CONCEPT: EUKARYOTIC POST-TRANSCRIPTIONAL REGULATION

●Eukaryotes regulate gene expression at the post-transcriptional level in _____ ways:

1. Alternative RNA _____ results in different protein products from the same mRNA transcript.
2. RNA processing adds a 5' _____ & poly-_____ tail to mRNA for protection from RNA degrading enzymes.
3. mRNA can be tagged for degradation or transcription is blocked by small noncoding _____ molecules.

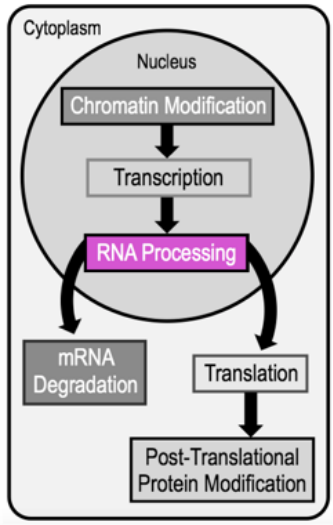
1) Alternative RNA Splicing

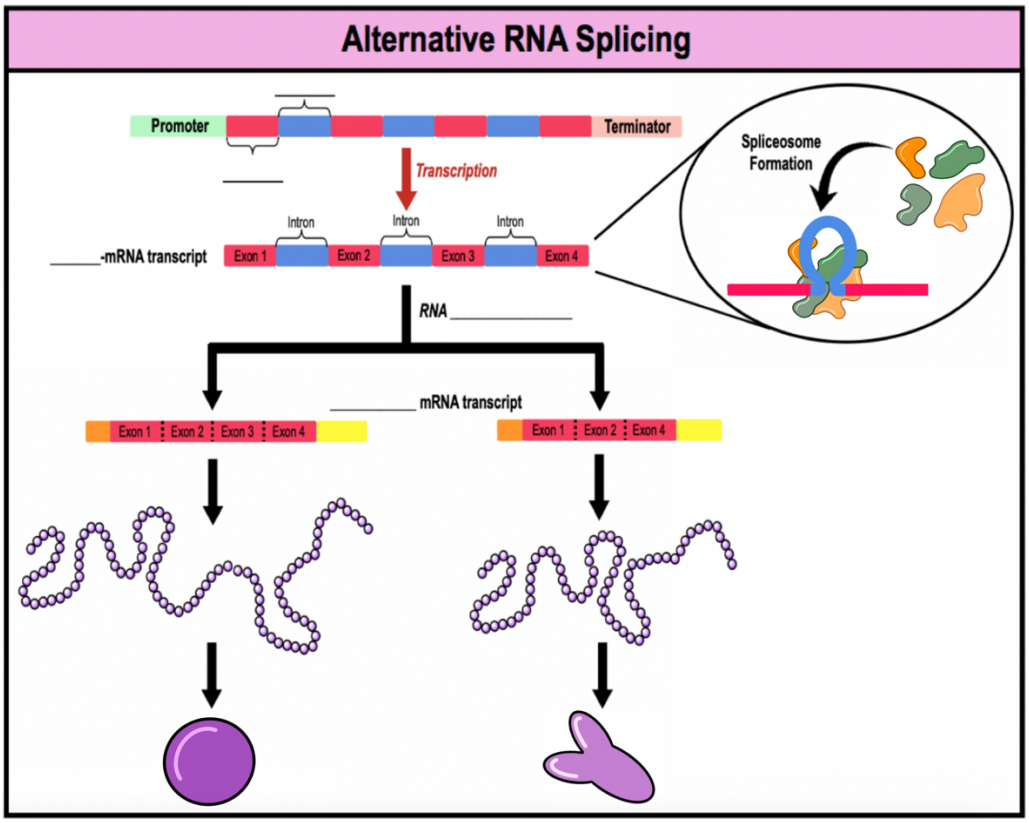
●*Recall:* Eukaryotes require _____-transcriptional modifications like *RNA splicing* which can alter gene expression.

□ **Alternative splicing**: when different mRNA molecules are produced from the _____ premature RNA.

□ The _____: the RNA-protein complex that removes introns from premature RNA.

EXAMPLE: Alternative RNA splicing results in different protein products from the same premature RNA.





PRACTICE Alternative RNA splicing has been estimated to occur in more than 95% of multi-exon genes. Which of the following is **not** an evolutionary advantage of alternative RNA splicing?

a) Alternative RNA splicing increases diversity without increasing genome size.

b) Different protein variants can be expressed by the same gene in different tissues.

c) Alternative RNA splicing creates shorter mRNA transcripts.

d) Different protein variants can be expressed by the same gene during different stages of development.

