

KEY TERMS

Match the numbered term with the definition that fits it best. Put the corresponding number in front of the appropriate definition.

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|--------------------------------------|-----------------------|-------------------------------------|
| 1. chromosomal theory of inheritance | 10. centimorgan | 20. amniocentesis |
| 2. mutation | 11. three-point cross | 21. dosage compensation |
| 3. X chromosome | 12. wild-type | 22. genetic mosaicism |
| 4. Y chromosome | 13. sex chromosomes | 23. chorionic villi sampling |
| 5. sex-linked | 14. Barr body | 24. maternal inheritance |
| 6. autosomes | 15. nondisjunction | 25. anonymous markers |
| 7. crossing over | 16. aneuploidy | 26. single-nucleotide polymorphisms |
| 8. hemophilia | 17. monosomics | 27. genomic imprinting |
| 9. genetic map | 18. trisomics | |
| | 19. Down syndrome | |

- a. ____ Females whose individual cells may express different alleles depending on which chromosome is inactivated.
- b. ____ The normal nucleotide sequence of a chromosome that is found in the wild.
- c. ____ The failure of homologues or sister chromatids to separate properly during meiosis.
- d. ____ Genetic markers detectable by molecular techniques that do not cause a detectable phenotype.
- e. ____ The condition that occurs when a small portion of chromosome 21 is present in three copies instead of two.
- f. ____ A map unit consisting of 1% of recombination determined from a two-point testcross.
- g. ____ A difference between an individual of a population that affects a single base of a genetic locus.
- h. ____ A procedure used in the prenatal diagnosis of genetic disorders by analysis of the fluid that bathes a fetus.
- i. ____ Uniparental inheritance from the mother typical of cellular organelles such as the mitochondria.
- j. ____ Humans that have gained an extra copy of an autosome and generally do not survive.
- k. ____ Maleness is typically determined by the presence of this chromosome.
- l. ____ An inactivated, highly condensed X chromosome attached to the nuclear membrane.
- m. ____ A condition in which a chromosome is gained or lost as a result of nondisjunction.
- n. ____ A trait determined by a gene located on the X chromosome.
- o. ____ A procedure used in genetic screening where cells are removed from a membranous part of the placenta.
- p. ____ Twenty-two chromosomal pairs perfectly matched in both males and females.
- q. ____ Ensures an equal level of expression from the sex chromosomes in males and females.
- r. ____ The physical exchange of genetic material between homologues during meiosis.
- s. ____ An unnatural, heritable change in the nucleotide sequence of a chromosome.
- t. ____ Allows the detection of double crossovers such that genes can be put into order.
- u. ____ An individual with two of these chromosomes produces only one type of gametes.
- v. ____ Humans that have lost even one copy of an autosome and generally do not survive embryonic development.
- w. ____ The phenotype caused by a specific allele is exhibited when the allele comes from one parent, not the other.
- x. ____ One pair of 23 pairs of chromosomes found in humans that distinguishes the gender of an individual.
- y. ____ Genes determining Mendelian traits are located on chromosomes that play a central role in heredity.
- z. ____ Positioning of genes on a chromosome based on genetic distance being proportional to recombination frequency.
- aa. ____ A disease that is more common in males because the gene affected is on the X chromosome.

EXERCISING YOUR KNOWLEDGE

Briefly answer the following questions in the space provided.

1. Why do sex-linked, recessive traits occur more often in males than in females?
 2. Why did Thomas Morgan need to perform a testcross with his red-eyed females?
 3. In Morgan's experiment, he found that female fruit flies could have white eyes. How could that happen if the trait is sex-linked?
 4. (a) How can genes located on the same chromosome assort during meiosis as if they were on different chromosomes? (b) How far apart must they be for this to be true?
 5. How are recombinant chromosomes distinguished from parental ones?
 6. Why is the number of recombinant progeny an underestimate of the distance between two very distant genes?
 7. All male individuals inheriting the gene for "Royal hemophilia" had the disease. Why is this not true of other forms of hemophilia?
 8. How can nondisjunction lead to trisomy 21?
 9. How are genes modified in genomic imprinting?
 10. What is amniocentesis used for?
- Circle the letter of the one best answer in each of the following questions.
11. What conclusion(s) is/are suggested if a normal and a mutant fly are crossed and the only mutant progeny observed are male?
 - a. Mutation is located on the X chromosome.
 - b. Mutation is located on the Y chromosome.
 - c. Mutation is lethal to females.
 - d. Mutation is lethal to males.
 - e. Both a and c are possible explanations.
 12. On which of the sex chromosomes is a sex-linked gene usually carried?
 - a. 13
 - b. 15
 - c. 18
 - d. Y
 - e. X

