Name: Key Period: _____

Genetics Study Guide

Key vocabulary terms:

DNA
RNA (mRNA, tRNA)
Codon
Amino acid
Protein
Transcription
Translation
Nucleus
Ribosome
Mutation
Gene
Genotype
Phenotype
Chromosome
Recessive
Dominant
Homozygous
Heterozygous
Allele
Punnett Square
Genetic Probability
Pedigree
Sex-linked trait (or X-linked)
Trisomy / Monosomy
Karyotype
Autosomes
Sex Chromosomes
Selective breeding
GMOs
Clone

DNA and RNA Structure

What is the shape of a DNA? What are the shapes of mRNA and tRNA?

hook, 4 leaf clover

DNA = twisted ladder, double helix, staircase
RNA = single-stranded

RNA:

a. What is the sugar? ribose
b. Where do you find RNA in a cell? ribosome
c. Is RNA single-stranded or double stranded? single
d. What are the 4 bases used in RNA? A-U C-G

DNA:

e. What is the sugar? deoxyribose
f. Where do you find DNA in a cell? nucleus
g. Is DNA single-stranded or double stranded? double-stranded
h. What are the 4 bases used in DNA? A-T C-G

Protein Synthesis: DNA→RNA→ protein

Explain Protein synthesis (Describe the basic steps of transcription and translation)

Transcription: Part One

What molecules are involved?
Where in a cell does this occur?
What are the resulting molecules called?

- DNA → mRNA
- nucleus
- copy of DNA is made → mRNA then leaves nucleus

Translation: Part Two

What molecules are involved?
Where in a cell does this occur?
What is the resulting molecule called?

- mRNA → tRNA → protein
- ribosome
- tRNA brings amino acids to match mRNA strand + amino acids join together to form a protein

Place a checkmark in the box if the statement applies to that kind of RNA.

	mRNA	tRNA
Made in the nucleus	X	
Used in protein production	X	X
Carries amino acids		X
Nucleic Acid (RNA)	X	X
Has codons	X	
Has anticodons		X
Made of nucleotides	X	X

If any of these lines of code are known, the others can be determined:

DNA	TAC	ATG	CTA	GGT	ATC	GCT	CAC	GGT
mRNA	AUG	UAC	GAU	CCA	UAG	CGA	GUG	CCA
tRNA	UAC	AUG	CUA	GGU	AUC	GCU	GAC	GGU
protein	MET/START	TYR	ASP	LEU	STOP	ARG	VAL	PRO

DNA	ATG	TAC	GAT	CCA	TAG	CGA	GTG	CCA
mRNA	UAC	AUG	CUA	GGU	AUC	GCU	CAC	GGU
tRNA	AUG	UAC	GAU	CCA	UAG	CGA	GUG	CCA
protein	TYR	MET	LEU	GLY	ILE	ALA	HIS	GLY

Mutations

Explain the differences between the 2 types of mutations

Chromosomal extra chromosomes / chromosome missing
- larger gene deleted / added

Point (or gene)

specific point in nucleotide sequence is changed (ie insertion, deletion, substitution)

Below is a string of nucleotides. With the string of nucleotides, you are going to create mutations to show how the sequence of DNA would be altered.

