Human Karyotype Project Instructions

1. Lightly color the chromosomes blue or pink according to the instructions at the bottom of the page.

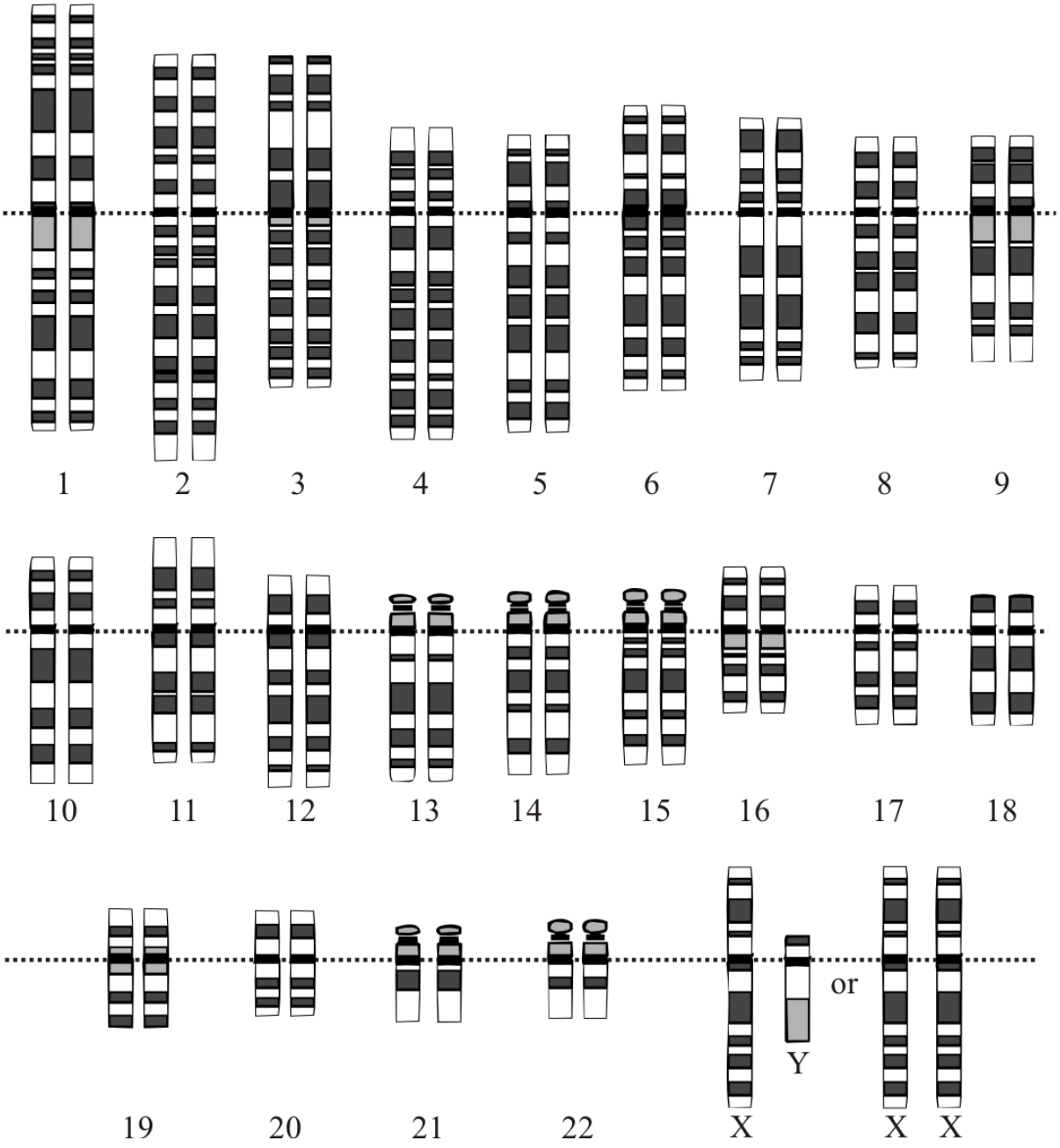
2. Cut out the chromosomes, but leave the gene labels attached to the chromosomes.

3. Sort the chromosomes by size from 1 through 22. The longest chromosome is number 1, and the shortest is number 22. The X and Y chromosomes are not assigned a number.

4. Find the homologous pair of each chromosome. For example, the blue chromosome 1 will make a homologous pair with the pink chromosome 1.

5. Arrange the homologous pairs in order on your poster from 1 to 22, with the sex chromosomes last. The chromosomes should all be lined up along the centromeres.

Example of a finished karyotype (gene labels not shown):



Blood types	I^A	I^B	*i*		Rhesus Factor	Rh+	Rh-
I^A	$I^A I^A$ = type A	$I^A I^B$= type AB	$I^A i$ = type A		**Rh+**	+	+
I^B	$I^A I^B$ = type AB	$I^B I^B$ = type B	$I^B i$ = type B		**Rh-**	+	-
i	$I^A i$ = type A	$I^B i$ = type B	*ii* = type O				

6. Determine the genetic traits of your individual. In the case of recessive genetic disorders an individual can be a carrier without suffering from the disease.

    a. male or female

    b. presence or absence of Turner Syndrome (only one X chromosome)

    c. presence or absence of Kleinfelter Syndrome (XXY)

    d. blood type
        i. A+, A-, B+, B-, AB+, AB-, O+, or O-

    e. Down Syndrome (trisomy 21)—three copies of chromosome 21

    f. Retinoblastoma cancer of the eye—dominant allele

    g. Color blindness—dominant in males, recessive in females

    h. Tay Sach's Disease—recessive allele

    i. Cystic Fibrosis—recessive allele

    j. Phenylketonuria (PKU)—recessive allele

    k. Hair color—brown is dominant over red

    l. Eye color—blue is dominant over green

Analysis Questions—answer with complete sentences

1. Why is color blindness dominant in males but recessive in females?

2. Down Syndrome is also called Trisomy 21 because an individual with the disorder has three copies of chromosome 21. Other kinds of trisomy are usually fatal. What does the relative size of chromosome 21 have to do with Down Syndrome not being a fatal disorder?

3. People concerned with their ancestry often talk about "blood lines" and "sharing blood" with their relatives. Explain whether the idea of blood lines is consistent with what we know about blood types from genetics and chromosomes. Could a child have a blood type that is different from both his mother and father?

4. In this activity you colored half the chromosomes pink and half the chromosomes blue. You combined them together to make the karyotype of a human. How many chromosomes would be in the gametes (sperm or ova) of this individual? Would they be all pink, all blue, or have some of each color? What reproductive process explains your answer?

5. You have learned that some genetic traits are dominant and some are recessive. Are dominant traits better than recessive traits? Are recessive traits better? Cite some examples to explain your answer, and clarify what "dominant" and "recessive" really mean.