2023-2024 Genetic PT - Answer Key

1. In Isoelectric Focusing, proteins separate based on their isoelectric point/pH.

2. When extracting genetic material for GMO detection in seed, what is the target material?

   a) Plasmid DNA
   b) Genomic DNA
   c) Ribosomal DNA
   d) cDNA

3. True or False The copy number of the DNA target is squared during each cycle of PCR.

4. List the three components that DNA is made up of.

   - Nitrogenous bases
   - Sugar
   - Phosphoric acid

5. The genetic composition of an organism is known as its:

   a) gene pool
   b) allele
   c) genotype
   d) phenotype

6. An organism with two identical alleles for a give trait is:

   a) homozygous
   b) dominant
   c) segregating
   d) unusually rare

7. True or False F1 hybrids are usually more healthy and productive than their parents.

8. The phenotype of an organism refers to its:

   a) genetic makeup
   b) appearance
   c) ability to reproduce
   d) enzymatic structure

9. PAGE stand for Polyacrylamide gel electrophoresis?

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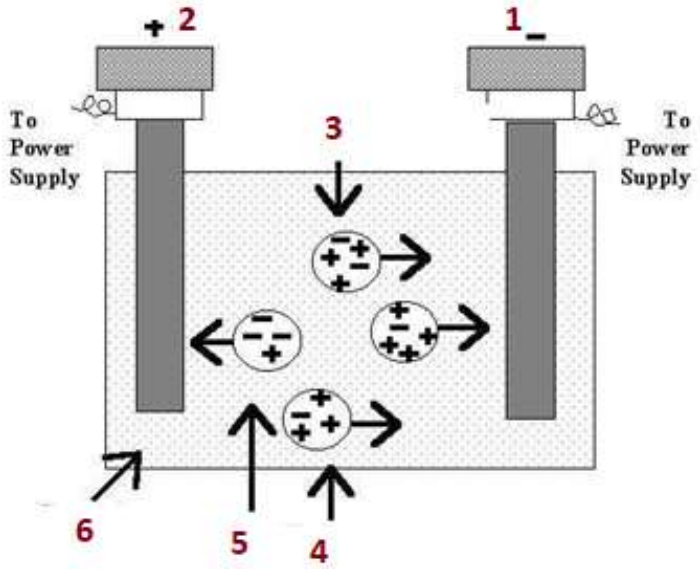
Label the parts of the basic electrophoresis configuration



10. Cation
    a) 1
    b) 2
    c) 3
    d) 4
    e) 5
    f) 6

11. Anion
    a) 1
    b) 2
    c) 3
    d) 4
    e) 5
    f) 6

12. Support Medium
    a) 1
    b) 2
    c) 3
    d) 4
    e) 5
    f) 6

13. Anode
    a) 1
    b) 2
    c) 3
    d) 4
    e) 5
    f) 6

14. Cathode
    a) 1
    b) 2
    c) 3
    d) 4
    e) 5
    f) 6

15. Protein Molecule
    a) 1
    b) 2
    c) 3
    d) 4
    e) 5
    f) 6

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16. List an advantage of starch gel electrophoresis.
    - High Throughput
    - Gives strong genotypic data
    - Starch matrix is suitable for isozymes to travel through and can get more than one slice from a gel.
    - Non-toxic
    - Fairly inexpensive equipment
    - Powerful ID: may be able to identify seed mixes or incorrect labeled samples if suspect variety previously tests.

17. List a disadvantage of starch gel electrophoresis.
    - What may be an off-type on the gel may or may not be expressed phenotypically.
    - Must be live tissue to extract isozymes, seeds cannot be tested.
    - Not all tissues of corn band the same. Some enzymes are not expressed in leave and brace root tissue.
    - Not suitable for scanning or long term storing gels.
    - Starch and chemical supply/demand issues.
    - Limited number of loci tested; may not be able to detect selfing in some hybrids.

18. List an advantage of SNP genetic purity testing.
    - SNP markers will work on degraded DNA samples.
    - High throughput.
    - The high frequency with which SNPs are found on the genome give them definite utility for trait or disease gene discovery purposes.
    - Because of their simple structure as base changes, genetic technologies are being developed to allow the rapid and efficient genotyping of individuals which can utilize thousands of SNPs.
    - SNPs generally are less mutable than other forms of polymorphism.

19. List a disadvantage of SNP genetic purity testing.
    - 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 (ex. A given marker set may only be applicable for North American corn).