Nucleotide sequence: A G G C G T C C A T G A

Make 3 point mutations-insertion, deletion, substitution

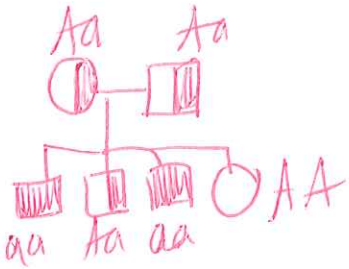
Insertion: A G G C G T C [A] C A T G A

Deletion: A G C G T C C A T G A

Substitution: [T] G G C G T C C A T G A

Pedigrees

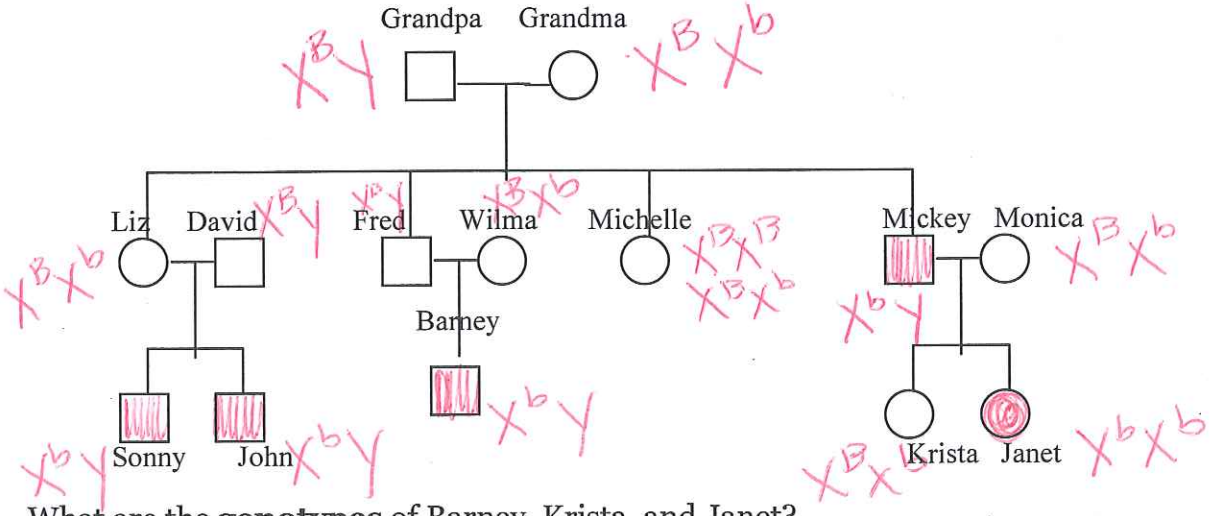
Create a pedigree showing the following members of a family for the Sickle Cell Disease (recessive disease, NOT sex-linked)



Mother – carrier (heterozygous) for Sickle Cell Disease
Father – carrier (heterozygous) for Sickle Cell Disease
Son – affected by Sickle Cell Disease
Son – carrier for Sickle Cell Disease
Son – affected by Sickle Cell Disease
Daughter – no Sickle Cell Disease

Color in the pedigree below using the following information:

Colorblindness is a recessive, sex-linked disorder.
Grandma and Grandpa are NOT colorblind.
Mickey is colorblind; all of their other children have normal color vision.
Sonny and John both inherited colorblindness, as did their cousins Barney and Janet.



What are the **genotypes** of Barney, Krista, and Janet?

Barney' genotype: X^bY Krista's genotype: X^BX^b

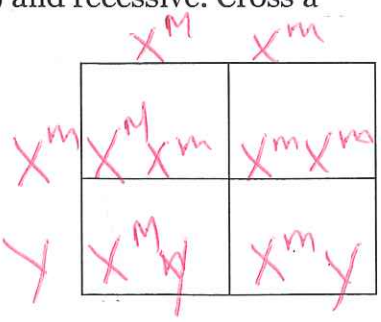
Janet's genotype: X^bX^b

Sex-linked genes

What are the sex chromosomes in a human female? XX male? XY

In humans, the gene for muscular dystrophy is **sex-linked** (X-linked) and recessive. Cross a normal muscle toned heterozygous female with an affected male.

Parents: X^MX^m x X^mY



a. What are all of the possible genotypes of the offspring?

X^MX^m, X^mX^m, X^MY, X^mY

b. What are the possible phenotypes of the offspring?

female normal, female muscular dystrophy
male normal, male muscular dystrophy

c. What is the probability they will have a colorblind son? muscular dystrophy 50% chance

d. What is the probability they will have a colorblind daughter? muscular dystrophy 50 % chance

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

Refer to the Punnett square above. Color-blindness is an X-linked recessive trait.

Does the father have color blindness?

no

Does the father have a recessive allele?

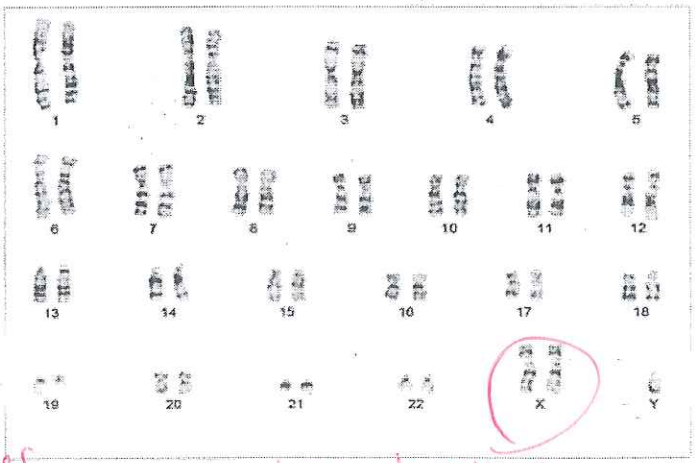
no

State whether the only child that could have color blindness is male or female.

male

Karyotypes

Using the karyotype to the below to answer the following questions:



Is this a normal karyotype?

no

If you answer was no, circle the abnormality in the karyotype.

If there are extra chromosomes in this karyotype, what effect would this have on an individual?

XY male but XXY
- extra X chromosomes → more genes resp. female sex characteristics (less body hair, breast growth, reading/speech difficulties)

What is the gender of this individual?

male

For a normal karyotype, how many chromosomes would you see?

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