8.

a. Amino acids are the components that make up proteins.

b. Transcription is the process by which DNA is copied to make RNA.

c. Translation then is the process by which RNA is converted into proteins.

d. As an exception to the Central Dogma, Hunter mentions AIDS and other retroviruses, which transform RNA into DNA.

e. If we represent each DNA base as a character, we need 8 bits per character. If we aren't storing them as characters we can represent them in 2 bits.

f. Six bits could be used to represent the 20 amino acids.

g. Humans are eukaryotes.

h. Prokaryotic cells contain less genes and those genes are organized in simpler regulatory patterns than eukaryotic cells.

i. Cells differentiate into lineages that determines their cellular specialization, which determines the cell's function.

j. The problem with saying that scientists have found "the gene" for breast cancer is that susceptibility to breast cancer is, like many traits, polygenic, meaning that it is impacted by many genes. This means that there is no one gene responsible for susceptibility.

9.

a. The SARS-CoV-2 genome is about 30,000 "letters" long.

b. Diseases studied through gene sequencing prior to Covid include HIV, influenza, Zika, dengue, chikungunya, and yellow fever.

c. Dr. Oliveira discovered that a new variant was responsible for the spike by noticing a new spike where the samples from 50 clinics were all very similar. All of the samples seemed to be very similar to each other and indicated a new variant of the disease was spreading.

10.

a. A single-stranded segment of DNA can act as a template because each base has a specific base it will bind to. Single-stranded DNA has the backbone and a single base of every pair and when more bases are introduced, the single bases will pair up, creating the complement of the existing single-stranded DNA.

b. There is uncertainty because of a few reasons. One is that there may be some light pollution from the other dots which affects the color of the dot being read. Another is that because the dots don't change color every cycle, there is some uncertainty whether there are multiple identical bases in a row (AAAATG…) or whether that template didn't pick up another base in this cycle. Finally, there is a possibility that one of the templates gained multiple bases in one round, skipping bases.

c. I expect more uncertainty towards the end of the read because the longer that the sequence is being read, the more chances there are for mistakes to have been made along the way, and those mistakes will cause uncertainty. In this example, the final yellow dot is also muddier, which probably indicates that some of the copies are glowing different colors, which makes for a higher uncertainty.