Karyotyping Lab

Name _____

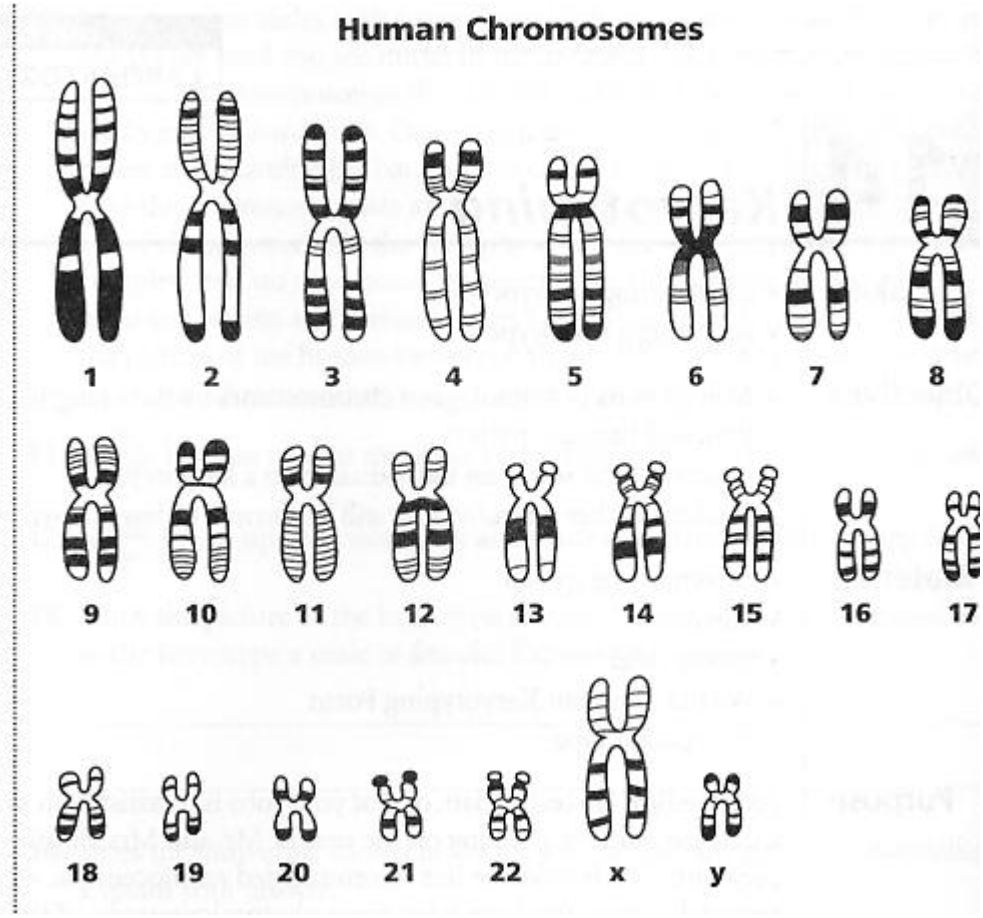
As a medical lab technician, one of your jobs is to assist with prenatal testing. Currently, you are working on the case of Mr. and Mrs. Isitaboyorgirl. Mrs. Isitaboyorgirl is pregnant, and her doctor has recommended an *amniocentesis*. Your job is to complete and analyze a karyotype of these cells to determine the sex of the baby and whether the baby has Down's Syndrome, Klinefelter's Syndrome or not.

Background:

Humans have 46 chromosomes in every diploid (2n) body or somatic cell. The chromosomes of a diploid cell occur in **homologous pairs,** which are pairs of chromosomes that are similar in size, shape, and the position of their centromere. In humans, 22 homologous pairs of chromosomes are called **autosomes**. The 23rd pair, which determines the individual's sex, make up the **sex chromosomes.** Females have only one type of sex chromosomes, which is called an **X chromosome**. Males have 2 types of sex chromosomes, an X and a much smaller **Y chromosome**. The diagram shows each of the 22 types of autosomes and the 2 types of sex chromosomes.

A **karyotype** is a diagram that shows a cell's chromosomes arranged in order from largest to smallest. A karyotype is made from a photomicrographed (photo taken through a microscope) of the chromosomes from a cell in metaphase. The photographic images of the chromosomes are cut out and arranged in homologous pairs by their size and shape. The karyotypes can be analyzed to determine the sex of the individual and whether there any chromosomal abnormalities. For example, the karyotype of a female shows 2 X chromosomes, and the karyotype of a male shows an X chromosome and a Y chromosome.

DO NOT CUT OUT THESE CHROMOSOMES!! Use this as a "map" for your karyotype that you will be constructing on the next page.



PLEASE PASTE CHROMOSOMES ON THE BACK OF THIS PIECE OF PAPER!

Chromosomal abnormalities often result from **nondisjunction**, the failure of chromosomes to separate properly during meiosis. Nondisjunction results in cells that have too many or too few chromosomes. **Trisomy** is an abnormality in which a cell has an extra chromosome, or section of a chromosome. This means that the cell contains 47 chromosomes instead of 46. **Down Syndrome** or **Trisomy 21** is a chromosomal abnormality that results from having an extra number 21 chromosome. **Klinefelter's Syndrome** results from having an extra X chromosome.

Procedure:

1. Carefully cut out each chromosome from the chromosome sheet you were given. (DO NOT cut out the above diagram). Be sure to leave a slight margin around each chromosome.
2. Arrange the chromosomes in homologous pairs. The members of each pair will be the same length and will have the centromere in the same location. (If you cannot not determine if 2 chromosomes are similar, use a ruler to measure the length and the position of the centromere)
3. Arrange the pairs according to their length, from largest to smallest. The banding patterns of the chromosomes may also help you to pair up the homologous chromosomes.
4. Tape or glue each homologous pair to your answer sheet below. Place the pairs in order, with the longest pair at position 1 and the shortest at position 22. The sex chromosomes should be placed at position 23.
5. Once completed, the diagram you have made is a karyotype. Analyze the karyotype to determine the sex of the baby and whether or not the baby has any chromosomal abnormalities.

Analysis Questions:

1. Is Baby Isitaboyorgirl a Boy or Girl? (Cirlce one)

2. will the baby be normal, have Down Syndrome, or have Klinefelter's Syndrome? Explain why you chose that answer.

Paste # from chromosome sheet here!

3. Why are karyotypes important tools for geneticists?

4. What are homologous chromosomes?

5. What is crossing over?

6. Does the karyotype represent a diploid or haploid cell?

Karyotype for Baby Isitaboyorgirl **(put chromosomes above the numbers)

1	2	3	4	5	6	7	8
9	10	11	12	13	14	15	16
17	18	19	20	21	22	23 (sex chromosomes)	