2020-2021 Genetic PT – Answer Key

1. Please explain the difference between Limit of Detection (LOD) and Limit of Quantification (LOQ).
    - Limit of Detection is defined as the lowest concentration that can be detected.
    - Limit of Quantification is the lowest concentration that can be quantified with accuracy and suitable precision.

2. Please explain the difference between robustness and ruggedness.
    - Robustness is the ability to remain unaffected by small variations in a method. Provides an indication of its reliability during normal usage. Measures lab verification.
    - Ruggedness is the reproducibility of results under varying conditions, such as a different lab and different equipment. Ring tests measure ruggedness.

3. Name two categories of Genetic Purity Testing methods.
    - Protein Electrophoresis
    - PCR-based SNP testing

4. Common protein electrophoresis methods include Starch Gels, _iso-electric focusing (IEF)_, and Polyacrylamide Gels (PAGE).

5. In iso-electric focusing, the proteins separate based on their ___pH___.

6. What does SNP stand for?
    - Single Nucleotide Polymorphism

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7. Name two advantages and two disadvantages of SNPs.
    - Advantages
        - SNP markers will work on degraded SNP samples.
        - High throughput
        - High frequency with which the SNPs are found on the genome – utility for traits or disease gene purposes.
        - Their simple structure as bases changes, GT are being developed to allow the rapid and efficient genotyping to utilize thousands of SNPs.
        - SNP is generally less mutable than other forms of Polymorphisms.
    - Disadvantages
        - More expensive
        - Highly sensitive and may indicate impurity levels that far exceed those observed in a grow-out.
        - Marker development and efficiency may depend on crop and region.

8. Electrophoresis requires what basic equipment or supplies? Please name three.
    - Electrical Power Supply.
    - Electrodes (anode and cathode).
    - Medium to run the test on (gels, paper, liquid).

9. Why is genetic purity important for seed production?
    - Quality control in seed certification programs.
    - PVP application and enforcement.
    - Varietal purity and quality control.
    - Maintaining seed purity in plant breeding programs.

10. What are co-dominant alleles and dominant alleles?
    - Co-dominant alleles are when both alleles of one gene express themselves in the phenotype of an organism.
    - Dominant alleles appear if one allele effect is expressed in a phenotype even in the presence of another allele.

11. In PCR testing, explain what the Plateau Effect is.
    - When the self-annealing of the strands becomes significant, the enzyme is limiting, or the base pairs are all deleted and the reaction ceases to be exponential.

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12. In PCR, the buffer used often contains _magnesium_ ions.

13. The four DNA bases are:
    a. Adenine, Guanine, Thymine, and Cytosine
    b. Cytosine, Ribose, Thymine, and Adenine
    c. Guanine, Adenine, Cytosine, and Thymine
    d. Uracil, Thymine, Adenine, and Guanine

14. DNA is made up of what three components?
    - Nitrogenous bases
    - Sugar
    - Phosphate group

15. In PCR testing traited corn, what are the two most common assays used?
    - P35S
    - T-NOS

16. Name one thing that would cause your PCR to have no end product.
    - Annealing temperature was too high.
    - Reaction was not set up properly.
    - Small amounts of phenol or chloroform may have been left in the DNA solution.
    - Primer amounts too low.
    - Template amounts too low.

17. What kind of bonds hold the base pairs together in DNA?
    - Hydrogen bonds

18. "A high temperature is used to break double stranded DNA into single strands". This is called _denaturation_.

19. When extracting genetic material for GMO detection in seed, what is the largest target material?
    a. Plasmid DNA
    b. Genomic DNA
    c. Ribosonal DNA
    d. cDNA

20. In genetic purity testing, what is the difference between an outcross and an off type in a hybrid sample?
    - An outcross contains the female portion of the pattern, but has the wrong male plant.
    - An off type is missing the female portion of the pattern. It may or may not contain the correct male portion.