Genetics Review Packet: Answers

Station 1: Round Table Answers:

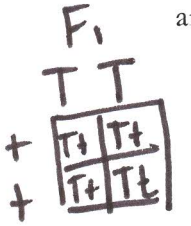
1. Trisomy 21 is Down's Syndrome. This disease is characterized by mental retardation, higher risk of heart disorders, flat broad faces and characteristic folds in the palms.
2. Non-disjunction is the mistake that happens in meiosis where the chromosomes do not split properly. The result is a chromosomal disorder.
3. A karyotype is a picture of someone's chromosomes which can show gender and chromosomal abnomalities.
4.

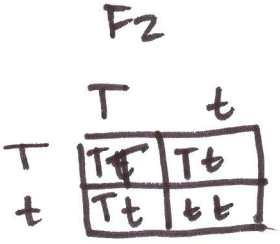
Mitosis	Meiosis
- Cells split once - Daughter cells are identical to the initial cells - Happens in body cells - Does not form tetrads	- Cells split two times - Daughter cells have half the number of chromosomes as the initial cells - Creates egg and sperm cells - Forms tetrads (homologous chromosomes line up together)

5. Both traits are partially dominant which means that the heterozygous genotype shows up as a combination or mixture of the two traits.
6. bbDd x BbDd Gametes: bD, bd Gametes: BD, bD, Bd, bd
7. A man is more likely to get a disorder because they only get one gene. Therefore if they get the recessive gene, they have to show it.
8. A partially shaded circle or square.
9. The two siblings should be linked together in a triangle formation.
10. Yes if they are both heterozygous.
11. Gregor Mendel
12. Klinefelters. This creates a sterile male who has feminine characteristics.
13. TT
14. A genotype gives the genetic make up and the phenotype talks about the physical trait that is seen.
15. 4 traits. Each different letter represents a different trait.
16. They are the second individual to generation 2.
17. The sperm cell only would have 20 chromosomes because it would only have one of each type of chromosomes where the body cell has 2 of each type.

Station 2: Mono/Dihybrids and Incomplete Dominance:

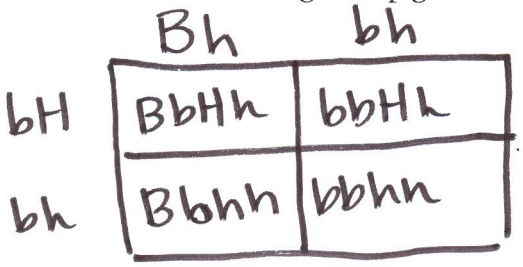
1. Tall is dominant to short in pea plants. A homozygous tall plant is crossed with a short plant. What are the genotypic and phenotypic ratios of the offspring? Now cross two of the offspring. What are the genotypic and phenotypic ratios of the F2 generation?





Answer:
Genotypes of Original Parents: TT x tt
F2 Genotypic Ratio: 1 TT : 2 Tt : 1 tt
F2 Phenotypic Ratio: 3 tall : 1 short

2. In guinea pigs brown fur is dominant over white fur (B,b) and short hair is dominant over long hair (H,h). Give the expected phenotypic ratio in a cross between a heterozygous brown furred, long hair guinea pig and a white furred guinea pig that is heterozygous for short hair.



Answer:
Genotypes Parents: Bbhh x bbHh
Mom Gametes: Bh, bh
Dad Gametes: bH, bh
Phenotypic Ratio: 1 brown short : 1 white short
~~1 brown long : 1 white long~~

3. In humans, brown eyes are dominant to blue eyes (B,b) and right handedness is dominant to left handedness (R,r). Cross a heterozygous brown, heterozygous right handed mom with a blue eyed left handed dad. What is the phenotypic ratio of the offspring?

	BR	Br	bR	br
br	BbRr	Bbrr	bbRr	bbrr

Answer:
Genotypes Parents: BbRr x bbrr
Mom Gametes: BR, Br, bR, br
Dad Gametes: br
Phenotypic Ratio: 1 brown right : 1 brown left
1 blue right : 1 blue left

4. In humans, straight hair is incompletely dominant to curly hair, creating a heterozygote with wavy hair. Two wavy hair people have children. What are the genotypic and phenotypic ratios of the offspring?