20. What does the P in SNP stand for?
    a) Polyacrylamide
    b) Protein
    c) Polymorphism
    d) Parent

21. What is the PAGE detergent which denatures a protein and in doing so, causes proteins to develop a negative charge that is proportional to the size of the protein?
    a) Tween
    b) TRIS
    c) SDS
    d) PBS

22. SNP testing can be used to for applications such as
    a) Genetic purity
    b) Variety verification
    c) Genotyping
    d) All of the above

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23. True or False The analyst cannot detect selfing of a hybrid tested with isozyme electrophoresis if the female and male parents have the same banding patterns on all loci tested.

24. Which loci can the analyst use to verify selfing of a hybrid tested with isozyme electrophoresis?

a b c d e f g **h** I j k l
m n **o**

Variety	Lot Number	Sample #	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
123	Female		4/4	4/4	4/4	7/7	4/4	6/6	6/6	3/3	16/16	12/12	12/12	2/2	5/5	9/9	4/4
789	Male		2/2	4/4	4/4	7/7	4/4	6/6	6/6	6/6	16/16	12/12	12/12	2/2	5/5	9/9	8/8
123789	Hybrid		2/4	4/4	4/4	7/7	4/4	6/6	6/6	3/6	16/16	12/12	12/12	2/2	5/5	9/9	4/8

Variety	Lot Number	Sample #	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
123	Female		4/4	4/4	4/4	7/7	4/4	6/6	6/6	3/3	16/16	12/12	12/12	2/2	5/5	9/9	4/4
789	Male		2/2	4/4	4/4	7/7	4/4	6/6	6/6	6/6	16/16	12/12	12/12	2/2	5/5	9/9	8/8
123789	Hybrid		2/4	4/4	4/4	7/7	4/4	6/6	6/6	3/6	16/16	12/12	12/12	2/2	5/5	9/9	4/8

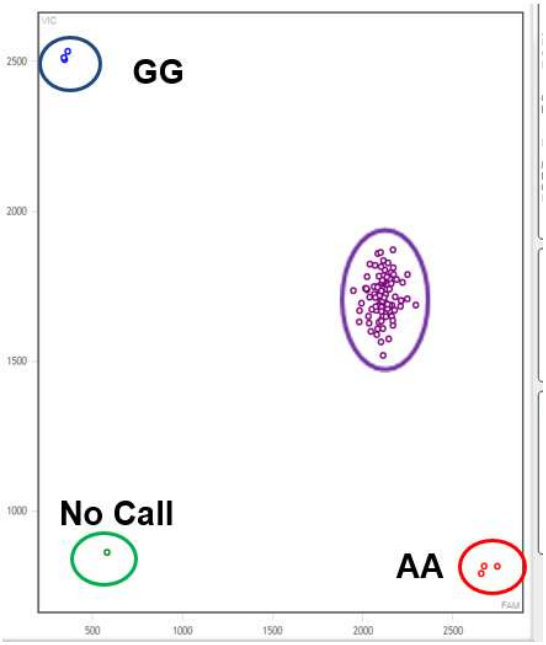
25. What is the % of total offtypes in these results?
    - 14%

# Seeds Tested	100
Variant	0
Female Selfs	1
Male Selfs	0
3L Offtypes	10
2L Offtypes	3

26. What is the % Total Purity?
    - 86.00%

# Seeds Tested	100
Variant	0
Female Selfs	1
Male Selfs	0
3L Offtypes	10
2L Offtypes	3

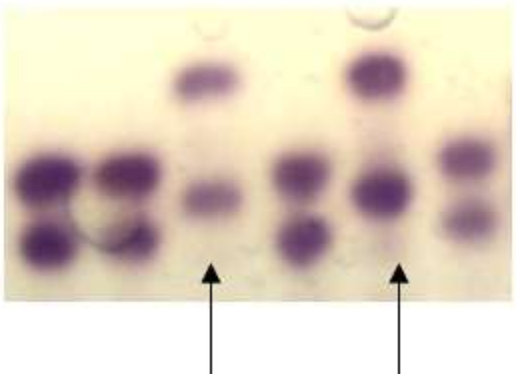
27. In this cluster plot, a hybrid was tested by SNP microarray. What is the expected phenotype of the purple cluster?
    - AG



28. True or False To know if two unknown seeds are identical, an analyst should test at least 10 markers.

29. The hybrid in the arrows does not have genetics from either parent and is accounting for 20% of the seeds tested. What potential contamination has been evaluated?

    - Seed Mix



30. True or False Segregation in a seed population is desirable in a breeding program.