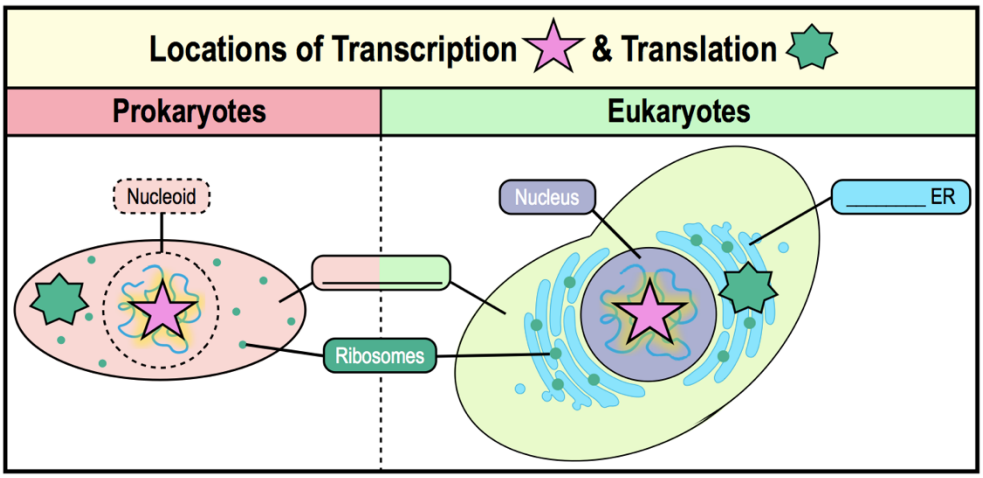
CONCEPT: PROKARYOTIC GENE EXPRESSION

Location of Transcription & Translation

●In *eukaryotes,* transcription occurs in the _____ & translation occurs in the rough ER.

●In *prokaryotes,* transcription & translation both occur in the cell _____.



PRACTICE: Which of the following statements is *true*?

a) In eukaryotes, transcription occurs in the nucleoid, while translation occurs in the rough ER.

b) In prokaryotes, transcription and translation both occur in the cytoplasm.

c) There is not difference between where transcription and translation occur in prokaryotes and eukaryotes.

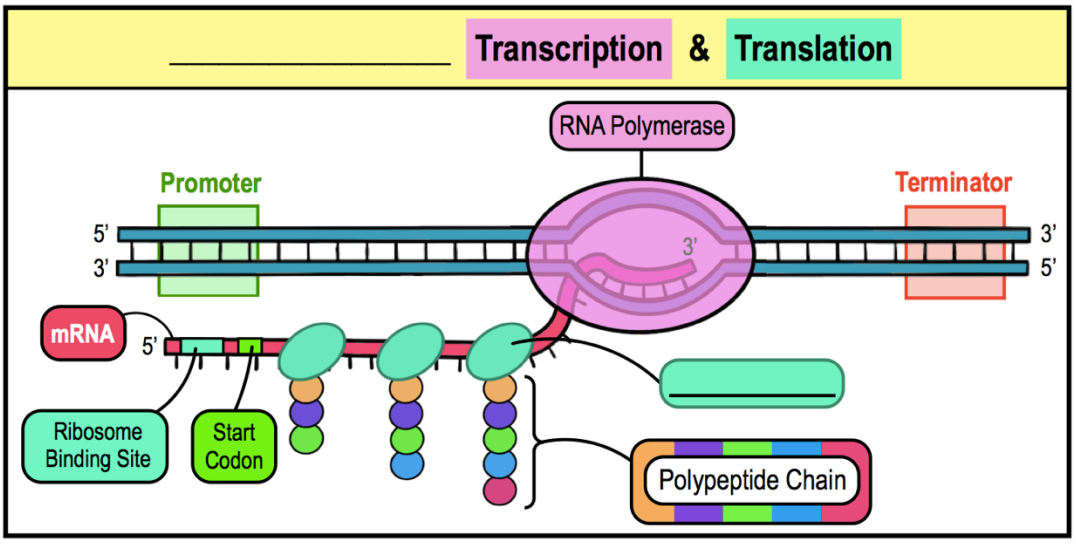
Simultaneous Transcription & Translation in Prokaryotes

●Unlike eukaryotes, *prokaryotic* gene expression can start translation of an mRNA _____ it is fully synthesized.

□ Free ribosomes in the _____ bind the mRNA and initiate translation while it is transcribed.

□ _____ ribosomes can translate the same mRNA making prokaryotic gene expression very efficient.

