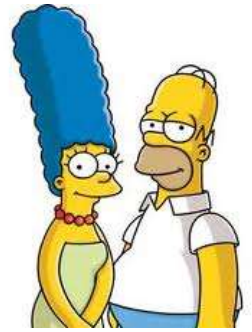


Name \_\_\_\_\_

## *Springfield Secrets*

### *Sex-linked Traits with Homer and Marge*

Adapted from from: <http://www.unc.edu/~abcook18/activities2.html>



#### **Background**

After many years of studying, geneticists have sequencing the genes on the sex chromosomes of Springfield's, Marge and Homer Simpson. Shocking discoveries have been made - can you figure them out?

#### **Part I: Simpson Family Secret Analysis:**

Use the data for Marge & Homer's sex chromosome in the tables below to answer questions that follow.

#### **Traits on the X chromosome (in the order they appear from top to bottom)**

(Disclaimer, most of these are made up. For example, there is no indication that clumsiness or impulsivity are sex linked traits)

Dominant	Recessive
O – predisposed to obesity	o – not predisposed to obesity
N – Normal vision (can see blue and yellow)	n – blue-yellow colorblindness
B – Normal hair growth	b – baldness
D – Normal hearing	d – deafness
R – Immunity to radioactivity	r – not immune to radioactivity
S – Sweat glands present	s – sweat glands absent
M – Athletic	m – not athletic
T – Impulsive (Doh)	t – not impulsive

- Use the genotype for Marge and Homer's to figure out their phenotype. Write each phenotype in the space provided in the table.

X-Linked Traits				
Trait	Homer's Genotype	Homer's Phenotype	Marge's Genotype	Marge's Phenotype
Obesity	$X^O Y$	<b>Obesity</b>	$X^o X^o$	<b>No obesity</b>
Color Vision	$X^N Y$		$X^N X^n$	
Hair Growth	$X^B Y$		$X^B X^B$	
Hearing	$X^D Y$		$X^d X^d$	
Immunity to radioactivity	$X^R Y$		$X^R X^r$	
Sweat Glands	$X^S Y$		$X^S X^s$	
Clumsy	$X^m Y$		$X^M X^m$	
Impulsive	$X^T Y$		$X^t X^t$	

- Is Marge immune to radioactivity? \_\_\_\_\_ (YES or NO). **Explain.**

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3. Is Homer lying when he tells Marge that he thinks her hair is a beautiful shade of blue? \_\_\_\_\_ (YES or NO). **Explain.**

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4. Homer fondly remembers a full head of hair and blames his hair loss on Bart. Would Homer have lost his hair if all his children were like Lisa? \_\_\_\_\_ (Yes, No). Explain

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5. Marge often invites Homer to exercise. Homer says that he just gets way too hot, and that he has a very hard time cooling down. Explain why this is true. (Hint: what feature helps people lose heat when they are exercising).

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6. Does Bart need to worry about becoming bald like his father? Set up a Punnett square to show your answer. **Answer YES or NO, and circle the genotypes that could belong to Bart.**


Use evidence from your Punnett square to explain your answer.

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7. What percent chance does Lisa have to be predisposed to obesity? \_\_\_\_\_.


Circle the genotypes that could belong to Lisa and use evidence from your Punnett square to explain your answer.

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8. What was the probability of Bart having normal vision? Show work.


9. Use a Punnett square to explain why Bart is very athletic (not clumsy) while Lisa is not (clumsy).


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10. What is the probability that Maggie's first word will be "Doh"? **Explain.**

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**Concluding Questions:**

1. Which parent determines the gender of the child? Explain why.

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2. Why are males affected by recessive sex-linked diseases more often than females?

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3. If a male has a disease that is Y-linked, what percentage of his sons will inherit the disease? Draw the Punnett square and explain your answer

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4. If a male has a disease that is Y-linked, what percentage of his daughters will inherit the disease? What percentage will be carriers? Draw the Punnett square and explain your answer

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