

## UNDERSTANDING SEX DETERMINATION

Worksheets to help assess students' content knowledge

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### *The Meaning of Sex: Genes & Gender* DVD Guide - Lecture 1

Name: \_\_\_\_\_

1. Name of Presenter?
2. What determines the sex of a human?
3. When is sex determined in humans?
4. What is the first part of the body to take on a sexual move? What does this lead to?
5. Before Mendel's discoveries in the 20<sup>th</sup> century, how did people think sex of a child was determined? Give some examples.
6. In *Drosophila melanogaster*, how is sex determined?
7. In humans, how is sex determined? Explain how you can have a human XX, male.
8. What does the SRY gene code for in the embryo?
9. What does the term transgenic mean?
10. Describe Turner and Klinefelter Syndromes.

11. Why does nature continue to have two sexes? What benefits does it bring?

12. Other Notes:



## ***The Meaning of Sex: Genes & Gender DVD Guide - Lecture 2***

Name: \_\_\_\_\_

1. Why do we use model organisms to study biological functions? Give examples of model organisms.
2. Name the organism that is the primary focus of this lecture.
3. What is the definition of a hermaphrodite?
4. This organism is unique in that you can see all the cells in its body. How many cells make up this organism?
5. How many sexes are present in this organism? Name them.
6. Why is the male needed?
7. The following is a pathway of genes used to determine gender. The two sexes in this organism use opposite genes; circle the genes that should be turned on for male gender to be ensured.

xol-1 }	sdc-1 }	her-1 }	tra-2 }	fem-1 }	tra-1
	sdc-2		tra-3	fem-2	
	sdc-3			fem-3	

8. Are females possible in this organism? If so, how?
9. What is the evolutionary history of this organism?
10. How long does sex determination take in this organism?
11. How many autosomes does this organism contain?
12. How is sex determined in this organism? What gene is involved?
13. How many X signal elements can be removed before a hermaphrodite is no longer produced?
14. Contrast introns and exons.
15. How is a gene turned off?
16. Repressor molecules stop the work of RNA polymerase; give an example.
17. Do hermaphrodites have any xol-1 present? If so, why?

### Extension:

1. Use your book or outside resources to explain and draw the life cycle of *C. elegans*.
2. Draw and label the anatomy of *C. elegans*. Define the following words.

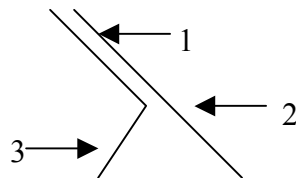
- |           |               |          |
|-----------|---------------|----------|
| ▪ Oocyte  | ▪ Intestine   | ▪ Vulva  |
| ▪ Pharynx | ▪ Spermatheca | ▪ Uterus |

- Embryos
- Gonad
- Anus

**The Meaning of Sex: Genes & Gender DVD Guide - Lecture 3**

Name: \_\_\_\_\_

1. How is dosage compensation accomplished in humans?
2. What is a Barr body? How many Barr bodies would be present in a human with 4 X chromosomes?
3. How is dosage compensation accomplished in *C. elegans*?
4. What occurs if nematodes have too many X chromosomes and not enough dosage compensation?
5. What occurs with an *xdc* pathway mutation?
6. The following is representative of the branched pathway for *sdc* to be turned on.



If there is a <i>sdc</i> mutation at point #	this is the outcome ( <i>sdc</i> : on or off?, sex?, dosage compensation on or off? , other outcomes?)	
1	<ul style="list-style-type: none"> <li>▪ <i>Sdc</i>?</li> <li>▪ Sex?</li> </ul>	<ul style="list-style-type: none"> <li>▪ DC?</li> <li>▪</li> </ul>
2	<ul style="list-style-type: none"> <li>▪ <i>Sdc</i>?</li> <li>▪ Sex?</li> </ul>	<ul style="list-style-type: none"> <li>▪ DC?</li> <li>▪</li> </ul>
3	<ul style="list-style-type: none"> <li>▪ <i>Sdc</i>?</li> <li>▪ Sex?</li> </ul>	<ul style="list-style-type: none"> <li>▪ DC?</li> <li>▪</li> </ul>

7. Explain the relationship between *xol-1* and *sdc*. What is the outcome when one is one and the other is off, etc.?
8. How does dosage compensation occur?
9. From where did the protein involved in dosage compensation evolve?
10. How many genes are present in the dosage compensation complex?
11. What are the functions of MIX-1?
12. What protein functions in both dosage compensation and mitosis?

13. How can you keep a *xol-1* mutant from dying?
14. What two proteins bind and associate with condensing chromosomes? When do they associate with the chromosomes?
15. In a normal individual, should there be the same number of transcripts coming from the X chromosome?
16. Which protein is involved in dosage compensation and meiosis? What is the function of this protein?



## ***The Meaning of Sex: Genes & Gender DVD Guide - Lecture 4***

Name: \_\_\_\_\_

1. What is the experiment the students performed previous to the lecture following?
2. Make a prediction as to what you think the experiment data will show.
3. What happens with testosterone levels as age progresses?
4. Is testosterone a male only hormone?
5. What is the NRY? How is it different from regions on other chromosomes?
6. What is a “housekeeping” gene? Give an example.
7. How many genes are known to be responsible for sperm production on the Y chromosome?
8. How many genes/ gene families are on the X? On the Y?
9. Briefly explain the evolutionary journey of the Y chromosome.
  
10. Why are inversions tolerated on the Y?
11. What is the most common genetic cause of male infertility? Give an example.
12. How long does it take to form a mature sperm?
13. Describe the ICSI procedure.

Extension: If you were a male, would you have Y-DNA testing performed if you were found to be “infertile”? What would you do as a result of this testing based on options presented on the DVD? Who do you think should be involved or made aware of your condition?