●This only occurs in prokaryotes (& not eukaryotes) because transcription & translation both take place in the *cytoplasm*.



CONCEPT: PROKARYOTIC GENE EXPRESSION

PRACTICE: In prokaryotes, as soon as RNA polymerase synthesizes the 5' end of mRNA, ribosomes come in and initiate translation before transcription is completed. This is called ____.

a) Simultaneous transcription & translation.
b) Post-transcription.
c) Co-transcription.
d) Coupled transcription and translation.
e) Co-translation.

Prokaryotic Sigma (σ) Factors

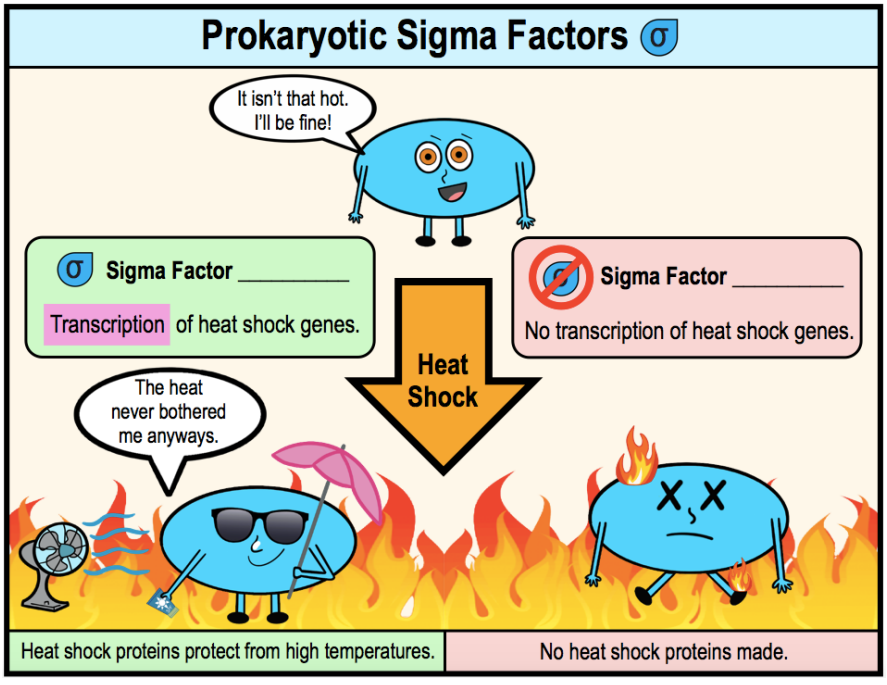
●*Recall:* Prokaryotic transcription initiation requires a _____ factor to bind the promoter sequence.

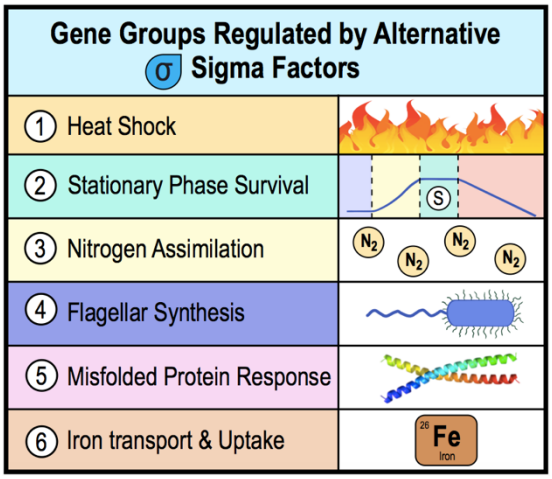
□ Cells have many different sigma factors that recognize _____ promotors.

□ *Standard* sigma factors are used for expressing genes during *routine* growth.

●_____ **sigma factors:** recognize *different* promotors & controls expression of *alternative gene groups.*

EXAMPLE: Alternative sigma factor controls the expression of a specific gene group during heat shock in bacterial cells.





PRACTICE: _____ allows RNA polymerase to recognize a specific promoter sequence of a gene.

a) Rho factor.
b) Omega factor.
c) Beta subunit of RNA polymerase.
d) Alpha subunit of RNA polymerase.
e) Sigma factor.

