

3.A.1 and 3.A.2 FRQ Formatives

1.

The human genome illustrates both continuity and change.

- (a) **Describe** the essential features of **two** of the procedures/techniques below. For **each** of the procedures/techniques you describe, **explain** how its application contributes to understanding genetics.
- The use of a bacterial plasmid to clone and sequence a human gene
 - Polymerase chain reaction (PCR)
 - Restriction fragment length polymorphism (RFLP) analysis
- (b) All humans are nearly identical genetically in coding sequences and have many proteins that are identical in structure and function. Nevertheless, each human has a unique DNA fingerprint. **Explain** this apparent contradiction.

2.

Meiosis reduces chromosome number and rearranges genetic information.

- (a) **Explain** how the reduction and rearrangement are accomplished in meiosis.
- (b) Several human disorders occur as a result of defects in the meiotic process. **Identify ONE** such chromosomal abnormality; what effects does it have on the phenotype of people with the disorder? **Describe** how this abnormality could result from a defect in meiosis.
- (c) Production of offspring by parthenogenesis or cloning bypasses the typical meiotic process. **Describe** either parthenogenesis or cloning and **compare** the genomes of the offspring with those of the parents.

3.

Protein synthesis is vital for cell growth and metabolism.

- (a) Describe transcription and translation.
- (b) Identify similarities between transcription and translation.
- (c) Identify differences between transcription and translation.
- (d) Describe structural changes that can occur to a protein after translation to make it function properly.

4.

A molecule of messenger RNA (mRNA) has just been synthesized in the nucleus of a human cell.

- (a) What types of modifications may occur to this RNA before it leaves the nucleus?
- (b) Once in the cytoplasm, how is the mRNA translated to a protein?
- (c) If the cell is a secretory cell, how is the protein from part (b) eventually targeted, packaged, and secreted to the exterior of the cell?

5.

Describe how a plasmid can be genetically modified to include a piece of foreign DNA that alters the phenotype of bacterial cells transformed with the modified plasmid. **Describe** a procedure to determine which bacterial cells have been successfully transformed.