2019 FFA Biotech Competition
50 Questions for the 2019 FFA Competition

1. A plant breeder makes a cross between two plants that are both the genotype Aa (Aa X Aa). How many different genotypes with respect to the A,a genes will be produced in their offspring? (3 points)
   a. 1
   b. 2
   c. 3
   d. 4

2. Which is the item below that is true about animal breeding? (3 points)
   a. Animal breeders are only interested in traits for which selection is obvious and the genetic control or inheritance is easy to predict
   b. Although slightly more difficult, breeding between 2 different species (ex. cat and dogs) can be done just as breeding within the same species.
   c. Animal breeders need to select the parents carefully
   d. Animal breeding would be much easier if there was no variation within a species in the genes that control their traits.

3. Protein(s)or polypeptide(s): (3 points)
   a. are a chain of amino acids
   b. is a rare molecule in an organism

4. What is the name of the technique that is used to amplify a single copy or few copies of a segment of DNA across an order of magnitude? (3 points)
   a. Polymerase Chain Reaction (PCR)
   b. Gel electrophoresis
   c. Lateral flow strip test
   d. Gene gun

5. Which choice is the correct ranking of the following items in order of smallest to largest?
   1. chromosomes 2. amino acids 3. proteins 4. Cell
   (3 points)
   a. 2 3 1 4
   b. 3 4 2 1
   c. 3 2 4 1
   d. 4 2 3 1

6. A corn plant has the genotype BbRr where BB and Bb plants are resistant to corn borers while bb plants are not AND RR and Rr plants are resistant to Roundup Herbicide while rr plants are not. Which of the follow is a genotype that could be made by selfing this BbRr plant? (3 points)
   a. BbRr
   b. BBRR
   c. bbrr
   d. All of the above

7. What is a difference between mitosis and meiosis? (3 points)
   a. meiosis happens faster than mitosis
   b. meiosis is used to make gametes that can genetically vary and mitosis makes identical cells.
   c. meiosis happens throughout an organisms life but mitosis only happens in young organisms.
   d. meiosis replicates chromosomes and mitosis replicates proteins.

8. A corn plant has the genotype BbRr where BB and Bb plants are resistant to corn borers while bb plants are not AND RR and Rr plants are resistant to Roundup Herbicide while rr plants are not. A corn breeder selfs the BbRr plant and produces hundreds of offspring. They grow hundreds of plants from these seeds. What fraction of all of these offspring from selfing BbRr will be BOTH corn borer resistant AND Roundup resistant? (3 points)
    a. 1/4
    b. 3/4
    c. 3/4 + 3/4
    d. 3/4 X 3/4
9. For natural sexual reproduction to take place, parents have to be (3 points)
    a. the same size
    b. the same age
    c. of similar species
    d. the same color
10. A transgenic organism is one that (3 points)
    a. has genes from another organism inserted into its chromosome
    b. has genes new genes created through mistakes in replication
    c. combines half the genes from one species with half from a different species
    d. has many of its genes removed by the genetic engineer
11. Mitosis is used (3 points)
    a. in plant tissue culturing
    b. to grow and develop tissues
    c. both the above
    d. none of the above
12. Clones are (3 points)
    a. genetically identical organisms
    b. organisms which produce a cloned protein
    c. organisms from which genes are removed
    d. genes that cause the production of twins that will always look identical
13. Cell division that creates two genetically identical cells is called (3 points)
    a. mitosis
    b. meiosis
    c. both of the above
    d. none of the above
14. Biotechnology can be used in all of the following EXCEPT (3 points)
    a. making proteins for human medicine
    b. increasing animal reproduction rate
    c. creating a living thing entirely from non-living molecules
    d. protecting plants from pests
15. The most commonly-used bacterium for gene transfer in plants is (3 points)
    a. Bacillus thuringiensis
    b. Escherichia coli
    c. Agrobacterium
    d. None of the above

16. A fertilized egg is known as a (3 points)
    a. Zygote
    b. clone
    c. anaphase
    d. Gamete
17. In humans, genes control all of the following EXCEPT (3 points)
    a. nutrition
    b. inherited diseases
    c. eye color
    d. skin color
18. Proteins are: (3 points)
    a. rare molecules in an organism
    b. able to mutate into a different protein
    c. biomolecules with a structure that is determined by a gene (DNA)
19. A altered version of a gene is known as a(n) (3 points)
    a. phenotype
    b. gamete
    c. allele
    d. genotype
20. Select the statement that is true about animal breeding (3 points)
    a. animal breeders are only interested in traits for which selection is obvious and the genetic control or inheritance is easy to predict
    b. animal breeders have a goal of improving a trait or traits in their breed or species of animal
    c. breeders all have the same traits they want to improve, no matter what the animal species or breed.
21. Which are reasons why mice can be good model organisms for gene discovery? (3 points)
    a. Mice use a universal genetic code so the DNA sequence of a mouse gene will be similar to the sequence of the gene that works in a similar way in other animals.
    b. Mice are easy to manipulate so they grow as large as a cow or live as long as a person.
    c. Mice were the first domesticated animals to provide milk, food, and fur.
22. Nucleotides are: (3 points)
    a. molecules of sugar
    b. building blocks of proteins
    c. the same as genes
    d. building blocks of genes
23. The reason DNA based detection works to detect a transgenic organism in more situations than Protein based detection is…. (3 points)
    a. protein detection cannot be for a specific protein.
    b. DNA detection works in all tissues of an organism that is transgenic but protein detection may not.
24. In mitotic division.... (3 points)
    new cells have 3/4 the original number of chromosomes
    b. new cells have 1/2 the original number of chromosomes
    c. new cells have the same chromosome number as the original cell
    d. new cells have three of each chromosome

