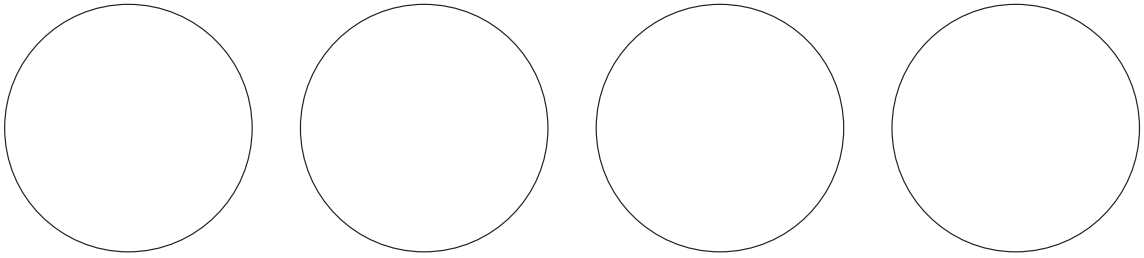
Name _____

Date _____ Hour _____

UV MUTAGENESIS WORK SHEET

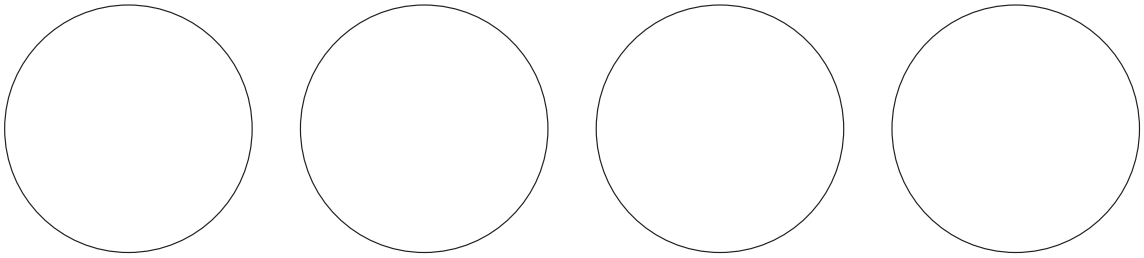
1. Draw pictures of what you observe on your dishes:

Dark-incubated dishes



0 Seconds | 30 Seconds | 60 Seconds | 90 Seconds

Light-incubated dishes



0 Seconds | 30 Seconds | 60 Seconds | 90 Seconds

2. Describe the bacterial colonies on your dark-incubated control dish (0 seconds of UV). Then list and describe the differences among the bacterial colonies seen on each of the dark-incubated experimental dishes relative to those on the dark control dishes.

   Dark-incubated control (0 sec.) dish: _____

   _____

   Dark-incubated 30 sec. dish_____

   _____

   Dark-incubated 60 sec. dish_____

   _____

   Dark-incubated 90 sec. dish_____

   _____

3. Based on these observations, summarize the effects that UV irradiation has on *Serratia* bacteria.

   _____

   _____

   _____

Name _____

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4. Now describe any differences among the bacterial colonies on each of the light-incubated dishes relative to those on the corresponding dark-incubated dish. (That is, compare the light-incubated control dish to the dark-incubated control dish, the light-incubated 30 sec. dish to the dark-incubated 30 sec. dish, and so forth.)

   Control (0 sec.) dishes: _____

   _____

   30 sec. dishes: _____

   _____

   60 sec. dishes: _____

   _____

   90 sec. dishes: _____

   _____

5. Based on the above observations, summarize the effects that cultivation in visible light has on UV-exposed *Serratia* bacteria.

   _____

6. Can you formulate a hypothesis to account for such an effect of visible light?

   _____

7. Do all of the bacteria on a dish appear to respond to UV and visible light in the same way? Why?

   _____

8. Do all of the mutations that you observe in *Serratia* after UV irradiation appear to be harmful? Explain.

   _____

9. Is it possible that a mutation could be beneficial? Explain.

   _____

   _____

Name _____

Date _____ Hour _____

ALBINO PLANT WORK SHEET

Data from your own pair of groups:

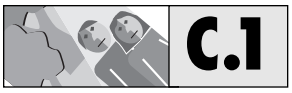
Number of plants on "light" plate		
Color	Observation #1 Light incubated	Observation #2 Light incubated
Green		
White		

Number of plants on "dark" plate		
Color	Observation #1 Dark incubated	Observation #2 Light incubated
Green		
White		

Data from the whole class:

Number of plants on "light" plates				
	Observation #1 Light incubated		Observation #2 Light incubated	
Group	Green	White	Green	White
Totals				

Number of plants on "dark" plates				
	Observation #1 Dark incubated		Observation #2 Light incubated	
Group	Green	White	Green	White
Totals				



Name _____

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DATA ANALYSIS

Use the data collected by the class as a whole to answer the following questions.

