Table 1- Human Genetic Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Your Phenotype</th>
<th>Genotype</th>
<th>Number in class</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Earlobes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unattached (d)</td>
<td>EE or Ee</td>
<td>ee</td>
<td>(d) =</td>
</tr>
<tr>
<td>Attached (r)</td>
<td></td>
<td></td>
<td>(r) =</td>
</tr>
<tr>
<td>2. Hairline</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Widow’s peak (d)</td>
<td>WW or Ww</td>
<td>ww</td>
<td>(d) =</td>
</tr>
<tr>
<td>Straight hairline (r)</td>
<td></td>
<td></td>
<td>(r) =</td>
</tr>
<tr>
<td>3. Tongue Rolling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Can roll tongue (d)</td>
<td>RR or Rr</td>
<td>rr</td>
<td>(d) =</td>
</tr>
<tr>
<td>Cannot roll tongue (r)</td>
<td></td>
<td></td>
<td>(r) =</td>
</tr>
<tr>
<td>4. PTC Tasting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTC taster (d)</td>
<td>LL or Ll</td>
<td>l</td>
<td>(d) =</td>
</tr>
<tr>
<td>Non-taster of PTC (r)</td>
<td></td>
<td></td>
<td>(r) =</td>
</tr>
<tr>
<td>5. Bent Little Finger</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bent little finger (d)</td>
<td>HH or Hh</td>
<td>hh</td>
<td>(d) =</td>
</tr>
<tr>
<td>Straight little finger (r)</td>
<td></td>
<td></td>
<td>(r) =</td>
</tr>
<tr>
<td>6. Hitchhiker's Thumb</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No hitchhiker's thumb (d)</td>
<td>TT or Tt</td>
<td>t</td>
<td>(d) =</td>
</tr>
<tr>
<td>Hitchhiker's thumb (r)</td>
<td></td>
<td></td>
<td>(r) =</td>
</tr>
<tr>
<td>7. Skin Pigmentation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freckles (d)</td>
<td>FF or Ff</td>
<td>f</td>
<td>(d) =</td>
</tr>
<tr>
<td>No freckles (r)</td>
<td></td>
<td></td>
<td>(r) =</td>
</tr>
<tr>
<td>8. Interlacing Fingers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Left thumb over right (d)</td>
<td>ll or li</td>
<td>i</td>
<td>(d) =</td>
</tr>
<tr>
<td>Right thumb over left (r)</td>
<td></td>
<td></td>
<td>(r) =</td>
</tr>
</tbody>
</table>
1. Based on the class data, are the dominant traits always the most prevalent?

2. Judy and her parents as well as her little sister Becky all have attached earlobes. Judy’s paternal grandmother has unattached earlobes. What is the grandmother’s genotype?

Activity 2: Pedigree Analysis

PEDIGREE CHART

1. What is Fred’s genotype?____________
2. Fred’s gametes can be ____________or___________
3. Susie’s gametes can be ____________or ___________
4. What are the chances of Fred and Susie having a heterozygous kitten?_________
5. What are the chances of them having a “cute” kitten?____________
6. What are the chances of them having a homozygous kitten?____________
7. What are the chances that the kitten will be homozygous recessive?____________
8. What is the genotype of Fred and Elsie’s ugly kitten?__________
9. What is the phenotype of a homozygous dominant kitten?__________
10. What is the genotype of a homozygous recessive kitten?__________
11. What is Fred’s father’s genotype?__________
12. What is Fred’s brother’s genotype?__________
13. What is the genotype of Susie’s mother?__________
14. What is the genotype of Fred’s mother?__________
15. Which parent did Susie inherit her “cuteness” from?__________

Activity 3: Punnet Squares

1. A reconstructed fragment of one of the Dead Sea scrolls describes Noah as an abnormal child born to normal parents. The Book of Enoch the prophet, written about 200BC gives a description consistent with albinism, “flesh as white as snow”.

   Explain what causes a person to be an albino?

   Perform a cross between Noah’s parents.

   Phenotypic ratio: _____ % normal _______%albino
   Genotypic ratio: _____%AA _____%Aa ______%aa

   If Noah was an albino, what is the chance his brother would have been an albino?

2. Cystic Fibrosis is caused by an autosomal allele, which is recessive to the allele for the normal condition. Two phenotypically normal people have four children; three are normal and one is affected with cystic fibrosis.

   What does “autosomal” mean?

   Describe the symptoms of cystic fibrosis.

   Perform a cross between the parents described.

   Phenotypic ratio: ______% normal ______%cystic fibrosis
   Genotypic ratio: _____%CC ____%Cc _____%cc

3. A widow’s peak is inherited as an autosomal dominant trait. A woman heterozygous for a widow’s peak marries a man with a straight hair line.
Perform a cross between the parents described.

Phenotypic ratio: _____% widow’s peak _______% straight hairline

Genotypic ratio: _____%WW _____%Ww _____%ww

4. A boy has PKU, an autosomal recessive disease. During his junior year in college he married a girl who father also had PKU.
What is the treatment for PKU?

Perform a cross between the parent described.

Phenotypic ratio: _____% normal _______%PKU

Genotypic ratio: _____%PP _____%Pp _____%pp

What is the chance they will have a child with PKU?

5. Huntington’s disease is an autosomal dominant disease. The symptoms of this disease do not appear until midlife. Woody Guthrie (father of Arlo Guthrie), died of Huntington’s disease. Woody’s mother (Arlo’s grandmother) also dies of this disorder, however Woody’s father was normal.

How is Huntington’s disease inherited?

Perform a cross between the parents described.

Phenotypic ratio: _____% normal _______% Huntington’s

Genotypic ratio: _____%HH _____%Hh _____%hh

What is the chance that Arlo, (Woody’s son) will develop the disease?
Note: Arlo’s mother is normal.

6. Sickle cell anemia is an incompletely dominant gene. Individuals who are homozygous dominant are normal, heterozygous individuals have the sickle cell trait and homozygous recessive have the full-blown sickle cell disease.

How is this disease related to Malaria? What causes Malaria?

Perform a cross between a person who is homozygous recessive and a person who is heterozygous for sickle cell anemia.
Phenotypic ratio: ______% normal ______% sickle cell trait ______% sickle-cell disease

Genotypic ratio: _______%SS _______%Ss _______%ss

If two people with sickle cell trait marry, what percent of the offspring will have the condition of sickle cell trait?

7. Charlie Chaplin was involved in a legal battle over the paternity of a child born to Joan Barry, a young starlet of the time. The baby had blood type B, the mother (Joan) had blood type A and Charlie’s blood type was O.
Note: The court declared him responsible for child support.

Perform a cross between Charlie Chaplin and Joan Barry.

Phenotypic ratios: ______ % Type A ______ % Type B ______ % Type AB ______ % Type O

Is Chaplin the father of the child (Carol Ann)? ________________
Explain why or why not.

8. Red-green color blindness is an X-linked trait. These traits are inherited much like autosomal traits in women, but in men the traits are inherited as hemizygous traits because the X chromosome is unpaired. As a result, men are more often affected by the disorder as only one copy of the gene is required to give them the trait.

A woman with normal vision who had a color-blind father married a man with normal vision.
Perform a cross between the parents described.

Phenotypic ratio: ______ % normal children ______ % color blind children
________ % normal female children ______ % affected female children
________ % normal male children ______ % affected male children

What is the chance the next child will be color-blind?