25. If the sequence of bases in a strand of DNA is represented by TACCAG, what would be the sequence of bases in the complementary DNA strand? (3 points)
    a. AUGGUC
    b. TACCAG
    c. UADDAG
    d. ATGGTC
26. Most organisms are _____ meaning that they have two sets of chromosomes, one from each parent. (3 points)
    a. triploid
    b. haploid
    c. diploid
    d. polyploidy
27. Why are marker genes often inserted into a cell's DNA along with genes of interest? (3 points)
    a. to protect the legal rights of a company to sell the transgenic product
    b. to add market appeal to the final transgenic organism
    c. to make the cells grow faster in culture
    d. to visually identify transgenic cells or organisms
28. Most humans have _____ pairs of chromosomes (3 points)
    a. 20
    b. 21
    c. 23
    d. 25
29. This is the molecule that actually does work in the cell such as catalyze a chemical reaction. (3 points)
    a. Protein
    b. Trait
    c. Gene
30. How many genes are found on the largest human chromosome? (3 points)
    a. 100-500
    b. 1-2
    c. 10-20
    d. 1000-2000
31. A plant breeder wants to cross a red flowered penstemon and a strong stemmed penstemon. The plants have perfect flowers. If the breeder wants the strong stemmed penstemon to be the male parent, he should? (3 points)
    a. Remove the stamen from the flowers of the strong stemmed penstemon and collect the pollen the plants are shedding, without worrying about damaging the pistil.
    b. Do nothing, the flower is already a male and female.
    c. Remove the pistil from the flower of the strong stemmed penstemon and then carefully place it in the flower of the other parent.
    d. Remove the stamen from the flowers of the strong stemmed penstemon, but be careful not to damage the pistil.

32. a: select parents
    b: select offspring
    c: identify a problem
    d: cross parents
    e: determine what combination of traits would help a plant overcome a problem.

    The steps above are done by a plant breeder. The order they would do those steps is...
    (3 points)
    a. d, b, e, a, c
    b. c, e, a, d, b
    c. d, b, c, e, a
    d. c, e, a, b, d

33. A peanut breeder would like to develop a variety that produces sweet flavored nuts for the peanut butter industry. She searches the world collection of peanut lines and cannot find any that produce sweet flavor. What should she do next? (3 points)
    a. She will need to cross peanuts with sugar beets or sugar cane to get sweet peanuts.
    b. Grow peanuts in a high sugar environment so they acquire the sweet flavor trait.
    c. Treat a peanut plant or peanut seeds with a mutagen in the hopes that a random mutation will make a new allele that can make peanuts produce sweet nuts.
    d. Give up, there is nothing she can do to incorporate this trait into peanuts.

34. Why do tree breeders need to be more patient than corn breeders? (3 points)
    a. Trees have a longer generation time, so it takes longer for the breeder to select individuals that have the right traits
    b. All trees have the same traits, so there is no motive for doing plant breeding with trees.
    c. Trick question, trees do not have flowers so there are not tree breeders.
    d. Trees produce very few seeds.

35. During transcription, the DNA code of a single gene is read and a copy is made called mRNA. Why is it not necessary for the entire chromosome to be copied during transcription? (3 points)
    a. the information coded in many genes is directly read to make proteins.
    b. not every gene is active in the cell at the same time…meaning not every protein is being produced all the time in every cell of an organism.
    c. Trick question, the entire chromosome IS copied into mRNA and travels into the cytoplasm.

36. Bacteria are different from plants and animals in that they (3 points)
    a. have more genes than plants and animals
    b. replicate slower than plants and animals
    c. are all genetically identical because they never change
    d. have fewer genes than plants and animals

37. Which is the most accurate description of plant transformation? (3 points)
    a. genes are shot at the plant leaves and the leaves develop into flowers, then seeds.
    b. the immature embryo might get removed from a plant, but these embryos are induced to develop masses of cells on a petri dish and it is these cells that are targeted for gene delivery before they develop into plants.
    c. genes inserted into pollen, seeds made from the pollen produce transgenic plants.
    d. genes inserted into thousands of cells in a seed and if enough cells incorporate the genes, the plant is considered genetically engineered.

