Use the following information to answer the next question.

In his work with the fruit fly (*Drosophila*), Thomas Morgan bred normal red-eyed female flies with white-eyed males. He bred enough flies to have acceptable statistical significance and reliability. The F_1 generation were all red-eyed. All the females of the F_2 generation had red eyes, but one-half of the males of the F_2 generation had white eyes.

1 A conclusion that may be drawn from Morgan's work is that the gene for white eyes is located on the

A. Y chromosome and is recessive
B. Y chromosome and is dominant
C. X chromosome and is recessive
D. X chromosome and is dominant

Protanopia, or red colour blindness, is a recessive X-linked characteristic. A woman with normal colour vision who carries the allele for red colour blindness and a man who is red colour-blind are expecting a child. Which statement about the child is likely correct?

2
A. If the child is a boy, there is a 100% chance that he will be colour-blind.
B. If the child is a girl, there is a 100% chance that she will not be colour-blind.
C. There is a 25% chance that the child will be colour-blind.
D. There is a 50% chance that the child will be colour-blind.

Use the following information to answer the next question.

In *Drosophila*, the genes for eye colour (pr), wing shape (vg), and body colour (eb) are all found on the same chromosome. The following crossover frequencies for these genes were determined by experimentation.

Genes	Crossover Frequency
pr and vg	12.5%
pr and eb	6.0%
vg and eb	18.5%

3 Which is the correct sequence of the genes pr, vg, and eb on the chromosome?

A. pr–vg–eb
B. vg–eb–pr
C. eb–pr–vg
D. eb–vg–pr

Use the following information to answer the next question.

In *Drosphila* (fruit flies), the genes for pink eyes, rough eyes, curled wings, and hairless bristles are located on chromosome 3.

Genes	Crossover Frequency
• pink eyes and hairless bristles	21.5
• hairless bristles and curled wings	19.5
• rough eyes and curled wings	41.1
• pink eyes and rough eyes	43.1
• rough eyes and hairless bristles	21.6

Legend
Pink eyes – 1
Rough eyes – 2
Curled wings – 3
Hairless bristles – 4

—from *Griffiths, 1993*

4. Use the legend to create a map of the four genes on a chromosome. Show the distances between them.

5. A cross was performed between two heterozygous Drosophila for wild type body colour and straight wings. The following offspring were observed:

Wild type body colour, straight wings	282	parental
Black body colour, straight wings	9	
Wild type body colour, curved wings	9	recombinants

a) Calculate the frequency of crossing over. (Show formula)

b) How far apart are the A and B gene on the chromosome?

6. The gene for wild-type eye colour is dominant and sex-linked in *Drosophila* White eyes are recessive. The mating of a male with wild-type eye colour with a female of the same phenotype produces offspring that are ¾ wild-type eye colour and ¼ white eyed. Indicate the genotypes of the P1 and F1 generations.

½

7. The normal daughter of a man with hemophilia (a recessive, sex-linked condition) marries a man who is normal for the trait.

a) What is the probability that a daughter will be a hemophiliac? (show punnette square to explain)

½

b) A son?

1

c) If the couple has four sons, what is the probability that all four will be born with hemophilia?

1