Scratch Sheet

Chapter 15 Questions

1. **What does the chromosome theory of inheritance say?**
2. **How many chromosomes does *Drosophila Melanogaster* have?**
3. **What is the wild type?**
4. **What are traits that are alternatives to the wild type?**
5. **What is the notation used to symbolize alleles in fruit flies?**
6. **How is fruit fly eye color determined (white or red)?**
7. **Compare and contrast the X and Y chromosomes.**
8. **Explain four of the chromosomal systems of sex determination.**
9. **What gene is required for the development of testes?**
10. **What are genes located on sex chromosomes called?**
11. **What does the development of female gonads require?**
12. **How is red-green color blindness transmitted?**
13. **What does hemizygous mean?**
14. **What is Duchenne muscular dystrophy?**
15. **What is hemophilia?**
16. **What happens to one of a female mammal's X chromosomes during early embryonic development?**
17. **What are linked genes?**
18. **In fruit flies, what are wings that are much smaller than normal called?**
19. **What are combinations of traits not seen in the P generation called?**
20. **What is genetic recombination?**
21. **What are parental types?**
22. **What are the opposite of parental types?**
23. **How is frequency of recombination defined?**
24. **What accounts for the recombination of linked genes?**
25. **What was the percent of recombination for a cross between homozygous recessive for linked alleles and a heterozygous for linked alleles fruit flies?**
26. **What is a genetic map?**
27. **What is a linkage map?**
28. **What is the unit used to express the distances between genes on a linkage map?**
29. **What are cytogenetic maps?**
30. **What is nondisjunction?**
31. **What aneuploidy?**
32. **What do monosomic and trisomic mean?**
33. **What is polyploidy?**
34. **What are examples of polyploids?**
35. **What are the four types of changes in chromosome structure?**
36. **What is a syndrome?**
37. **What is Down syndrome?**
38. **What is Klinefelter syndrome?**

39. **What occurs when a male is born with an extra Y chromosome?**
40. **What happens to females with trisomy X?**
41. **What is Turner syndrome?**
42. **What is cri du chat?**
43. **What is chronic myelogenous leukemia (CML)?**
44. **What is genomic imprinting?**
45. **What is insulin-like growth factor 2 (Igf2)?**
46. **How are genes imprinted?**
47. **What are genes that are not inside of the nucleus?**
48. **Where does a zygote get its genes that are outside of the nucleus?**
49. **What do defects in mitochondrial genes cause?**
50. **What is mitochondrial myopathy?**
51. **What is Leber's hereditary optic neuropathy?**
52. **CHECK OUT PG 313 if time**

Chapter 15 Answers

1. Mendelian genes have specific loci along chromosomes and chromosomes undergo segregation and independent assortment
2. 8
3. The phenotype for a character most commonly observed in natural populations
4. mutant phenotypes
5. The gene takes symbol from the first mutant discovered, superscript + is wild type allele
6. wild type is X-linked dominant
7. Two X make female, X and Y make male, Y is smaller than X, short segments at either end of Y chromosome are only regions homologous with regions on X
8. X-Y system - In mammals, offspring depends whether sperm has X or Y
   X-0 system - In grasshoppers, cockroaches, some other insects, only X chromosome (females have XX, males have one sex chromosome (X0))
   Z-W system - In birds, some fishes, some insects, sex chromosomes present in egg determine offspring (females are ZW, males are ZZ)
   Haplo-diploid system - no sex chromosomes in bees and ants, females develop from fertilized eggs (diploid), males develop from unfertilized (haploid, no father)
9. SRY (sex-determining region of Y), absence causes development of ovaries
10. sex-linked gene, X-linked if on X (approx 1,100), Y-linked if on Y (about 78 genes coding for 25 proteins)
11. Gene WNT4 (chromosome 1, autosome), encodes protein that promotes ovary dev (extra copies in XY child will result in rudimentary female gonads)
12. X-linked recessive
13. It means only having one copy of a gene (boys are hemizygous for X-linked genes)
14. X-linked, one of 3,500 males in US, characterized by progressive weakening of muscles and loss of coordinations, affected rarely live past early 20s, traced to absence of dystrophin (key muscle protein mapped to specific locus on X chromosome)
15. X-linked recessive disorder, defined by absence of proteins required for blood clotting, bleeding is prolonged because firm clot forms slowly, was widespread among royal families of Europe in 1800s, spread under Queen Victoria of England
16. Randomly, one X chromosome is inactivated and condenses into compact object called Barr body (Canadian anatomist Murray Barr), lies along inside of nuclear envelope. In ovaries, Barr body chromosomes reactivated in cells that give rise to eggs. All mitotic descendants of cell have same inactivated X chromosome. Inactivation involves modification of DNA and histones (bound proteins), such as methylation of nucleotides. One region with genes involved in inactivation process on each X chromosome associate briefly with each other at early stage of embryonic development, then XIST gene (X-inactive specific transcript) becomes active in chromosome that will become Barr body, RNA product of gene attach to parent X chromosome and almost cover it, interactions between RNA and chromosome initiates inactivation.
17. Genes located near each other on same chromosome

