Sex-Linked Traits Worksheet

1) Albinism is a recessive autosomal genetic disorder that causes the complete or partial absence of pigments in the skin, hair and eyes. Fill in the Punnett square and determine the expected genotypic ratios from crossing homozygous recessive and heterozygous dominant parents.

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>a</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>Aa</td>
<td>a</td>
<td></td>
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<tr>
<td>a</td>
<td>aa</td>
<td>a</td>
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</tbody>
</table>

Genotypes: Aa, aa  Genotypic Ratio: 2:1
Phenotypes: carrier, Albin

% of kids with disorder: 50%  % of carrier kids: 50%

2) Red-Green color blindness is a recessive sex-linked (X chromosome) genetic disorder where the middle (green) or long (red-yellow) wavelength cones in the eyes have a partial or complete loss of function. Fill in the Punnett square and determine the expected genotypes and phenotypes from crossing a normal male and a female who is a carrier for color blindness.

<table>
<thead>
<tr>
<th></th>
<th>X^H</th>
<th>X^A</th>
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<tbody>
<tr>
<td>X^H</td>
<td>X^h</td>
<td>X^a</td>
<td></td>
</tr>
<tr>
<td>Y</td>
<td>X^h</td>
<td>Y</td>
<td></td>
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</tbody>
</table>

Genotypes: X^h X^h, X^h X^A, X^h Y, X^A Y

Circle all phenotype(s): normal male, male with colorblindness,
normal female, carrier female, female with colorblindness

% of kids with disorder: 25%  Circle their gender(s) male / female

3) Color blindness is a recessive sex-linked genetic disorder located on the X chromosome. Fill in the Punnett square for a cross of a male with color blindness and a normal female.

<table>
<thead>
<tr>
<th></th>
<th>X^H</th>
<th>X^H</th>
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<tbody>
<tr>
<td>X^A</td>
<td>X^H</td>
<td>X^H</td>
</tr>
<tr>
<td>Y</td>
<td>X^H</td>
<td>Y</td>
</tr>
</tbody>
</table>

Genotypes: X^h X^H, X^h Y

Circle all phenotype(s): normal male, male with colorblindness,
normal female, carrier female, female with colorblindness

% of kids with disorder: 50%  Circle their gender(s) male / female

4) Color blindness is a recessive sex-linked genetic disorder located on the X chromosome. Fill in the Punnett square for a cross of a male who is color blind and a female who is a carrier for color blindness.

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<tr>
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<th>X^B</th>
<th>X^B</th>
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</thead>
<tbody>
<tr>
<td>X^b</td>
<td>X^B</td>
<td>X^B</td>
</tr>
<tr>
<td>Y</td>
<td>X^B</td>
<td>Y</td>
</tr>
</tbody>
</table>

Genotypes: X^b X^b, X^b X^b, X^b Y

Circle all phenotype(s): normal male, male with colorblindness,
normal female, carrier female, female with colorblindness

% of kids with disorder: 50%  Circle their gender(s) male / female

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5) Color blindness is a recessive sex-linked genetic disorder located on the X chromosome. Fill in the Punnett square for a cross of a normal male and a female who is color blind.

Genotypes: $X^b X^b$, $X^b Y$

Circle all phenotype(s): normal male, male with colorblindness; normal female, carrier female, female with colorblindness

% of kids with disorder: 50%  Circle their gender(s) male/ female

6) Color blindness is a recessive sex-linked genetic disorder located on the X chromosome. Fill in the Punnett square for a cross of a color blind male and a color blind female.

Genotypes: $X^b X^b$, $X^b Y$

Circle all phenotype(s): normal male, male with colorblindness; normal female, carrier female, female with colorblindness

% of kids with disorder: 100%  Circle their gender(s) male/ female

7) Explain how sex-linked traits are different than autosomal traits.

Sex-linked affect males more - Trait is attached only to X chromosome.

8) Explain why males have more sex-linked disorders than females.

Because males only have 1 X chromosome, so it is not possible for a male to be a carrier - It only takes 1 recessive gene for a male to have the disorder whereas it takes 2 for a female to have the disorder.
Sex-Linked Pedigrees Worksheet

Background Information: Pedigrees are used to trace a gene as it is passed down from generation to generation. The squares represent a male and the circles represent a female. In the examples on this handout, the shaded circles and squares will represent having the disorder. Make sure to read each question to find out if a disorder is caused by dominant alleles or recessive alleles. A person can be a carrier of a trait, meaning they have heterozygous alleles.

1) Hemophilia is a recessive sex-linked disorder located on the X chromosome where a person’s body cannot control blood clotting or coagulation. Write in the genotypes on the line next to/below each individual.

For all phenotype questions, on the first line write: male or female and the second line write: normal, carrier, hemophilia.

2) What is the phenotype of individual 2? Female carrier

3) What is the phenotype of individual 4? Male hemophilia

4) What is the phenotype of individual 5? Male hemophilia

5) What is the phenotype of individual 7? Male normal

6) What is the phenotype of individual 9? Female carrier

7) What is the phenotype of individual 10? Male normal

8) What is the phenotype of individual 11? Female carrier

9) What is the phenotype of individual 12? Female carrier

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10) Fragile-X syndrome is a recessive sex-linked disorder located on the X chromosome. Below is a pedigree tracing the passing of the fragile-X syndrome gene through 3 generations. Write in the genotypes on the line next to / below each individual.

For all phenotype questions, on the first line write: male or female and the second line write: normal, carrier, fragile-X.

11) What is the phenotype of individual 1? Male Normal

12) What is the phenotype of individual 4? Male Normal

13) What is the phenotype of individual 6? Female Carrier

14) Below is a recessive sex-linked pedigree tracing the red-green colorblindness gene located on the X chromosome. Write in the genotypes on the line next to / below each individual.

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