1. What ratio of green seedlings to white seedlings was present in the light-incubated seedlings on the first day of observation?

   First express this as a ratio of the total numbers of green seedlings and white seedlings observed. (For example, 461:119)

   _____

   Now divide the larger by the smaller number to express it as an exact ratio. (For example, 461:119 = 3.87:1)

   _____

   Now convert this exact ratio to the nearest integral ratio. (For example, 3.87:1 ≈ 4:1)

   _____

2. What did you expect the ratio of green seedlings to white seedlings to be, given that this difference in color has a simple genetic basis? Explain.

   _____

   _____

   _____

3. Do you think that the difference between the exact ratio that you calculated for Question 1 and the expected ratio that you gave for Question 2 is significant? Explain.

   _____

   _____

   _____

Name _____

Date _____ Hour _____

4. What ratio of green plants to white plants was present in the dark-incubated seedlings on the first day of observation?

_____

5. Is this significantly different than the ratio of green plants to white plants that was present in the light-incubated seedlings on the first day of observation?

_____

6. Formulate a hypothesis to explain this difference between the light-incubated and dark-incubated seedlings.

_____

_____

7. How could your hypothesis be tested?

_____

_____

8. Compare the ratios of green seedlings to white seedlings that were observed in the dark-incubated seedlings on the first observation and the second observation.

First observation: _____

_____

Second observation: _____

_____

9. How do you account for any difference between these two ratios?

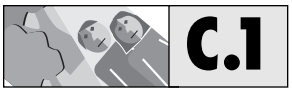
_____

_____

10. What overall conclusion can you draw from the data collected in this experiment?

_____

_____



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AN OPTIONAL STEP: A CHI-SQUARE ANALYSIS OF THE ALBINO PLANT DATA

1. Following the instructions for How to Perform a Chi-Square Test on Any Data Set (see Chapter 2, Section E.3) and using the data collected by the class as a whole, calculate χ^2 and p for the light-incubated seedlings on the first day of observation.

   χ^2:_____ p:_____

2. Based on the value of p that you obtained, do you think that the class data for the light-incubated seedlings are consistent with the hypothesis that seedling color is determined by a pair of alleles that exhibit a simple dominant-recessive relationship? Explain.

   _____

   _____

3. Repeat the calculation of χ^2 and p for the light-incubated seedlings on the first day of observation, using only the data collected by your own group.

   χ^2:_____ p:_____

4. Based on the value of p that you obtained this time, do you think that your own data are consistent with the hypothesis that seedling color is determined by a pair of alleles that exhibit a simple dominant-recessive relationship? Explain.

   _____

   _____

5. Which data set gave you the higher p value, the class data or your own data? Explain.

   _____

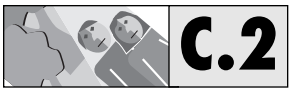
   _____

6. Do you think you need to perform a χ^2 test to determine whether the data that your class collected with respect to the dark-incubated plants during the first observation are consistent with the proposed hypothesis? Explain.

   _____

   _____

   _____



Name _____

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HEART DISEASE WORK SHEET

1. Determine your environmental (lifestyle) risk. Draw one slip (without looking) from each of the envelopes (A, B, C, and D) that your teacher will pass around. Record the information on that slip in the table below. Add the numbers to get your total environmental risk score.

Envelope	Characteristic	Personal attribute	Score
A	Weight		
B	Diet		
C	Smoking		
D	Exercise		

My total environmental (lifestyle) risk = _____

2. Determine your genetic risk. Two cups containing poker chips or other objects of different colors will now be passed around. The different colored chips will represent alleles with different risk values. One cup will be labeled "Mother's Genes," and the other will be labeled "Father's genes." When one of these cups reaches you, close your eyes, stir the chips, and pick three chips with your eyes still closed. Open your eyes, record the colors of the chips in the spaces below, and then return the chips to the cup and pass the cup on to the next person. After all students have selected and recorded the colors of their three chips, your teacher will announce the risk score associated with each color of allele. Record these scores below, add up your genetic risk, and then add up your total heart disease risk.

