James Jedediah Smith

Review Foundational Knowledge

BIFX 504

8/25/2021

**Section 2: Polymers**

Q: What is the complimentary strand of the following sequence: ACCTGTCCA?

A: TGGACAGGT

Q: If a section of DNA was damaged or altered, how could this potentially impact protein production?

A: DNA is used to make RNA which is used to make proteins. Assuming the damage is not repaired, it could change the type of amino acids put into a protein.

**Section 3: Proteins**

Q: What could happen to a protein if its amino acid composition was altered due to a mistake in DNA?

A: The shape and charge of amino acids play an important role in determining structure. And structure dictates function. This would have the potential to alter the function of a protein.

Q: Which level(s) of protein structure would a change in amino acid sequence effect?

A: It could potentially affect all four levels. The primary structure is made up of an amino acid sequence. Each subsequent level is partially determined by the previous one.

**Section 4: Genes**

Q: How could a DNA deletion mutation effect the produced proteins?

A: A deletion could cause the codon reading frame to shift, potentially altering which amino acids are produced from the mRNA transcript. This would then change the function of whatever protein is made, as the structure and charge of the amino acids would be different.

Q: What amino acids are produced from the RNA sequence UGGACAGGU?

A: UGG = Tryptophan; ACA = Threonine; GGU = Glycine

**Section 5: Classifications**

Q: What are the Genus and Species name for *Ophiocordyceps unilateralis*?

A: The Genus is *Ophiocordyceps* and the species is *unilateralis*.

Q: How are organisms traditionally classified under the Linnean classification system? Why might old classifications change as the result of new technologies?

A: Organisms were originally classified based on morphology. With recent breakthroughs in DNA sequencing and analysis, it becomes possibly to determine how closely two species are related based on the similarity of their DNA. This has resulted in certain organisms being reclassified, especially within the realm of fungi and plants.

**Section 6: Mendel’s Laws**

Q: There is both a homozygous dominant mother (AA) and homozygous recessive father (aa). By which filial generation of their offspring would there by the potential for a homozygous recessive individual?

A: It would take until the F2 generation, since the F1 generation would be all Aa.

Q: A geneticist notices that the segregation of his pea plant alleles seems to be totally random. This shouldn’t come as a surprise to him, as one of Mendel’s principles is at play. Which is it?

A: The principle of independent assortment.

**Section 7: Darwin’s Evolution**

Q: Why might a lack of genetic variation within a population reduce their overall fitness?

A: One reason would be the higher chance for lethal or debilitating mutations to arise due to inbreeding. Another reason is that a lack of genetic variation results in an inflexible population. There is less opportunity to develop beneficial variations that would help a population survive radical change.

Q: What is a way in which technology has influenced how we construct phylogenetic trees?

A: Like classification, phylogeny was traditionally based in morphology. But now, tools such as DNA analysis have allowed us to look beyond the physical and group things based on their genes. Sometimes the same mutations are favorable to two similar species and will arise independently of one another. These coincidences are easier to spot with technology.

**Section 8: Bioinformatics**

Q: Why might someone trained or interested in computer programming be a better fit for Bioinformatics than Computational Biology?

A: Computational biology has more of an emphasis on using mathematics to enhance our understanding. Bioinformatics has a focus on creating programs to serve as tools for scientists.

Q: Why might the skills of bioinformatics be relevant in other fields?

A: Bioinformatics is a data science that utilizes universal skills, such as programming and database structure, to help solve biological questions. These skills are transferrable to other fields.