

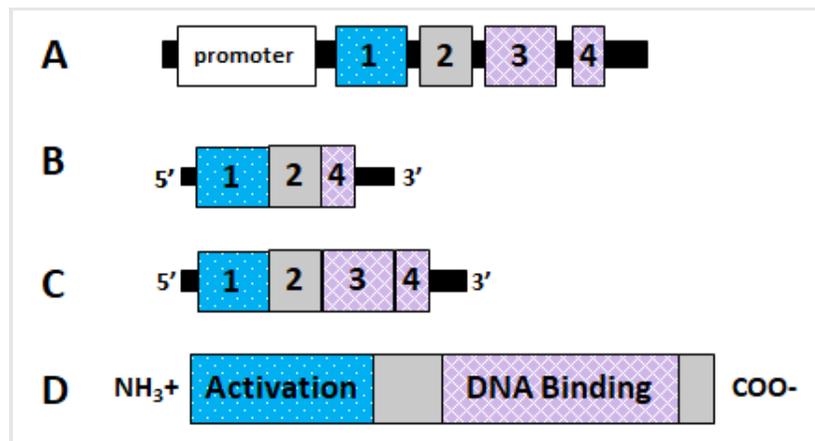
“Splicing it together: Using primary data to explore RNA splicing and gene expression in large-lecture introductory biology”

Arneson, Woodbury, Anderson, Collins, Cavagnetto, Davis, Offerdahl 2021

Pre-Class Quiz

Correct answers are indicated in **BOLD**:

1. Select all options that result in a true statement. Transcription factors _____.
 - a. Are a type of mRNA
 - b. Activate expression of genes**
 - c. Repress expression of genes**
 - d. Activate translation of mRNA
 - e. Repress translation of mRNA
2. Which of the following are hallmarks of cancer? Select all that apply.
 - a. Cancer cells replicate and divide slower than normal cells.
 - b. Cancer cells use less glucose than normal cells.
 - c. Cancer cells require increase blood flow to fuel uncontrolled growth.**
 - d. Cancer cells have the same genes as normal cells.**



3. In this schematic, Molecule _____ represents a gene (DNA) that is transcribed and spliced to make Molecule(s) _____, which are mRNA molecule(s). Molecule _____ is one protein produced from the gene. The molecule that will function as a transcription factor is _____.

Drop-down options:

A (correct answer for first blank)

B

C

B and C (correct answer for second blank)

B, C, and D

D (correct answer for blanks three and four)

4. Use the schematic from the previous question. If Exon 3 is spliced out, how would this affect the function of the transcription factor?
 - a. The transcription factor will no longer be able to activate expression.
 - b. The ability of the transcription factor to bind to DNA will be altered.**
 - c. The functionality of the transcription factor will not be affected.

Bridge trolls produce glitter in their tail cells in order to deceive prey into thinking it is a unicorn. The *FnTsy* gene, which contains 6 exons in trolls, can be transcribed and alternatively spliced to produce a few mature mRNAs. One mature *FnTsy* mRNA is translated into the protein glitterase, which is involved in the production of glitter.

Bridge Troll *FnTsy* pre-mRNA



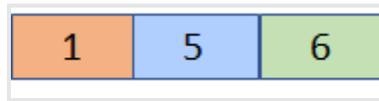
Interestingly, the *FnTsy* gene is also present in unicorns and can be expressed to produce the same glitterase protein. In unicorns, though, the *FnTsy* gene only contains 4 of the exons found in trolls.

Unicorn *FnTsy* pre-mRNA



5. Use today's lecture slides and the examples above to answer the following question:

Shown here is the mature *FnTsy* mRNA that encodes glitterase in unicorns.



Which of the following mature *FnTsy* mRNAs is most likely to code for glitterase in bridge trolls?

- A.
- B.
- C.
- D.

D is the most correct response – the same combination of exons is most likely to produce the same protein. It is possible one might predict that a transcript with exons 1, 5, and 6 (like C) could produce a protein that folds in such a way to allow some glitterase function. This was not an argument or question posed by students in any semester we

implemented the activity – nearly $\frac{3}{4}$ of our students answered “D” – but it could be used for discussion of structure/function should the question arise.