COMPETIFY HUB

FUELING AMBITION, FORGING PATHS

BIOLOGY

GRADES 9-12

PROVIDING FREE RESOURCES FOR ALL

Q1: A child is born between a father who is diagnosed with hemophilia (a sex-linked recessive disease) and a mother who does not have a trait for hemophilia. What is the probability that the child also has hemophilia?

a. 0%
b. 25%
c. 50%
d. 75%
e. 100%

Q2: A student is predicting the probability that a guinea pig born from a father who is homozygous dominant for black fur and brown eyes, and a mother who has brown fur and is heterozygous for black eyes. If the trait for black fur and black eyes is dominant, what is the probability that the child guinea pig has brown eyes and brown fur?

a. 1/16%
b. 1/8%
c. 1/4 %
d. 1/32 %
e. 0 %

S1: A - 0%

Explanation: Setting up a Punnett square of the sex chromosomes of the gametes will help find the probability of a daughter with either two recessive x chromosomes (xx) or a son with a recessive x chromosome and a Y chromosome, both of which will allow a phenotype of hemophilia. After setting up, it can be found that the probability is 0/4 or 0%.

S2: E - 0%

Explanation: Setting up a dihybrid Punnett square allows us to figure out that the probability of a guinea pig with brown eyes and brown fur is 0%.

Q3: How does the recombination frequency of a monohybrid cross compare to a dihybrid cross?

a. The recombination frequency of a dihybrid cross is higher than that of a monohybrid cross
b. The recombination frequency of a monohybrid cross is higher than that of a dihybrid cross
c. The recombination frequencies are equal
d. None of the above

Q4: An organism that is homozygous recessive for white eyes and heterozygous for black fur mates with another organism that suffers from triploidy. This organism is homozygous dominant for red eyes and homozygous recessive for white fur. What is the probability that the F2 generation of the organism has white eyes and white fur?

a. 1/4
b. 1/8
c. 1/16
d. 1/32

S3: D - None of the Above

Explanation: While monohybrid crosses track the genotype of one gene and dihybrid crosses track the genotype of two genes, the requirement for recombination frequency mentioned in the question have to occur on the same chromosome and tracks two genes at the same time, making the comparison fundamentally wrong.

S4: C - 1/16

Explanation: Setting up a Punnett square or calculating the probability of each trait allows us to figure out the probability that the organism has white eyes and white fur in the triploid organism, which is 1/16.

Q5: Sickle Cell Anemia is codominant at which organizational level?

a. Molecular
b. Cellular
c. System
d. Chemical

Q6: Which chromosomal system might a grasshopper belong in if a female has two sex chromosomes but a male has only one?

a. X-Y system
b. X-0 system
c. Z-W system
d. Haploid – Diploid system

S5: A - Molecular

Explanation: The genotypic expression of Sickle Cell Anemia reflects dominance at the molecular level, that is, both alleles are present and expressed equally by allele.

S6: B - X-0 system

Explanation: A X-0 chromosomal sex system refers to when a female has XX chromosomes, while males have X0 chromosomes or just one X chromosome. This matches the sexual genotype seen in the grasshopper.

Q7: Gregor Mendel's pea color and texture experiment followed Mendelian genetics only because the genes for the traits acted as though they were unlinked, even while on the same chromosome. What if this had not been the case?

a. The Chromosomes would not assort independently
b. Recombination frequency would be less than 50%
c. Loci of genes would be closer together
d. All of the above

Q8: Gregor Mendel's pea color and texture experiment followed Mendelian genetics only because the genes for the traits acted as though they were unlinked, even while on the same chromosome. What if this had not been the case?

a. Asters
b. Kinetochores
c. Spindle Fiber
d. Synaptonemal complex

S7: D - All of the above

Explanation: Genes that are linked exhibit all the above characteristics. They are all notable in terms of this context.

S8: D - Synaptonemal Complex

Explanation: The Synaptonemal complex is the zipper-like structure formed during the synapsis of two chromosomes and is responsible for the process of crossing over in early prophase I.

Q9: Which of the following correctly orders the traits on a gene map, assuming the left is 0% recombination frequency?

a. Wing Color < Wing Size < Eye Color < Body Color
b. Eye Color < Body Color < Wing Size < Wing Color
c. Body Color < Wing Size < Wing Color < Eye Color
d. Wing Size < Eye Color < Wing Color < Body Color

Q10: A geneticist wants to detect specific gene sequences, genetic variations, and identify genetic diseases. Which instrument should he use?

a. Gel Electrophoresis
b. Microarray
c. Karyotype
d. Amniocentesis

S9: C - Body Color < Wing Size < Wing Color < Eye Color

Explanation: Setting up a gene map and deciphering the loci in map units of the dragonfly traits allows us to get to the answer above. Genes with higher recombination frequency are further apart, while genes with smaller recombination frequency are closer together.

S10: B - Microarray

Explanation: A microarray is an instrument a geneticist uses to detect and analyze gene expression or detect specific DNA sequences, as well as identify variations and genetic diseases. The other instruments have other important functions