



AP Bio

FRQ Fridays

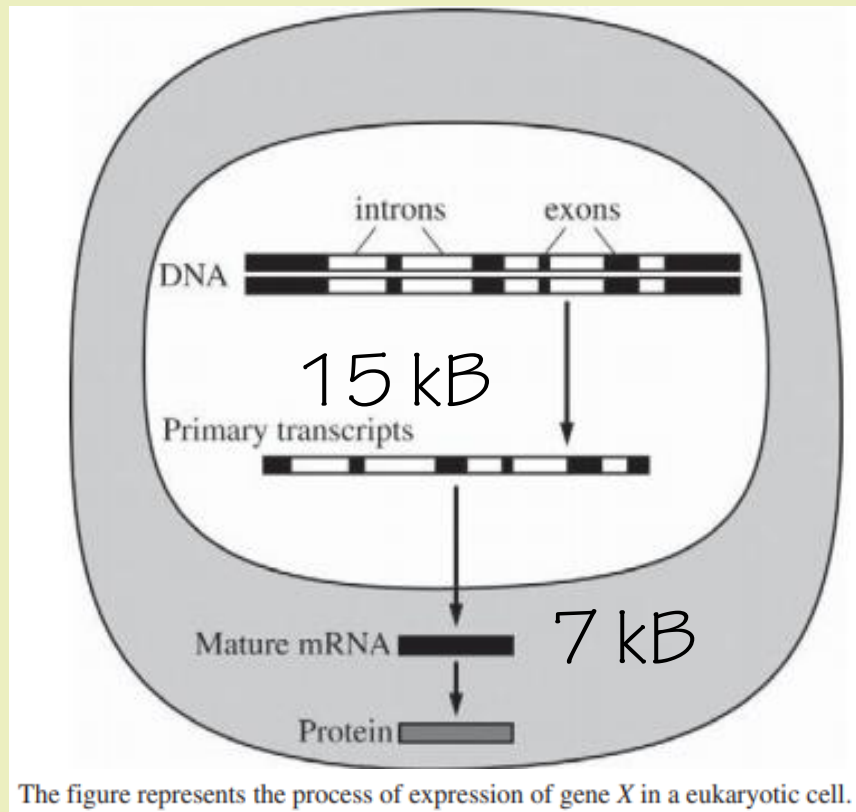
2016 #4
Post-Transcriptional Modification
Prokaryotes vs Eukaryotes



FRQ Friday #15

2016 #4

(a) The primary transcript in the figure is 15 kilobases (kb) long, but the mature mRNA is 7 kb in length. Describe the modification that most likely resulted in the 8 kb difference in length of the mature mRNA molecule. Identify in your response the location in the cell where the change occurs.



The figure represents the process of expression of gene X in a eukaryotic cell.

Describe process (1 point)

- Removal of introns
- RNA processing

Identification (1 point)

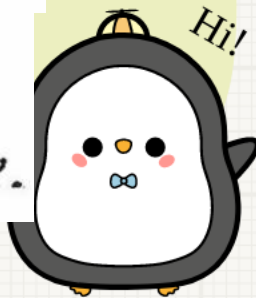
- Nucleus



FRQ Friday #15

2016 #4

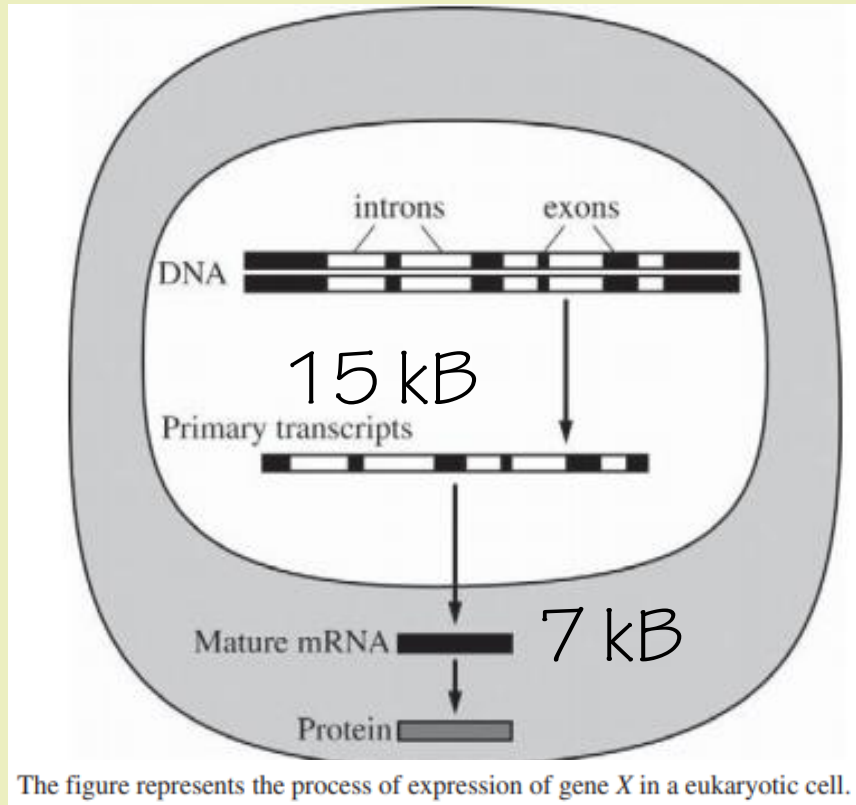
a. Primary transcripts, also known as pre-RNA, include introns in the raw DNA complementary code. In order to achieve the finished product, mRNA, the pre-RNA must go through RNA processing in the **nucleus** itself. A 5'-cap of modified guanine is added to the pre-RNA to help it bind to the ribosome for translation. A poly-A tail is added to the 3'-~~end~~ end, in order to protect the RNA from degradation by hydrolytic enzymes and to help the RNA be ejected from the nucleus and into the cytoplasm. ^{Most importantly,} ~~then in~~ ~~the~~ ~~at~~ There, snRNPs and spliceosomes **remove introns** from the pre-RNA, resulting in mature mRNA's smaller size.



FRQ Friday #15

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(b) Predict the length of the mature gene X mRNA if the full-length gene is introduced and expressed in prokaryotic cells. Justify your prediction.



Prediction (1 point)

- 15 kb
- Longer than the mature mRNA in the eukaryote

Justification (1 point)

- mRNA processing typically does not occur in prokaryotes



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Justification (1 point)

- mRNA processing typically does not occur in prokaryotes

b. If this gene was expressed in prokaryotic cells, the mature RNA would be just as long as the original gene, 15 kb, because prokaryotic cells lack the ability to remove eukaryotic introns.

