Assignment 8

1. File upload (1 point)

Go this interactive website and read the introduction. Then select Karyotype 1 and create the karyotype by dragging chromosomes to the correct place on the numbered chart. Note that one chromosome of each pair is numbered, so be sure to place it on the correct numbered line. You can then locate the matching chromosome based on size, banding pattern, and centromere location. Note that this karyotype has an abnormality. When you have completed the karyotype, see if you can answer question 1 and 2 next to the karyotype. Then capture an image of the karyotype and submit it to WebAssign as a .jpg or .png file.

NOTE: the interactive web site uses a version of Flash which may not run on new computers. If the link does not work, go to this alternate site and match the homologous chromosomes according to directions on the site. Use Google Chrome as your browser for the best experience. When you have matched all of the chromosomes, capture an image of the completed karyotype and submit it to WebAssign. You do not need to do anything else at this site, but be sure that you can tell if the karyotype is male or female.

For questions 2 and 3, you must read the article on Telomeres.

2. Multiple-choice (1 point)

What happens if the telomeres within a cell become very short?

The cell becomes immune to cancer.
The cell cannot divide and may die.
The cell divides more rapidly.
The cell becomes immortal.
The cell is unaffected.

3. Multiple-choice (1 point)

Which two types of cells are likely to have high telomerase levels?

Cells that divide frequently throughout life and cancerous cells.
Cells that divide only a few times throughout life and cancerous cells.
Cells that never divide and cancerous cells.
Cells that never divide and cultured cells.
Cells that never divide and cells from old individuals.
4. Matching (4 points)

This is a difficult question and you should fill out diagram 2 (on the diagram help sheet) before beginning. The diagram takes you through the process of meiosis in a stepwise fashion and will enable you to visualize how the chromosomes look at each meiotic stage.

Below are cells which might have appeared during meiosis of the mother cell shown on the right. This mother cell has four DNA helices (chromosomes) **before replication** of the DNA, so the diploid number is 4. Note that there are two pairs of homologous chromosomes: a black set from one parent and a gray set from the other parent.

Decide whether the following diagrams of cells show stages in **meiosis I, meiosis II**, or **would not be found** in meiosis of this mother cell. Then match the letter of the cell to meiosis I, meiosis II, or “would not be found” in WebAssign.

![Mother cell](image)

Cell A  
Cell B  
Cell C  
Cell D

5. Matching – place meiotic stages in proper order (4 points)

View these 4 images of meiosis. They are all stages of lily pollen formation. Indicate which of the cells is the earliest, 2\(^{nd}\) earliest, 3\(^{rd}\) earliest, and latest meiotic stage (of the stages shown).

<table>
<thead>
<tr>
<th>Cell letter</th>
<th>Order in meiosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell A</td>
<td></td>
</tr>
<tr>
<td>Cell B</td>
<td></td>
</tr>
<tr>
<td>Cell C</td>
<td></td>
</tr>
<tr>
<td>Cell D</td>
<td></td>
</tr>
</tbody>
</table>

6. Essay (2 points)
Name the stage of meiosis seen most frequently within this anther cross section. Then write one or two sentences that justify your answer.

7. File upload (2 points)

Examine this slide of a lily ovary viewed by virtual microscopy. Study each of the 6 ovules to determine whether a meiotic stage is present. Locate an ovule that contains a prophase, capture the image at high magnification, and label the ovule and chromosomes. Submit your labeled image to WebAssign in .jpg or .png format.

8. True/false (2 points-0.5 points each)
In humans, brown eyes (B) are dominant over blue (b). A brown-eyed man marries a blue-eyed woman and they have three children, two of whom are brown-eyed and one of whom is blue-eyed. Draw the Punnett square that illustrates this marriage, then answer the following questions:

______ The mother can only produce eggs that contain the b allele.
______ The father can only produce sperm that contain the B allele.
______ The brown eyed children of this marriage can have the genotype BB or Bb.
______ The blue-eyed child of this marriage can only have the genotype bb.

9. Multiple-choice (1 point)

In pea plants, round seeds (R) are dominant to wrinkled seeds (r). In a genetic cross of two plants that are heterozygous for the seed shape trait, what fraction of the offspring should have round seeds?

25%
50%
75%
100%
none of the seeds will be round

10. Essay (2 points)
A rooster with gray feathers is mated with a hen of the same phenotype. Among their offspring, 15 chicks are gray, 6 are black, and 8 are white. Write a short essay that answers the following questions:

a. What is the simplest explanation for the inheritance of these colors in chickens?

b. What color(s) of offspring would be produced from the mating of a gray rooster and a black hen?

11. Multiple-select (1 point)

A person with type A blood and a person with type B blood are married. List all blood cell genotypes that their children could have. (There is no partial credit for this question.)

AA, Ao, AB, BB, Bo, oo

12. Multiple-choice (1 point)

A man with type AB blood has been in a car accident and needs a blood transfusion. Which of the following people could donate their blood for him?

a person with AB blood only
a person with A blood only
a person with B blood only
a person with O blood only
all of these people

For each of the next 3 problems, you must solve the type of inheritance. By examining the results of cross 1 and cross 2, determine the genotypes of the parents. (These problems are based on the transmission of genes on one pair of chromosomes, so you may wish to review diagram 1 on your help sheet before beginning.)

13. Essay (2 points)

cross 1: red-eyed mouse X white-eyed mouse
  gives F1: all red-eyed

cross 2: red-eyed F1 X red-eyed F1
  gives F2:
  36 red-eyed
  13 white-eyed
Write a short essay that answers the following questions:

a) Is the inheritance of eye color dominant / recessive or incomplete dominance?

b) What is the genotype of the parents in cross 1? (List both genotypes—you can choose any letter to indicate eye color)

14. Essay (2 points)

cross 1: long-eared mouse X short-eared mouse
  gives F1:
  12 long-eared
  10 short-eared

cross 2: long-eared F1 X long-eared F1
  gives F2:
  36 long-eared
  13 short-eared

Write a short essay that answers the following questions:

a) Is the inheritance of ear length dominant / recessive or incomplete dominance?

b) What is the genotype of the parents in cross 1? (List both genotypes—you can choose any letter to indicate eye color)

15. True/false (2 points—0.5 points each)
Answer the following questions about the tail-less/normal gene as true or false.

cross 1: tail-less mouse X normal mouse
  gives F1:
  10 tail-less
  9 normal

cross 2: tail-less F1 X tail-less F1
  gives F2:
  10 normal
  21 tail-less
  9 born dead

______ The inheritance of the tail-less/normal gene shows incomplete dominance.
Mice which are homozygous for the abnormal (tail-less) gene are born dead.

Mice which are heterozygous for this gene are normal.

The parental genotypes of cross 1 are Tt and TT.