13. If a red-eyed male fly is mated to a homozygous red-eyed female fly, what percentage of the male offspring will have red eyes?
- 100%
 - 75%
 - 50%
 - 25%
 - 0%
14. Morgan discovered that the white eye mutation in fruit flies is:
- autosomal.
 - lethal in females.
 - sex-linked.
 - on the Y chromosome.
 - dominant.
15. What important contribution did Thomas Morgan's experiments with the white eye mutation provide for the field of genetics?
- the importance of the eye color in flies
 - genes reside on chromosomes
 - flies have sex chromosomes
 - independent assortment of genes
 - segregation of alleles
16. What determines the sex of a human?
- presence or absence of an X chromosome
 - presence or absence of a Y chromosome
 - presence of two X chromosomes
 - absence of a Y chromosome
 - environmental conditions
17. Which of the following is an example of a sex-linked human disease?
- Tay-Sachs disease
 - cystic fibrosis
 - Huntington disease
 - hemophilia
 - sickle cell anemia
18. Of the two X chromosomes inherited by human females, one becomes
- a mutant.
 - an allele.
 - inactivated.
 - an autosome.
 - an O chromosome.
19. What molecular structure is responsible for the mosaic coloring of calico cats?
- Y chromosome
 - Barr body
 - nuclear envelope
 - cell membrane
 - mitochondria
20. The inheritance of mitochondrial genes is an example of which of the following?
- paternal inheritance
 - biparental inheritance
 - uniparental inheritance
 - chromosomal inheritance
 - Mendelian inheritance
21. Generation of a genetic map is dependent on which normal cellular process?
- mitosis
 - asexual reproduction
 - independent assortment
 - mutation
 - recombination
22. A centimorgan is a unit of measure that corresponds to:
- the length of a chromosome.
 - the length of a gene.
 - the length of DNA, which yields a recombination event in 1% of meioses.
 - the distance between two alleles.
 - the distance between two genes.
23. Which of the following is an example of a recombinant chromosome that can result from the parental homologous chromosomes Ab & aB?
- AB
 - aB
 - Ab
 - Aa
 - Bb
24. If an individual has homologous chromosomes (ABC & abc), which is a double recombinant chromosome that could result?
- ABc
 - aBC
 - AbC
 - aBc
 - Both C and D are correct.
25. When can double crossovers be observed in a two-point cross?
- always
 - never
 - only when the crossovers are close together
 - only when the crossovers are far apart
 - only on X chromosomes

26. In a three-point cross, the middle gene is the one
- that never recombines.
 - that always recombines.
 - that recombines the most often.
 - that recombines the least often.
 - that is not observed.
27. Which of the following occurs most frequently?
- recombination between two genes 0.1cM apart.
 - recombination between two genes 5cM apart.
 - recombination between two genes 10cM apart.
 - recombination between two genes 50cM apart.
 - recombination that occurs 20% of the time.
28. Why is trisomy 1 never observed in humans?
- Trisomy 1 does exist.
 - Chr. 1 never undergoes nondisjunction.
 - Chr. 1 is very stable.
 - Chr. 1 has so many genes it causes lethality.
 - Chr. 1 is too small to cause an effect.
29. Genetic counselors look for which of the following in samples taken during pregnancy?
- aneuploidy
 - chromosomal alterations
 - lack of normal enzymatic activities
 - gene mutations
 - all of the above
30. The genotype of an individual with Turner syndrome is
- YO.
 - XXY.
 - XYY.
 - XO.
 - XXX.