



Module 4: Splicing – Removal of introns from messenger RNA by splicing

Answer Sheet

Q1. List two ways in which the histograms are similar.

a. _____

b. _____

Q2. List one way that the histograms differ (other than color).

a. _____

Q3. Recall that our other evidence (see Module 3) indicates that *tra*-RA (blue, female-specific) extends from 9,851 to 10,846. How many gaps do you see in the histograms in this interval?

Q4. How many exons do you see?

Q5. Do females or males make more *transformer* mRNA, or do they express it at about the same level?

Q6. Using the information you've gathered so far, make a diagram of the *tra*-RA (female-specific) isoform with 3 exons and 2 introns. Represent exons as rectangular boxes and introns as lines connecting the boxes. Number each exon and intron (start from the left with “exon 1”).

Q7. Where is the promoter in relation to the exons and introns? On your diagram, mark the putative Transcription Start Site in your diagram with a bent arrow pointing in the direction of transcription.

Q8. What is the coordinate of the last nucleotide of tra-RA exon 1?

Q9. What are the first two nucleotides of tra-RA intron 1?

Q10. What are the last two nucleotides of tra-RA intron 1?

Q11. What is the coordinate of the first nucleotide of tra-RA exon 2?

Q12. What are the last three nucleotides of tra-RA exon 2?

Q13. What is the coordinate of the last nucleotide of tra-RA exon 2?

Q14. What are the first two nucleotides of tra-RA intron 2?

Q15. What are the last two nucleotides of tra-RA intron 2?

Q16. What is the coordinate of the first nucleotide of tra-RA exon 3?

Q17. Using the information you've gathered so far, make a graphical picture of the tra-RA (female-specific) isoform with 3 exons and 2 introns. Number each exon and intron at the corresponding DNA coordinates. Add the coordinates for first and last nucleotide of the exons that you have found so far. Add the sequences of the splice donor and splice acceptor sites at the appropriate locations.

Q18. Where do you think the promoter is located in relation to your gene model? What evidence do you have to support your idea, using the evidence tracks we have displayed (Base Position, RNA-Seq Coverage, Exon Junctions)?

Q19. Bonus question! Support your hypothesis by gathering additional data. Recall our explorations in Modules 2 and 3. You might want to open the tracks “D. mel. cDNAs,” and “TSS Annotations,” both in **full**. What type of evidence is shown by each of these tracks (refer to Module 2)? Finally, to see tra-RA as currently annotated in FlyBase, open the “tra Isoform” track on **full**, or to see both isoforms open the “FlyBase Genes” track in **pack**. Do these results support your model? Do any ambiguities remain?



Module 4 Homework: Determining splice sites for the *spd-2* gene

Answer Sheet

Q1. How many exons does *spd-2* have?

Q2. How many introns does *spd-2* have?

Q3. What is the coordinate of the last nucleotide in exon 1?

Q4. What are the first two nucleotides of intron 1?

Q5. What are the last two nucleotides of intron 1?

Q6. What is the coordinate of the first nucleotide in exon 2?

Q7. What is the coordinate of the last nucleotide in exon 2?

Q8. What are the first two nucleotides of intron 2?

Q9. What are the last two nucleotides of intron 2?

Q10. What is the coordinate of the first nucleotide in exon 3?

Q11. Using the information you've gathered so far, make a graphical picture of the *spd-2* gene with 3 exons and 2 introns. Number each exon and intron. Add the coordinates for first and last nucleotide of the exons that you have found so far. Add the sequences of the splice donor and splice acceptor sites at the appropriate locations. Finally, add a bent arrow for the transcription start site.