1. Assume that a cross is made between AaBb and aabb plants and all of the offspring are either AaBb or aabb. These results are consistent with the following circumstance:

   A. Complete linkage  
   B. Alternation of generations  
   C. Codominance  
   D. Incomplete dominance  
   E. Hemizygosity

   **Reason:** Genes that are completely linked are so close together that recombination rarely if ever occurs.

2. Assume that a cross is made between AaBb plants and aabb plants and the offspring occur in the following numbers: 106 AaBb, 48 Aabb, 52 aaBb, 94 aabb. These results are consistent with the following circumstance:

   A. Sex-linked inheritance with 30% crossing over  
   B. Linkage with 50% crossing over  
   C. Linkage with approximately 33 map units between the two gene loci  
   D. Independent assortment  
   E. 100% recombination

   **Reason:** $\frac{48 + 52}{300} = 33\% = 33$ map units

3. The recessive mutations m (mahogany eyes) and eb (ebony body) identify two autosomal linked genes of *Drosophila melanogaster*. When females heterozygous for these genes were crossed with mahogany eyed, ebony bodied males, the following classes and numbers of progeny (out of 1000) were obtained:

   - wildtype eyes, wildtype body 370
   - mahogany eyes, wildtype body 130
   - wildtype eyes, ebony body 120
   - mahogany eyes, ebony body 380

   Based upon these results, the map distance between the m and eb genes is estimated to be:

   **Answer:** 25 map units.  
   **Reason:** $\frac{130 + 120}{1000} = 250/1000 = 25\%$
4. The recessive mutations *s* (scute bristles) and *rb* (ruby eyes) identify two linked autosomal genes of *Drosophila melanogaster*. When females heterozygous for these genes were crossed with scute bristled, ruby eyed males, the following classes and numbers of progeny (out of 1000) were obtained:

wildtype bristles, wildtype eyes 188  
sute bristles, wildtype eyes 307  
wildtype bristles, ruby eyes 313  
sute bristles, ruby eyes 192

Based upon these results, the map distance between the *s* and *rb* genes is estimated to be:

A. 31.3 map units  
B. 38 map units  
C. 30.7 map units  
D. greater than 50 units because all four classes of offspring were observed

Reason: \( \frac{188 + 192}{1000} = 38\% = 38\text{ map units} \)

5. In the above question, which offspring are recombinants?

*Answer:* The wildtype bristles, wildtype eyes, and scute bristles, ruby eyes are the recombinants. You know this because recombinants always occur at a lower frequency than parentals.

6. Draw the chromosome and gene arrangement of the female fly from the above question.

*Answer:* You need to draw your chromosome so that *s*+ and *rb* are on the same chromosome and *s* and *rb*+ are on the same chromosome.