CONCEPT: EUKARYOTIC POST-TRANSCRIPTIONAL REGULATION

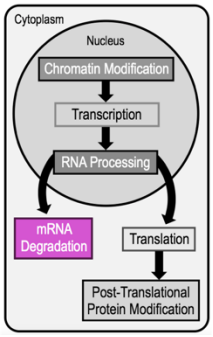
2) mRNA Protection in the Cytoplasm

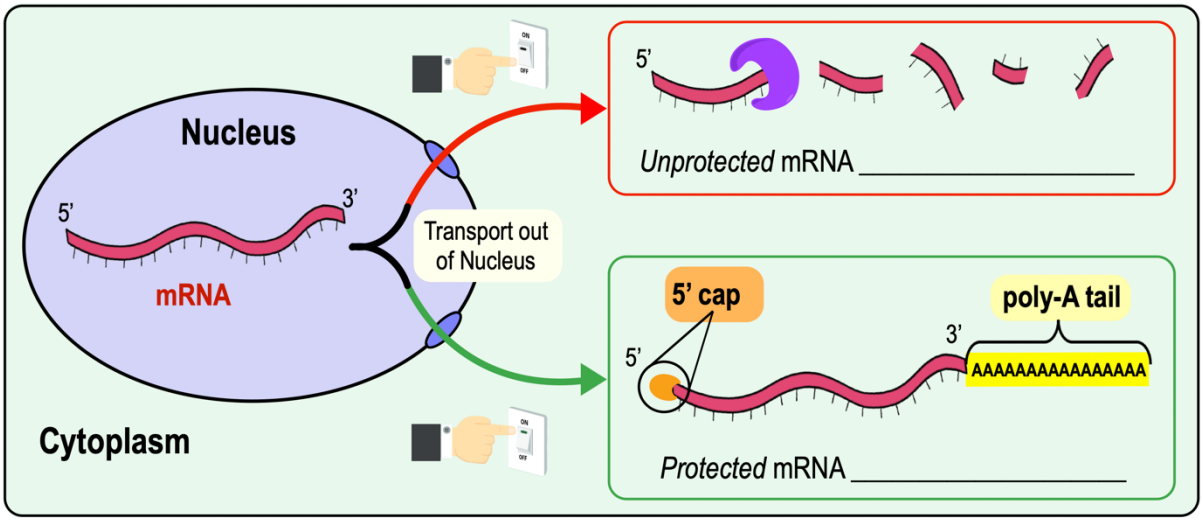
●mRNA transcripts must be transported to the _____ where they can be translated by ribosomes.

□ The cytoplasm has many RNA degrading enzymes destroy *foreign* viral RNA molecules.

●The ____' cap & poly-A _____ of mRNA molecules _____ the mRNA from degradation by enzymes.

EXAMPLE: mRNA is protected from degradation by cytoplasmic enzymes with a 5' cap and poly-A tail.





3) RNA Interference

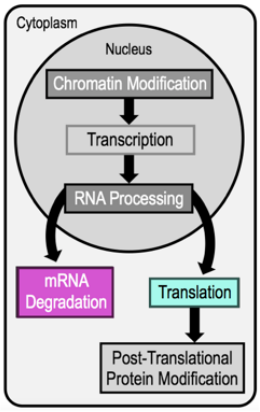
●**RNA** _____ **(RNA__):** process of small noncoding RNAs blocking translation of target mRNA molecules.

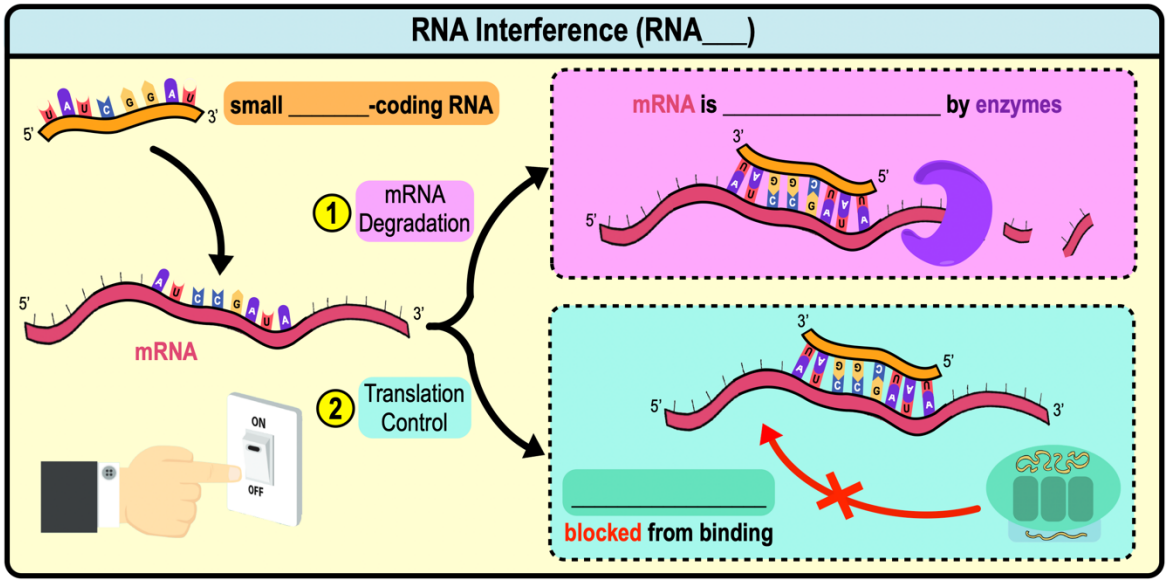
□ **Small noncoding RNA:** short strands of RNA that have a *complementary sequence* to their mRNA target.

