AT 3' template

3' CCCATC **C**TA 5' coding

**Answer:** *AUU and AUC both code for leucine. This is a silent mutation, and will not affect the structure or function of the protein.*

**Figure S2** Examples of formative and summative questions used to discuss the difficult concept of mutation. The correct answer is highlighted in bold.