Colors of "Mother's Genes:" 1. _____ 2. _____ 3. _____

Points for "Mother's Genes:" 1. _____ 2. _____ 3. _____

Colors of "Father's Genes:" 1. _____ 2. _____ 3. _____

Points for "Father's Genes: 1. _____ 2. _____ 3. _____

My total genetic risk = _____

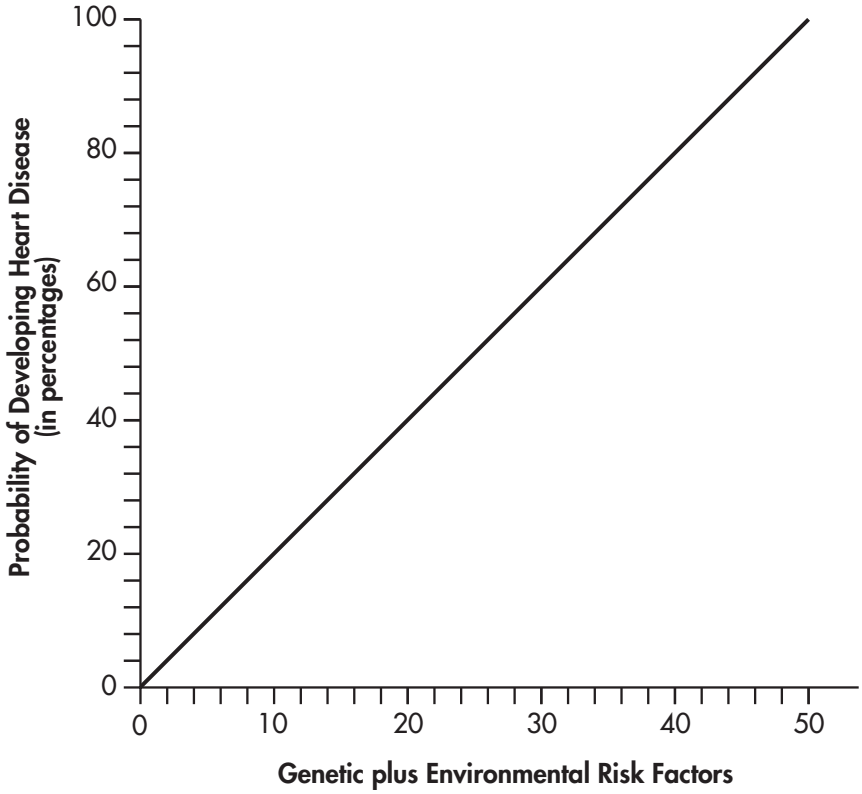
3. Determine your total risk.

My total risk of contracting heart disease = lifestyle risk + genetic risk = _____

Name _____

Date _____ Hour _____

4. Using the graph below, determine your probability of developing heart disease.



5. If this were my actual risk score (as opposed to my simulated risk score),

   my probability of contracting heart disease would be about _____%.

6. My calculated risk of getting heart disease is _____% due to my environmental

   (lifestyle) factors and _____% due to genetic factors.

7. Indicate the most important changes you could make in your lifestyle changes to lower your risk of heart disease if your simulated risk scores were your actual risk scores.

   _____

   _____

   _____

8. By doing the above, I could lower my probability of developing heart disease to about

   _____%.

Name _____

Date _____ Hour _____

SEX-LINKED MUTATION WORK SHEET

1. If a woman is a carrier for a mutation causing a sex-linked disorder, what is the chance that one of her sons will have the disorder? Explain.

   _____

2. If a woman who is a carrier for a sex-linked disorder already has one son who has the disorder, what is the chance that if she has a second son he will also have the disorder? Explain.

   _____

3. If a man has a sex-linked disorder, what is the chance that he will pass it on to one of his sons? Explain.

   _____

4. If a man has a sex-linked disorder, what is the chance that one of his daughters will be a carrier for that disorder? Explain.

   _____

5. If a man has a sex-linked disorder, what are the chances that one of his grandsons will inherit that disorder? Explain.

   _____

   _____

6. It has been postulated that a condition known as "hairy ears" is caused by a mutation of a gene on the Y chromosome. Assuming that this is true, what is the chance that one of the sons of a man with hairy ears will inherit the "hairy-ear mutation?" Explain.