●There are _____ possible scenarios that turn gene expression **OFF**:

1 mRNA is _____ OR 2 Ribosome is _____ from binding

EXAMPLE: RNA Interference can block ribosome binding or recruit cellular enzymes for mRNA degradation.





CONCEPT: EUKARYOTIC POST-TRANSCRIPTIONAL REGULATION

PRACTICE: Which of the following statements best describes the function of RNAi?

a) Small RNA molecules interfere with translation by targeting ribosomes for degradation.

b) Small DNA molecules interfere with mRNA molecules by blocking their ability to bind to a ribosome.

c) Small RNA molecules interfere with translation by targeting specific tRNA molecules

d) Small RNA molecules interfere with translation by blocking a target mRNA's ability to bind to a ribosome.

Types of Small Noncoding RNAs

●There are _____ classes of RNAs involved *in RNAi*:

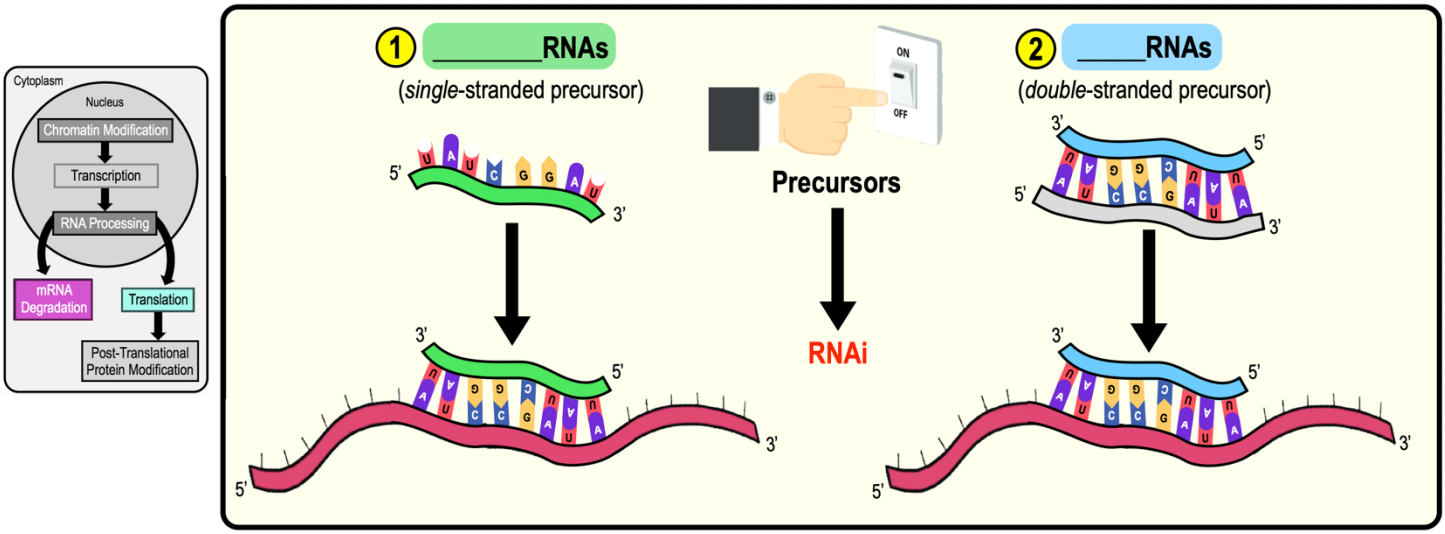
1 _____RNAs 2 small interfering RNAs (_____)

□ BOTH types bind to a target mRNA by complimentary base paring & turns _____ expression of that gene.

●The only difference between microRNAs & siRNAs is the structure of their precursor form:

□ *mircoRNAs* have a _____-stranded precursor & *siRNAs* have a _____-stranded precursor

EXAMPLE: RNA interference by two types of small noncoding RNAs (microRNAs & siRNAs).



PRACTICE: Which of the following best describes siRNA?

a) A short double-stranded RNA with one strand that can complimentarily bind to and inactivate an mRNA.

b) A single-stranded RNA with internal complementary base pairs that allow it to fold into a cloverleaf pattern.

c) A portion of rRNA which is a component of the large and small ribosomal subunits.

d) A molecule, known as Dicer, that can degrade or cut RNA sequences.