

ANNEXURE 2

Activity – Make a Linkage Map

Subject	Biology
Class	XII
Chapter	Principles of Inheritance and Variation
Topic	Linkage and Recombination
Duration	40 minutes
Nature of the Activity	Individual

What will I learn? (Learning Outcome) –

Skills- Conceptualising, Critical thinking

What I have to do? –To depict the genes present on the X-chromosome of *Drosophila melanogaster*

What do I require?

- A long plastic rod/ nylon string, red and black marker

What do I need to know?

Morgan's experiments on *Drosophila melanogaster*, Linkage, Recombination, Meiosis

- **Teacher's activity-** Teacher will give the instructions along with the protocol (Student's activity)
- Teacher will act as facilitator and summarise, at the end of the activity

How will I proceed?

- **Student's activity**
 1. To tie a knot on the nylon string a little away from the end and mark it 0.0 map units (Represents gene for body colour of *Drosophila* - Call it A)
 2. Tie another knot at a distance of 1.5cm away from the first and mark it 1.5mu (Represents gene for eye colour of *Drosophila* - Call it B)
 3. Tie the third knot at a distance of 36 cm away from the first and mark it 36 mu (Represents gene for wing shape of *Drosophila* - Call it C)
 4. Alternately, on a thin plastic rod, put the same markings using a red marker and depict the centromere further down, by making a circle on it (Choose a scale and note the same on a sheet, say 0.5cm = 1map unit)
 5. Call it linkage map of X- chromosome of *Drosophila melanogaster*, showing 3 different genes

6. Keep your 'linkage map' on the table or hold it straight and ask a student volunteer/ your partner to make 5 markings on it with a black marker.
7. Count the number of marks between A and B, and those between B and C
8. Note your observations

What have I observed?

Student	Number of markings between A and B	Number of markings between B and C
1	0	5
2	1	4
3		

40		
Total Markings→		

What have I learnt?

→More the distance between two given points, in this case B&C, more is the number of markings that can be made. Similarly, more the distance between any two loci on the chromosome, more the probability of crossing over and thus more recombinants.

→That the genes for body colour (y/y⁺) and eye colour (w/w⁺) are tightly linked that the genes for eye colour (w/w⁺) and wing shape (m/m⁺) are loosely linked

What would I like to know ?

Apart from the 3 genes studied, how many more are located on the X- chromosome of *Drosophila* ? What is the relative distance between those genes? Which ones are tightly linked and which ones are loosely linked?

Let me Evaluate myself-

1. What is a linkage group? How many linkage groups are there in *Drosophila* ?
2. Apart from map units, what are the units for measuring genetic linkage?
3. Comment upon Thomas Morgan's 'Fly room'
4. What is the highest percentage of recombinants that can be obtained due to crossing over?
5. The distance between genes a and b is 5 m.u., between b and c is 15 m.u., that between c and d is 4 m.u. and between a and d is 6 m.u. Write the sequence of the genes?