   _____

   _____

7. What is the chance that one of the daughters of the man referred to above will pass the "hairy-ear mutation" on to one of her sons? Explain.

   _____

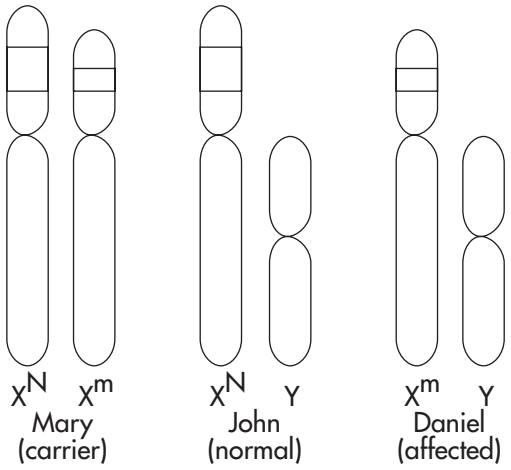
   _____

Name _____

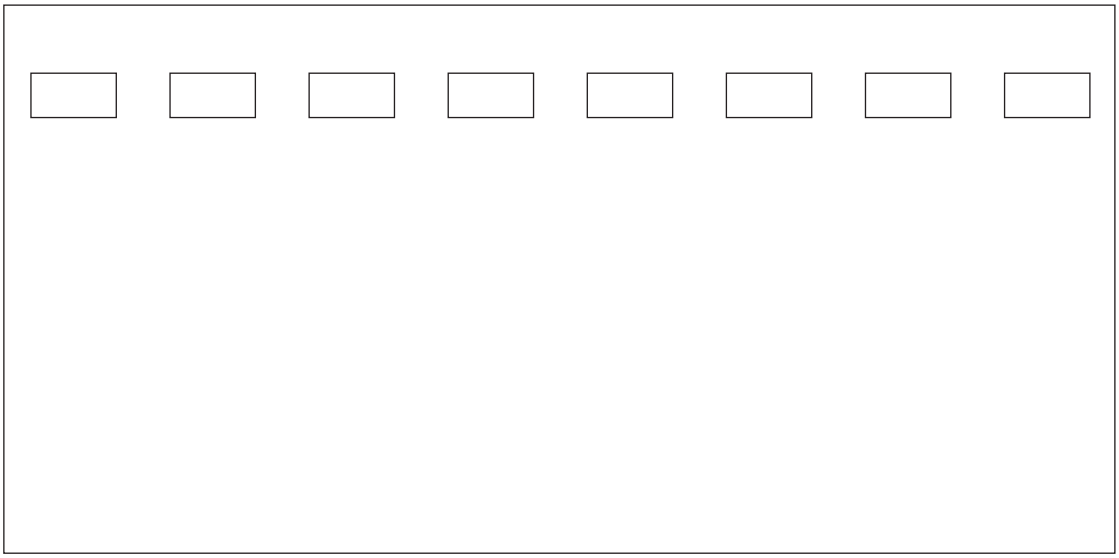
Date _____ Hour _____

DMD DIAGNOSIS WORK SHEET

1. On the diagram below, color the defective alleles purple and the normal alleles blue. NOTE: Deletion not to scale.



2. On the diagram below, a) above each well, put the letter that was on the sample that was loaded into that well and b) using colored pencils, draw all the bands that you observed on your gel after electrophoresis.



Name _____

Date _____ Hour _____

3. Fill in each of the blanks in the data table below:

Sample	Family Member	# of DMD Alleles	Genotype	Status
Tube A	Mother Mary	2	$X^N X^m$	Carrier
Tube B	Father John	1	_____	Healthy
Tube C	Son Daniel	1	_____	Has DMD
Tube D	Daughter Alice	_____	_____	_____
Tube E	Son Michael	_____	_____	_____
Tube F	Fetus M or F (circle)	_____	_____	_____

4. Which allele moves further into the gel, the normal (X^N) or mutant (X^m) allele? Why?

_____

5. Is the daughter, Alice, a carrier for DMD? How can you tell? _____

_____

6. Does Michael have DMD? How can you tell? _____

_____

7. What can you tell the Smith family about their unborn child? _____

_____

8. Why are most patients with DMD male? _____

_____

9. Can a boy be a carrier for DMD without having the disease? Why or why not?

_____

10. If you were the genetic counselor in this case, what would you tell the Smiths about their test results?

_____