CONCEPT: PROKARYOTIC GENE EXPRESSION

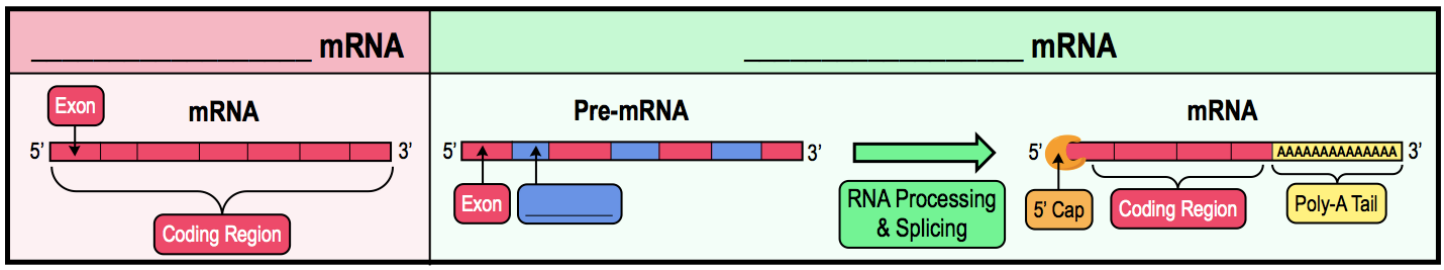
PRACTICE: During which stage of bacterial transcription are sigma (σ) factors involved?

a) Initiation. b) Elongation. c) Termination. d) Splicing.

Prokaryotic vs. Eukaryotic mRNA

●*Recall: Eukaryotic* mRNAs must be processed after transcription (like the *5' cap, poly-A tail,* & _____ *removal*).

□ Prokaryotic mRNAs do _____ have *introns* so they don't require processing after transcription.



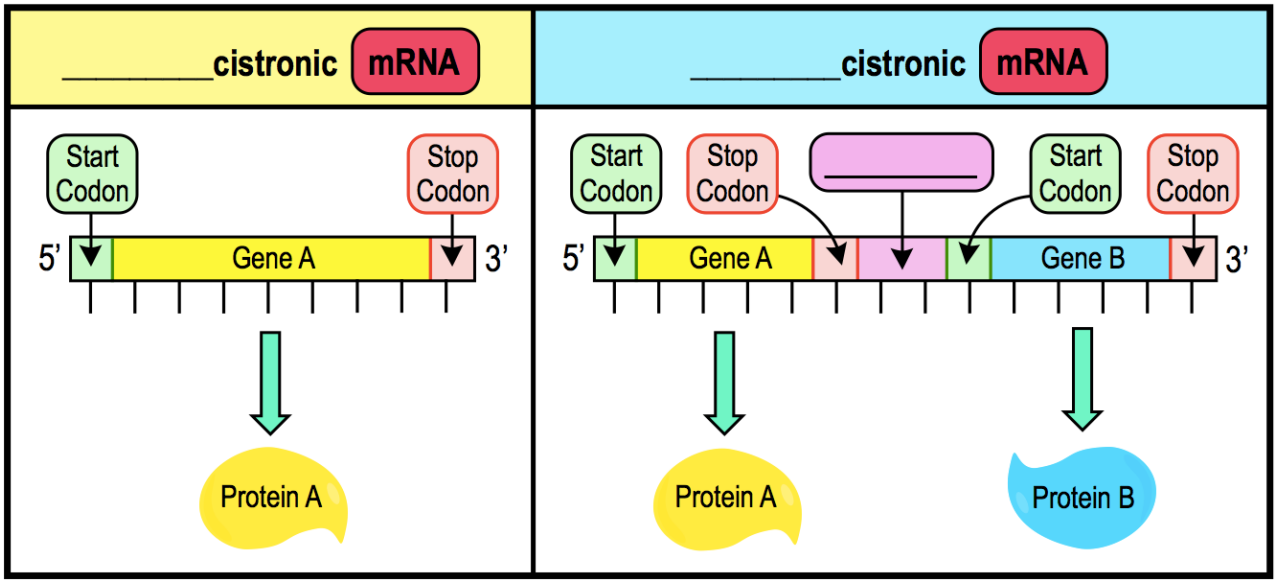
Monocistronic mRNA vs. Polycistronic mRNA

●*Eukaryotes* only make _____cistronic mRNA whereas *prokaryotes* make either mono- OR _____cistronic mRNA.

1) **Monocistronic:** mRNA carrying only _____ gene.

2) **Polycistronic:** mRNA carrying _____ genes.

□ Contain _____ (random non-coding sequences) between genes.



PRACTICE: "Cistron" is another word for "gene". Which of these answers are characteristics of polycistronic mRNA?

a) Only found in prokaryotes.

b) Single mRNA strand, carrying multiple genes.

c) Single mRNA strand can be translated into many proteins.

d) All of the above are characteristics of polycistronic mRNA.