11. Use the following mRNA codon key as needed to answer the next two questions:

GCC	Alanine
AAU	Asparagine
CCU	Proline
GGA	Glycine
UGG	Tryptophan
UGA	"Stop" (no amino acid)
GAA	Glutamic acid
GAG	Glutamic acid
AGG	Arginine
CCC	Proline
CAU	Histidine

The following DNA sequence (coding strand) occurs near the middle of the coding region of a gene.

DNA

```
                  50          55          60          65
5'—A A T G A A T G G G A G C C T G A A G G A G  —-3'
```

The corresponding mRNA sequence is shown below. Note that the coding strand of DNA has the same sequence as the mRNA, except that there are U's in the mRNA where there are T's in the DNA. The first triplet of nucleotides AAU (underlined) is in frame for coding, and encodes Asparagine as the codon table above indicates.

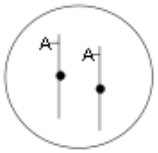
mRNA

```
                  50          55          60          65
5'—A A U G A A U G G G A G C C U G A A G G A G  —-3'
```

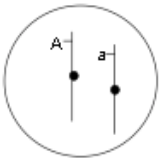
Which of the following DNA mutations is almost certain to result in a shorter than normal mRNA?

a) A→G at position 50
b) G→A at position 53
c) C→A at position 58
d) None of the above

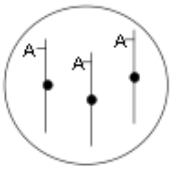
20. Sue's chromosome #18 pair looks like this:



Bob's chromosome #18 pair looks like this:



Bob and Sue have a stillborn son with three copies of chromosome #18 that look like this:



In which parent did the chromosome separation problem occur?

a) Sue

b) Bob

c) You need additional information to determine which parent.

Figure S1 Complete versions of abbreviated GCA questions shown in Table 3.