38. What is the definition of a chromosome? (3 points)
    a. Amino acid chains that have a specific shape and function
    b. Segment of DNA that encodes a protein or an RNA molecule
    c. Organism's characteristics
    d. Macromolecules that are long DNA chains wound around proteins.
39. Pig producers would like female pigs that have more piglets per litter. If a pig geneticist knew what gene or genes were responsible for litter size they could genetically engineer their best meat production breeds to have more offspring. The motivation for doing this would be… (3 points)
    a. pig breeders cannot increase litter size using classical methods
    b. genetic engineering can remove all biological restrictions so there will be no limit to the number of pigs in a litter.
    c. the genetic engineering approach to increasing litter size might be faster than the classical breeding approach.
40. Plants are easier to transform than animals because… (3 points)
    a. they have a cell wall
    b. the cells that are targeted to be transformed are so big you do not need a microscope to see them.
    c. they have cells that can be cultured more easily to produce new plants in a test tube or on a petri dish
    d. they have fewer genes than animals
41. What is the definition of a gene? (3 points)
    a. Organism's characteristics
    b. Amino acid chains that have a specific shape and function
    c. Segment of DNA that encodes a protein or an RNA molecule
    d. Macromolecules that are long DNA chains wound around proteins and contain genes.
42. What is the definition of a protein? (3 points)
    a. Macromolecules that are long DNA chains wound around proteins and contain genes.
    b. Amino acid chains that have a specific shape and function
    c. Segment of DNA that encodes a protein or an RNA molecule
    d. Organism's characteristics
43. Quantitative traits are (3 points)
    a. traits that are not controlled by genes
    b. traits that are often controlled by one (or just a few) genes and their expression is either present or absent, such as no hair vs. hair, black fur color vs. brown fur color.
    c. traits that are often controlled by many genes and are measured in amounts, such as inches, pounds, percent, quantity.
44. Which type of genetic engineer must clone (copy) a gene as part of their work? (3 points)
    a. Microbial genetic engineer
    b. Plant genetic engineer
    c. Animal genetic engineer
    d. All the above

45. Two genes that the genetic engineer could work with are gene A and gene B. Gene A from algae, is turned on in salt water and encodes an enzyme that breaks down oil. Gene B is from soil bacteria, is turned on in soil and encodes an enzyme that breaks down plant material. Which transgene could be used to create a genetically engineered soil bacteria that can clean up oil spills? (3 points)
    a. Use gene A
    b. Use the promoter from gene B and the coding region from gene A
    c. Use gene B
    d. Use the promoter from gene A and coding region from gene B

46. Identify advantages mice would have over cattle or even pigs as a model to discover animal function genes? (3 points)
    a. Cattle and pigs who have a very unique genetic code from other animals, mice would use a more common DNA code.
    b. Mice are cheaper to raise
    c. Mice do not make messes where they live or bleed when you cut them.

47. A potato breeder develops a variety of potatoes that makes excellent French fries, has good yield and gives potato farmers very little management problems. Can the plant breeder retire? (3 points)
    a. No, the growing environment can change and so a variety that grows well now, may not grow as well years from now. The breeder needs to always be working for future change.
    b. No, the breeder cannot retire because the improved plants they create and select for farmers cannot be propagated by the farmer, only by the plant breeder.
    c. Yes, potato varieties that meet farmer and consumer needs today will always fit those needs decades later.

48. How do genetic engineers and plant breeders work together? (3 points)
    a. Genetic engineers add new genes and plant breeders combine these new genes with the best combinations of genes between different plants.
    b. Plant breeders add new genes and genetic engineers combine these new genes with the best combinations of genes between different plants.
    c. Genetic engineers always finish the genetic improvement process that plant breeders start so they are responsible for making the seeds sold to farmers.
    d. They do not work together. A company uses either plant breeder or genetic engineering to make new varieties, but not both.

49. The things that are true about animal breeding are… (3 points)
    a. although slightly more difficult, breeding between 2 different species (ex. cat and dogs) can be done just as breeding within the same species.
    b. animal breeding would be much easier if there was no variation within a species in the genes that control their traits.
    c. animal breeding is only done on domestic animals not wild animals
    d. breeding can only be done between 2 animals of the same species.

50. What is the definition of a phenotype? (3 points)
    a. Macromolecules that are long DNA chains wound around proteins and contain genes.
    b. Amino acid chains that have a specific shape and function
    c. Organism's characteristics
    d. Segment of DNA that encodes a protein or an RNA molecule

TEST	
1	C
2	C
3	A
4	A
5	A
6	D
7	B
8	D
9	C
10	A
11	C
12	A
13	A
14	C
15	C
16	A
17	A
18	C
19	C
20	B
21	A
22	D
23	B
24	C
25	D
26	C
27	D
28	C
29	A
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31	A
32	B
33	C
34	A
35	B
36	D
37	B
38	D
39	C
40	C
41	C
42	B
43	C
44	D
45	B
46	B
47	A
48	A
49	D
50	C

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