This activity helps students learn about human chromosomes. Students will have to match the sizes and banding of the chromosomes to determine the patient's karyotype.

Note:
- Sheets A and B are for practice. These two karyotypes have the normal complement of 46 chromosomes.
- Sheets C through F are patient chromosomes that may or may not have 46 chromosomes.

After matching the chromosomes, students are given cytogenetic reports that should confirm their results. As a second part to the activity, students can create an information pamphlet for patients, learning more about various chromosome abnormalities.

We have provided answer keys for the teacher. As the students work, it is easier to help if you have the full chromosome complement before you.

Materials needed:
1. Worksheets for each workstation
   a. A or B for practice
   b. then one of C to F
   Note: we have found that this activity works best in pairs
2. Scissors - one pair per workstation
3. Glue
4. Resource materials - textbooks or internet - for future research on chromosome abnormalities
A1- Answer Key

Images provided by the Cytogenetic Laboratory at the Royal Columbian Hospital (Fraser Health Authority)
B1- Answer Key

Images provided by the Cytogenetic Laboratory at the Royal Columbian Hospital (Fraser Health Authority)
C1- Answer Key

Images provided by the Cytogenetic Laboratory at the Royal Columbian Hospital (Fraser Health Authority)

47, XXY
D1- Answer Key

Images provided by the Cytogenetic Laboratory at the Royal Columbian Hospital (Fraser Health Authority)

47, XX, +13
E1- Answer Key

Images provided by the Cytogenetic Laboratory at the Royal Columbian Hospital (Fraser Health Authority)

47, XX, +18
F1- Answer Key

Images provided by the Cytogenetic Laboratory at the Royal Columbian Hospital (Fraser Health Authority)
Part A:
You got a summer job working with a cytotechnologist at your local hospital. Your boss is late for work, and a doctor is waiting for a chromosome report on a patient. You are given a sheet that has an incomplete karyotype, with the missing chromosomes at the bottom. Your task is to complete the karyotype and determine what, if any, the abnormality is. You need to check with the cytogeneticist (your teacher), and she will give you an official report to give to the doctor.

Note:
Sheets A and B are for practice. These two karyotypes have the normal complement of 46 chromosomes. Sheets C through F are patient chromosomes that may or may not have 46 chromosomes.
Images provided by the Cytogenetic Laboratory at the Royal Columbian Hospital (Fraser Health Authority)
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Part B:
The following sheets are reports that should confirm your results for karyotypes C to F.

The doctor has asked that you make a pamphlet for the patient that describes the condition. Your task is to research the condition, and make a pamphlet with the following information:

- Name of syndrome
- Cause of the syndrome (extra or missing chromosomes etc.)
- Common Physical Features
- Impact on Development (cognitive, motor, language etc)
- Treatment
- Life expectancy
- Impact of this condition on the affected person and their family
Dr. Moxy Michael                                      Orley, Bob
Fairview Medical Clinic                              DOB:       75/06/02
1234 ATCG Street                                     Care Card #: 9156 222 555
Vancouver, BC                                         Collected:  05/06/14    10:30
                                                        Received:  05/06/15    10:00

Copy to:    Dr. Wilson
            Dr. Seuss

Tissue (s):   Blood
Reason for Referral: Infertility

FINAL CYTOGENETIC ANALYSIS

Cytogenetic Analysis of cultured peripheral cells at 300 band
resolution showed a 47, XXY karyotype (10 cells).

This test does not exclude subtle chromosomal rearrangements or
low level mosaicism.

ISCN nomenclature:   47, XXY

Comments: This karyotype is consistent with a diagnosis of
Klinefelter Syndrome.
D2

CYTOGENETICS LABORATORY
DEPARTMENT OF PATHOLOGY AND LABORATORY MEDICINE
LABORATORY GENETICS PROGRAM

Inquiries: 604 GEN ETIC

Dr. Moxy Michael
Fairview Medical Clinic
1234 ATCG Street
Vancouver, BC

SMITH, Jane
DOB: 65/02/03
Care Card #: 9898 565 252

Collected: 05/06/14 10:30
Received: 05/06/15 10:00

Copy to: Dr. Wilson
Dr. Seuss

Tissue (s): Amniotic Fluid
Reason for Referral: Intrauterine Growth Retardation,
Cleft Lip seen on Ultrasound

FINAL CYTOGENETIC ANALYSIS

Cytogenetic Analysis of cultured amniocytes at 400 band resolution showed a 47, XX, +13 karyotype (10 cells).

This test does not exclude subtle chromosomal rearrangements or low level mosaicism.

ISCN nomenclature: 47, XX, +13
FINAL CYTOGENETIC ANALYSIS

Cytogenetic Analysis of cultured peripheral cells at 500 band resolution showed a 47, XX, +18 karyotype (9 cells).

This test does not exclude subtle chromosomal rearrangements or low level mosaicism.

ISCN nomenclature: 47, XX, +18
Dr. Moxy Michael  
Fairview Medical Clinic  
1234 ATCG Street  
Vancouver, BC  

BEATTY, Julie  
DOB: 00/01/15  
Care Card #: 9653 232 124  
Collected: 05/06/14 10:30  
Received: 05/06/15 10:00

Copy to: Dr. Wilson  
Dr. Seuss

Inquiries: 604 GEN ETIC

Tissue (s): Blood  
Reason for Referral: Webbed neck, short stature

**FINAL CYTOGENETIC ANALYSIS**

Cytogenetic Analysis of cultured peripheral cells at 500 band resolution showed a 45, X karyotype (11 cells).

This test does not exclude subtle chromosomal rearrangements or low level mosaicism.

**ISCN nomenclature:** 45, X

**Comments:** This karyotype is consistent with a diagnosis of Turner Syndrome.