Unit 9 Worksheet Packet

Four babies were born at the same time in the same hospital. One baby has blood type O, another has blood type A, another has blood type B, and the fourth baby has blood type AB. The four pairs of parents have the following blood types:

- parents type: O and O
- parents possible genotypes: OO x OO
- baby type that would belong to them: O

- parents type: AB and O
- parents possible genotypes: Aα x O0
- baby type that would belong to them: Aβ

- parents type: A and B
- parents possible genotypes: AA / Aα x BB / Bβ
- baby type that would belong to them: B

- parents type: B and B
- parents possible genotypes: BB / Bβ x BB / Bβ
- baby type that would belong to them: BB

Complete the paragraph by filling in the blank with the correct word or number.
Normal human somatic cells contain (5) 46 chromosomes. Each cell contains 44 (6) autosomes, the chromosomes that make up the 22 (7) homologous pairs, as well as 2 (8) sex chromosomes. In a (9) number disorder, the total number of chromosomes per cell is abnormal. The only survivable autosomal number disorder is (10) Down’s Syndrome, in which there are (11) 47 total chromosomes per cell with (12) 3 chromosomes at the (13) 21st position. Abnormalities can also occur that involve the number of sex chromosomes in each cell. In Klinefelter syndrome, known as (14) 47XX, there are (15) 47 total chromosomes per cell while individuals affected with (16) Turner’s Syndrome, 45XO, are missing one sex chromosome and have a total number of (17) 45 chromosomes per cell. All of these disorders are most commonly caused by (18) nondisjunction, a mistake in the process of (19) meiosis, when either the (20) homologous chromosomes fail to separate in (21) anaphase, or the (22) sister chromatids fail to separate in (23) anaphase. A test that doctors can use to detect a number disorder is called a (24) karyotype.

The following pedigree illustrates the inheritance of a recessive trait. Identify the genotype(s) of each individual shown in the pedigree.

Key: 25. [Image of a pedigree]

Create a Pedigree based on the following information: 26-35

Although Jane and Joe Smith have dimples, their daughter, Clarissa, does not. Joe’s dad has dimples, but his mother, and his sister, Grace, do not. Jane’s dad, Mr. Renaldo, her brother, Jorge, and her sister, Emily, do not have dimples, but her mother does.
The following pedigree illustrates the inheritance of a dominant trait. Identify the genotype(s) of each individual shown in the pedigree.

Key: 

\[ D = \text{dominant} \quad d = \text{recessive} \]

Examine the following pedigree showing the inheritance of PKU to answer questions

\[ R = \text{normal} \quad r = \text{PKU} \]

49. Provide the genotype(s) for the following individuals:

I-1  
I-2  
II-3  
II-4  
III-2  
III-4

50. If individual II-3 marries a man with PKU, what is the probability they would have a child with the disorder? 50% 

51. If the couple (II-3 x a PKU male) have a child with normal phenotype, what is the probability their child is a carrier for PKU? 100%

Examine the pedigree below showing Marfan syndrome to answer questions

\[ m = \text{dominant/marked} \quad \bar{m} = \text{recessive/no marked} \]

52. First you will need to determine the pattern of inheritance (Is Marfan a dominant or recessive disorder) Dominant

53. Identify the genotype(s) of the following individuals:

A  
B  
C  
D

54. If individual E marries a woman without the disorder, what is the probability they will have a child with the disorder? 50%

55. What is the probability individual F is a carrier? Explain. On it
The following pedigree shows the inheritance of colorblindness in several generations of a family. Analyze the pedigree and answer the questions that follow.

64. Identify the genotypes of all the individuals in the pedigree.

65. If individual III-2 marries an unaffected woman who's dad had colorblindness, what is the probability that their son will be colorblind? 50% What about their daughter? 50% Show your work using a Punnett square!

66. If individual III-3 marries a non-colorblind male, what is the probability that they will have colorblind daughters? 25% sons? 50% Show your work using a Punnett square!

Pedigree Practice – Analyze the following pedigree and answer the questions that follow.

67. What is the pattern of inheritance? (autosomal recessive, autosomal dominant, or sex-linked recessive)

68. List the genotypes for the following individuals: I-1 I-2 I-3 I-5 I-7 II-8 II-9 III-4 III-6 III-9

69. What disorder(s) could this pedigree represent? Marfan's, Huntington

70. If individual II-5 marries an unaffected man, what is the probability that their children will be affected? 50%

Genotypes – Match the correct genotype with each description. Please note: There may be more than one possible answer for each description & each choice may be used more than once!

H 71. Genotype of male with sex-linked recessive trait

E 72. Genotype of female with sex-linked recessive trait

C 73. Genotype of male with autosomal recessive trait

C 74. Genotype of female with autosomal recessive trait

E 75. Genotype of female carrier for sex-linked recessive trait

B 76. Genotype of female carrier for autosomal recessive trait

A 77. Genotype of male with autosomal dominant trait

A 78. Genotype of female with autosomal dominant trait
Complete the Table – complete the table by matching the disorder described from the list below. Identify the type of disorder as number (N), autosomal recessive (AR), autosomal dominant (AD), autosomal co-dominant (ACo), or sex-linked recessive (SR).

