Human Genetics Objective Sheet

**Tested Objectives**

Bio.3.2.2 Predict offspring ratios based on a variety of inheritance patterns (including dominance, co-dominance, incomplete dominance, multiple alleles, and sex-linked traits)

Bio.3.2.3 Explain how the environment can influence the expression of genetic traits

**Essential Vocabulary (ALL MUST BE DEFINED FOR FULL CREDIT)**

Inheritance pattern, Co-dominance, incomplete dominance, multiple alleles, polygenic, autosomal, sex-linked. Nondisjunction, karyotype, trisomy, aneuploidy, Down syndrome, Turner syndrome, Klinefelter syndrome, pedigree, cystic fibrosis, Huntington’s disease, sickle-cell anemia, color blindness, hemophilia, PKU, nature vs. nurture

**Questions to Master (ALL MUST BE ANSWERED FOR FULL CREDIT)**

1. Humans have 23 pairs of chromosomes. In a karyotype, the two chromosomes of each pair are lined up together and sorted from 1 to 23. The 23rd pair of chromosomes are NOT homologous. These chromosomes are called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ chromosomes.
2. Define **allele:**
3. List the possible genotypes for each of the following blood phenotypes:
   1. Type A –
   2. Type B –
   3. Type AB –
   4. Type O –
4. In order for someone to show a recessive trait (with complete dominance), what would their genotype be and how many recessive alleles must they have?
5. What are the sex chromosomes for normal males and normal females?
   1. Male =
   2. Female =
6. Define **gene:**
7. What type of inheritance occurs when two traits are equally dominant and are expressed side by side in the phenotype for the heterozygous condition?
8. Why are males more affected with sex linked disorders than females?
9. Describe the difference between **genotype** and **phenotype**.
10. Define **pedigree:**
11. A circle in a pedigree represents a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. A square represents a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
12. Define **nondisjunction.** What problem does this cause in the offspring.
13. For the following chromosomal disorders that are a result of nondisjunction, define what is wrong with the chromosomal set in a karyotype:
    1. Down’s Syndrome =
    2. Klinefelter’s Syndrome =
    3. Turner’s Syndrome =

Punnett Practice

1. In humans, the gene for cystic fibrosis is an autosomal recessive disorder. A healthy father and a mother who has cystic fibrosis have four children. The father’s mother had cystic fibrosis.
2. What is the chance that they will have a child with cystic fibrosis?
3. Muscular Dystrophy is caused by a recessive gene located on the X chromosome. A carrier for the disease marries a man with muscular dystrophy.
4. What is the chance that their male children will have muscular dystrophy?
5. What is the chance that their female children will have muscular dystrophy?
6. Huntington’s disease is an autosomal dominant disorder. What is the chance that a heterozygous male and a normal female would create offspring with Huntington’s disease?
7. A man and a woman have a baby and they have their doubts as to whether the child is theirs. They believe there could have been an accidental baby swap at the hospital. To find out, the couple has a blood test performed. The parents are both Type A blood. The baby has type O blood. Is it possible for this couple to be the parents of the child. Show the punnett square to explain whether it is or is not possible.
8. Evaluate examples of nature vs. nurture in the expression of traits (ie. twin studies, PKU, Heart Disease).
9. Differentiate between the inheritance of gene disorders and chromosomal disorders.
10. Draw a pedigree for the following family and answer the analysis questions below:

Ray and Elaine were married in 1970. They both had normal vision. They had 2 daughters and then a son. Both daughters, Alicia and Candace, had normal vision and never had any children of their own. The son, Mike, was colorblind. The son married Beth who also had normal vision and they had 2 children of their own, first Greg then Victoria. Victoria was colorblind, but Greg was not.

* 1. Is colorblindness (dominant or recessive)? Circle the correct answer
  2. Colorblindness is found on (autosomal chromosomes/ sex-chromosomes). Circle the correct answer
  3. \*\*BONUS\*\* Write the genotypes of each person beside their circle or square.