	S	C
S	SS	SC
C	SC	CC

Answer:
Genotypes Parents: SC x SC
Genotypic Ratio: 1 SS : 2 SC : 1 CC
Phenotypic Ratio: 1 straight : 2 wavy : 1 curly

Station 3: Word Sort

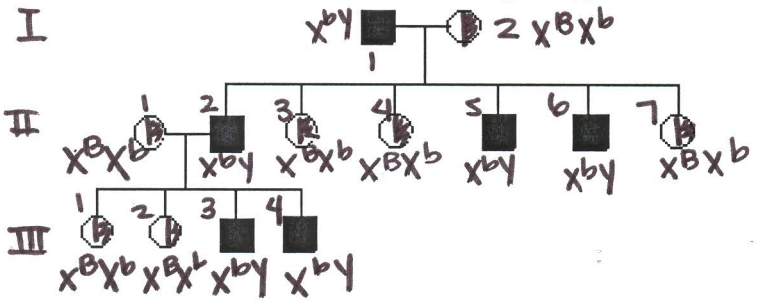
Directions: Take the words in the word bank and sort them into different categories. Based on your groupings create a title for each category that describes why these words are grouped together or create a flow chart showing how one word links to the next word.

Word bank:
Gamete, chromosome, gene, haploid, diploid, homologous, meiosis, law of segregation, dominant, recessive, allele, heterozygous, homozygous

*see station 6 for definitions

Station 4:Pedigrees

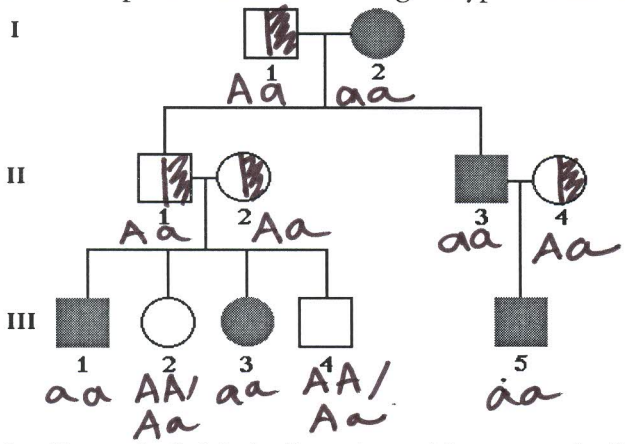
1. Example 1: Fill in all of the genotypes of the individuals



Example 1 Questions:

1. Is this a sexlinked pedigree? Why or why not? yes, only males
2. Label the generation and numbers.
3. How many people show the recessive trait? 6
4. How many generations are present? 3

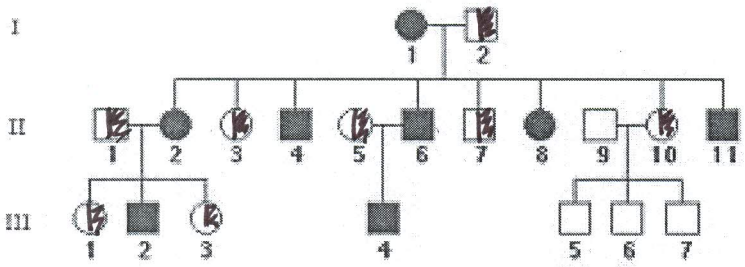
2. Example 2: Fill in all of the genotypes of the individuals



Example 2 Questions:

1. Is this a sexlinked pedigree? Why or why not? not
2. How is person II2 related to III5? Aunt
3. How many children did the first generation shown have? 2
4. How many females are present? 5

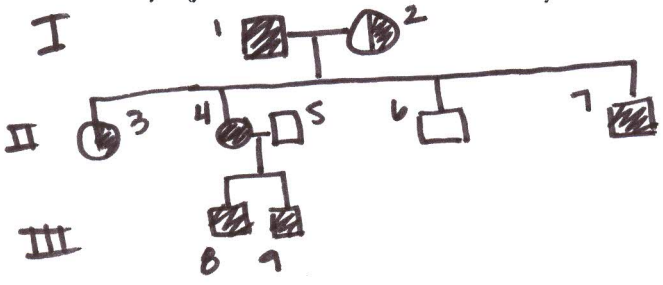
3. Example 3: Mark all carriers with proper shading.



Example 3 Questions:

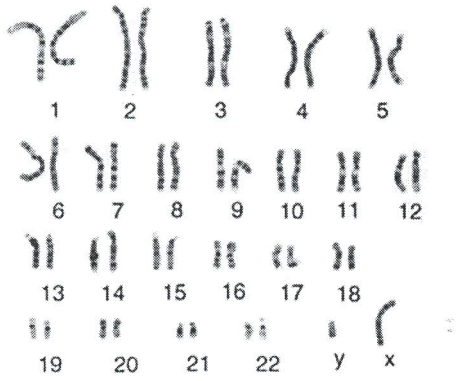
1. Is this a sexlinked pedigree? Why or why not? Look at person II7 to help you decide. insex linked, NO, affected & have all affected sons
2. What are the genotypes of the following people:
   - I1: aa
   - II7: Aa
   - III3: Aa
   - II5: Aa
3. How many females are present? 8

4. Construct a pedigree that shows how colorblindness (a sex linked recessive trait) runs through the following family. Mr Jones is colorblind and marries normal sighted Mrs Jones. They have four children- 2 girls (one of which is colorblind) and two boys (one of which is colorblind). The colorblind daughter marries a normal male and has 2 boys (you need to determine if they are normal or colorblind). Make sure to label he generations.