<table>
<thead>
<tr>
<th>Name of Disorder</th>
<th>Type of Disorder</th>
<th>Description of Disorder</th>
</tr>
</thead>
<tbody>
<tr>
<td>Achondroplasia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>albinism</td>
<td></td>
<td></td>
</tr>
<tr>
<td>colorblindness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cystic fibrosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Down syndrome</td>
<td></td>
<td></td>
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<tr>
<td>Duchenne MD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hemophilia</td>
<td></td>
<td></td>
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<tr>
<td>Huntington’s disease</td>
<td></td>
<td></td>
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<tr>
<td>Klinefelter syndrome</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marfan syndrome</td>
<td></td>
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<tr>
<td>PKU</td>
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<td></td>
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<tr>
<td>Tay-Sachs disease</td>
<td></td>
<td></td>
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<tr>
<td>Turner syndrome</td>
<td></td>
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</tbody>
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<tbody>
<tr>
<td>79. <strong>Tay-Sachs</strong></td>
<td>AR</td>
<td>Fatal disorder that causes rapid breakdown of the nervous system beginning a few months after birth with death usually occurring by 4-6 years; higher incidence in Jewish population</td>
</tr>
<tr>
<td>80. <strong>Albinism</strong></td>
<td>AR</td>
<td>Disorder in which a lack of melanin production results in no pigment in hair, skin, eyes; increased susceptibility to UV light</td>
</tr>
<tr>
<td>81. <strong>Cystic Fibrosis</strong></td>
<td>AR</td>
<td>Most common fatal genetic disorder in the US; characterized by excess mucus production, respiratory infections, and digestive problems</td>
</tr>
<tr>
<td>82. <strong>Sickle cell</strong></td>
<td>ACo</td>
<td>Disorder seen mainly in individuals of African ancestry that results in abnormal hemoglobin, red blood cells; associated with resistance to malaria offering heterozygotes a survival advantage</td>
</tr>
<tr>
<td>83. <strong>Hemophilia</strong></td>
<td>SR</td>
<td>Disorder seen mostly in males; missing enzyme required for normal blood clotting</td>
</tr>
<tr>
<td>84. <strong>Huntingtons</strong></td>
<td>AD</td>
<td>Fatal disorder in which symptoms do not show until mid-30's, results in breakdown of nervous system</td>
</tr>
<tr>
<td>85. <strong>Colorblindness</strong></td>
<td>SR</td>
<td>Disorder in which affected individuals cannot distinguish between colors; higher incidence in males</td>
</tr>
<tr>
<td>86. <strong>Down Syndrome</strong></td>
<td>N</td>
<td>Trisomy 21; results in circulatory problems, characteristic facial features, and learning disabilities</td>
</tr>
<tr>
<td>87. <strong>Marfan</strong></td>
<td>AD</td>
<td>Connective tissue defect resulting in weakening of the major blood vessel leading away from the heart; unusually long bones, eye changes</td>
</tr>
<tr>
<td>88. <strong>Klinefelter</strong></td>
<td>N</td>
<td>47XXY; disorder characterized by males with underdeveloped genitalia, enlarged breasts, sterility</td>
</tr>
<tr>
<td>89. <strong>Duchenne MD</strong></td>
<td>SR</td>
<td>Much more common in men; progressive disorder characterized by muscle deterioration in which symptoms appear a few years after birth; death usually occurs before adulthood</td>
</tr>
<tr>
<td>90. <strong>PKU</strong></td>
<td>AR</td>
<td>Affected individuals are missing enzyme required to break down phenylalanine; results in mental retardation if untreated. Can be controlled by diet</td>
</tr>
<tr>
<td>91. <strong>Turner</strong></td>
<td>N</td>
<td>45XO; disorder characterized by women with under-developed sex organs, sterility, webbed neck, and short stature</td>
</tr>
<tr>
<td>92. <strong>Achondroplasia</strong></td>
<td>AD</td>
<td>Disorder in which affected individuals have abnormalities in cartilage formation, especially in the longs bones of the arms and legs; results in short stature.</td>
</tr>
</tbody>
</table>

93. 2a. How many autosomes would a sperm or egg cell contain? 46

94. 2b. What sex chromosome would a sperm contain? What about an egg? 

95. What happens in non-disjunction? Failure of chromosomes to separate during meiosis.

96. Referring to #87, what would this error result in? 47XXY or 47XXX; Down's Syndrome, Klinefelter's.

97. Name three diseases caused by the error mentioned in #17. Down's Syndrome, Turner's Syndrome, Klinefelter's Syndrome.

98. What is meant by the term carrier? Heterozygote. Don't have it but can carry it.

99. Can a male be a carrier for a sex-linked trait? Explain. No, two males have the X chromosome.

100. Can you be a carrier for a dominant trait? Explain. No, dominant traits are not recessive.

101. If a man has a sex-linked disorder, who does he pass his recessive allele to? His daughter.

102. If a woman has a sex-linked disorder, what does that mean about her sons? They will all have it.