18. vestigial wings
19. nonparental phenotypes
20. Production of offspring with nonparental phenotypes
21. Offspring with phenotypes matching that of parents
22. Recombinant types or recombinants, offspring that have new combinations of alleles
23. Percent of offspring that are recombinants
24. Crossing over
25. 17%
26. Ordered list of genetic loci along a particular chromosome
27. Genetic map based on recombination frequencies
28. Map units, 1 map unit = 1% recombination frequency
29. Locate genes with respect to chromosomal features
30. Members of a pair of homologous chromosomes do not move apart properly during meiosis I or sister chromatids fail to separate during meiosis II. One gamete receives two of same type of chromosome and another gamete receives no copy
31. The condition of having an abnormal number of a chromosome
32. Monosomic means missing one chromosome, trisomic means having an extra, 10-25% of human conceptions, main reason for pregnancy loss
33. Having more than two complete chromosome sets, triploidy (3n), tetraploidy (4n)
34. Common in plant kingdom, bananas triploid, wheat hexaploid, strawberries octoploid, few fishes and amphibians are polyploid
35. Deletion when fragment removed, fragment may attach to other chromatid to form duplication, fragment may reattach in reverse orientation to produce inversion, or fragment could join nonhomologous chromosome in translocation. Deletions and duplications especially likely to occur in meiosis
36. A set of traits, genetic disorders caused by aneuploidy can be diagnosed before birth
37. aneuploid condition, 1 of 830 children in US, usually result of trisomy 21 (extra chromosome 21). Includes characteristic facial features, short stature, correctable heart defects, and developmental delays. Have increased chance of developing leukemia and Alzheimer's disease, have a lower rate of high blood pressure, atherosclerosis, stroke, and many solid tumors. Have shorter lifespan than most, most males and half females are sterile. Frequency increases with age (0.04% in children of women under 30, climbs to 0.92% in mothers age 40)
38. Extra X chromosome in male, 1 per 500 to 1000 live male births, have male sex organs but testes are small and man is sterile. Extra X is inactivated, some breast enlargement and other female body characteristics are common. May have subnormal intelligence.
39. 1 in 1000 males, undergo normal sexual dev, do not exhibit syndrome, taller than avg.
40. 1 in 1000 females, healthy, slightly taller than average
41. 1 every 2500 females, monosomy X, only known viable monosomy. Phenotypically female, sterile since sex organs do not mature (estrogen replacement therapy allows dev of secondary sex characteristics), most have normal intelligence
42. Syndrome caused by specific deletion in chromosome 5, child is severely intellectually disabled, has small head with unusual facial features, usually die in early childhood

43. Cancer that is caused by reciprocal translocation that happens during mitosis of cells that are precursors of white blood cells, large portion of chromosome 22 with small fragment from tip of chromosome 9 swap, producing very short chromosome 22 called the Philadelphia chromosome.
44. Variation in phenotype depending on whether allele is inherited from male or female parent (100 imprinted genes in humans, 125 in mice), occurs during gamete formation, results in silencing of particular allele of certain genes, imprinted genes always imprinted in same way
45. One of the first imprinted genes to be identified. Required for normal prenatal growth, only paternal allele is expressed (recessive mutation causes dwarfism), methylation of certain cytosines of paternal chromosome lead to expression of allele
46. Allele in one gamete is silenced or activated. Imprint consists of methyl groups added to cytosine nucleotides of one allele (heavily methylated genes generally inactive). Methylation can also activate gene
47. Extranuclear or cytoplasmic genes
48. Mother (egg), mitochondria contributed by sperm destroyed in egg by autophagy
49. Reduce amount of ATP the cell can make, causes disorders in 1 of 5000 births.
50. Mitochondrial disorder, causes weakness, intolerance of exercise, muscle deterioration
51. Mitochondrial disorder, can produce sudden blindness in people as young as 20s or 30s. Four mutations cause disorder to affect oxidative phosphorylation during cell respiration