Station 5: Karotypes

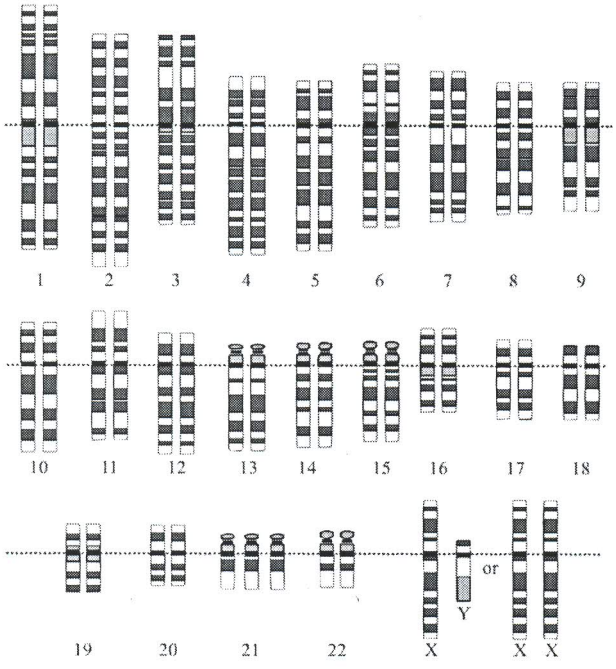
1. Example 1



Example 1 Questions:

1. Is this a boy or a girl? Boy
2. Does it have any genetic disorders? How do you know? NO, all chromosomes are normal
3. Why are there two of each chromosome? diploid: one from mom
4. How many chromosomes are present? 46
5. Is this a diploid or haploid cell? diploid

2. Example 2:



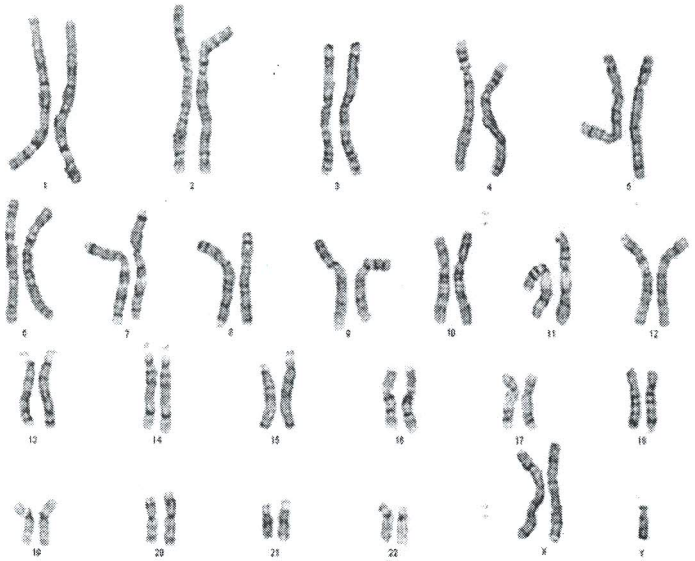
Example 2 Questions:

1. What disorder is present? Down's
2. When did this mistake happen-what caused the disorder? meiosis → nondisjunction
3. What are the symptoms of this disorder? mental retardation, facial features
4. What do the white lines represent? genes
5. How many chromosomes are present? 47

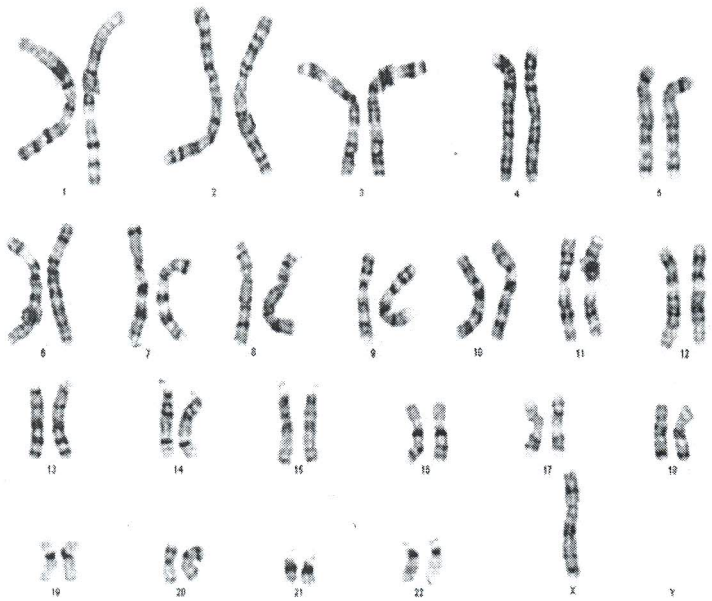
3. Example 3:

Example 3 Questions:

1. What disorder is present? Klinefelters
2. What are the symptoms of this disorder? sterile male w/ femine characteristics
3. Is this a male or a female? male
4. What can you learn from a karyotype? disorder / male / female
5. How many chromosomes are present? 47



4. Example 4:



Example 4 Questions:

1. What disorder is present? Turner's
2. What are the symptoms of this disorder? sterile female
3. Is this a male or a female? female
4. How many chromosomes are present? 45
5. What is the mistake that caused this called? nondisjunction

Station 6: Vocab Memory

Words to know:

Word	Defintion	Word	Definition
Carrier	has the gene but does not show it	Genetics	study of inherited traits
Phenotype	physical characteristic	Law of Independent Assortment	Different traits are passed on independently
Genotype	genetic make up	Punnet Square	shows possible offspring of a genetic cross
Gene	segment of a chromosome that codes for a trait	Heterozygous	2 different genes Tt

Chromosome	DNA wound up	Homozygous	2 of the same genes TT, tt
Allele	different forms of a gene	Recessive	only shows if no dominant gene is present
Diploid	2 of each type of chromosome	Dominant	masks other genes
Haploid	1 of each type of chromosome	Homologous	pairs of the same type of chromosomes
Meiosis	process to make gametes	Law of Segregation	genes for a single trait are passed on separately

Station 7: Multiple Alleles/Sex Linked Crosses

1. There are three children and three sets of parents at the hospital but there has been a mix up! You need to use the blood types to determine which baby belongs to which parent and prove it by giving the genotype of each set of parents.

Parents	Type	Genotype
Mr Smith	A	I^Ai
Mrs Smith	A	I^Ai
Mr Johnson	AB	I^AI^B
Mrs Johnson	B	I^BI^B/I^Bi
Mr Jones	O	ii
Mrs Jones	B	I^BI^B/I^Bi

Babies:
Child #1: Type AB
Child #2: Type O
Child #3: Type B

ANSWER:
Child #1's Parents: Johnson
Child #2's Parents: Smith
Child #3's Parents: Jones

2. A man with blood type A marries a woman who has blood type O. The man's father had blood type O. What are the genotypic and phenotypic ratios for their children?

$I^Ai \times ii$

	I^A	i
i	I^Ai	ii
i	I^Ai	ii

Answer:
Genotypes Parents: $I^Ai \times ii$
Genotypic Ratio: $2I^Ai : 2ii$
Phenotypic Ratio: 2A : 2O

3. Colorblindness is a sex linked recessive trait. A colorblind man marries a woman who has normal vision but had a father who was colorblind. Of all of the offspring, what percentage of them will be colorblind males and what percentage will be colorblind females?

	X^b	Y
X^B	X^BX^b	X^BY
X^b	X^bX^b	X^bY

Answer:
Genotypes Parents: $X^bY \times X^BX^b$
Percent CB Males: 25%
Percent CB Females: 25%

4. In fruit flies eye color is sex linked. Red is dominant to white eyes. A white eyed female mates with a red eyed male. Two of their offspring mate. What are the genotypic and phenotypic ratios of the F1 (children) generation and the genotypic and phenotypic ratios of the F2 (grandchildren) generation?

F1

	X^b	X^b
X^B	X^BX^b	X^BX^b
Y	X^bY	X^bY

F2

	X^b	Y
X^B	X^BX^b	X^BY
X^b	X^bX^b	X^bY

Answer:

Genotypes of Original Parents: $X^bX^b \times X^BY$

F1 Genotypic Ratio: $2X^BX^b : 2X^bY$

F1 Phenotypic Ratio: 2 red ♀ : 2 white ♂

F2 Genotypic Ratio: $1X^BX^b : 1X^bX^b : 1X^BY : 1X^bY$

F2 Phenotypic Ratio: 1 red ♀ : 1 white ♀ : 1 red ♂ 1 white ♂

Additional Review:

Make a venn diagram of Mitosis vs. Meiosis