



Gene Expression and Cell Specialization

IST-2.C.1

Promoters are DNA sequences upstream of the transcription start site where RNA polymerase and transcription factors bind to initiate transcription.

IST-2.C.2

Negative regulatory molecules inhibit gene expression by binding to DNA and blocking transcription.



Gene Expression and Cell Specialization

IST-2.D.1

Gene regulation results in differential gene expression and influences cell products and function.

IST-2.D.2

Certain small RNA molecules have roles in regulating gene expression.

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What is the function of the promoter?

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What is the function of the promoter?



Location for RNA polymerase to bind.



What is the function of RNA Polymerase?

- A. Synthesize RNA primer**
- B. Synthesize RNA transcript**
- C. Use RNA template to synthesize DNA**
- D. Use RNA template to synthesize protein**

**What is the function of
RNA Polymerase?**

**B. Synthesize RNA
transcript**



RNA polymerase is an enzyme that uses a DNA template to synthesize a RNA transcript. Recall enzymes tell you what they do, RNA Polymerase makes an RNA polymer.

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**How do transcription factors
affect transcription?**

How do transcription factors affect transcription?



They regulate transcription/gene expression. They can bind to enhance the binding of RNA polymerase.

I explain it like a baseball/softball glove. When you catch a ball, you would rather catch it in your glove with TWO hands instead of bare handling it. Why? It's more stable. The transcription factors create a "secure" fit for the RNA polymerase to get started



What are siRNA?

- A. Small interfering RNA**
- B. Short introns of RNA**
- C. Serine in RNA**

What are siRNA?

A. Small interfering RNA



siRNA are small interfering RNA. These are single stranded RNA that bind to mRNA to inhibit translation or degrade the mRNA.

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**Describe what is the function of
siRNA**

Describe what is the function of siRNA



Small interfering RNAs (siRNA)
> short segments of RNA (21-28 bases) bind to mRNA, create sections of double-stranded mRNA, "death" tag for mRNA (triggers degradation of mRNA)
> cause gene "silencing" by post-transcriptional control, turns off gene so no protein produced

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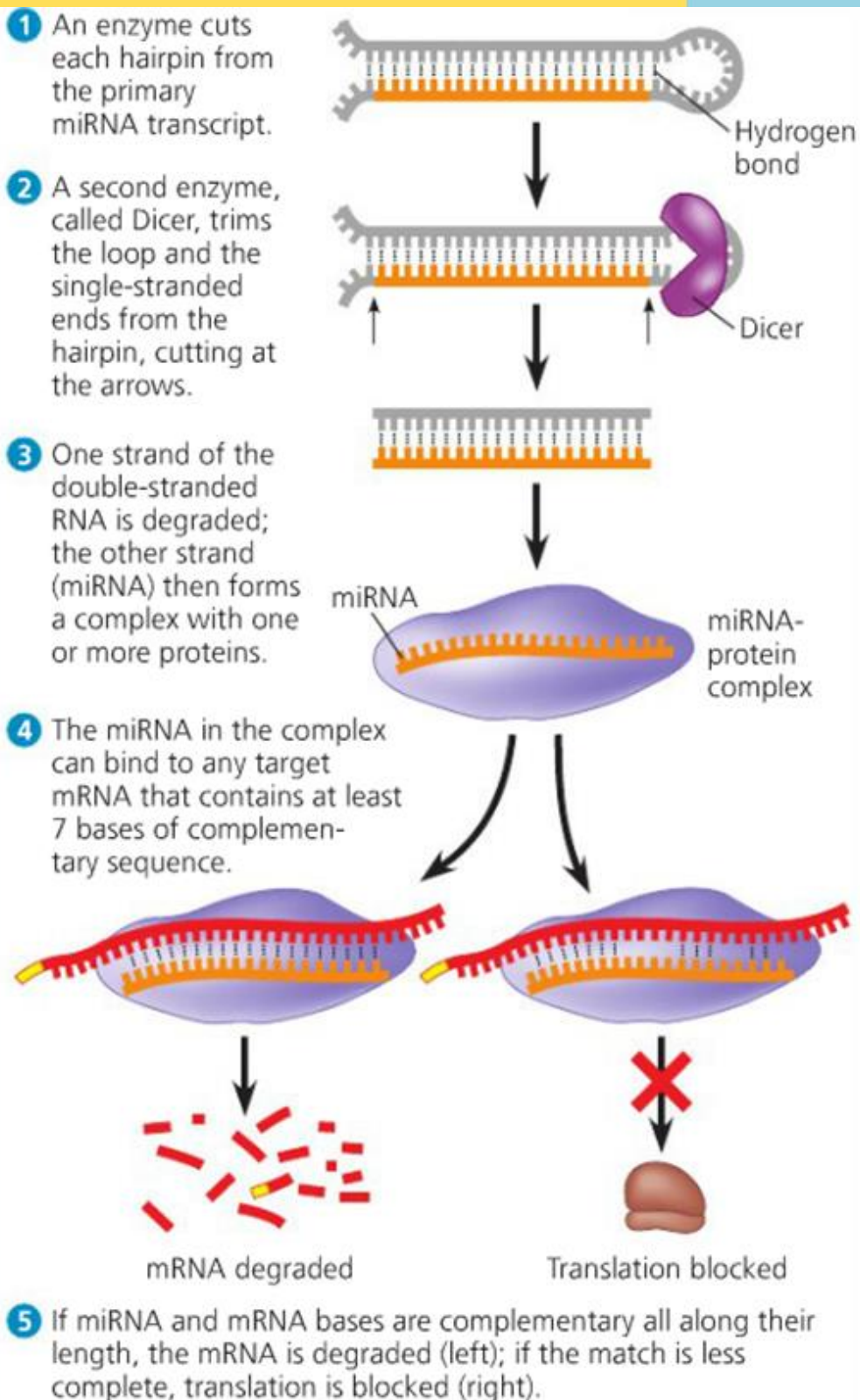
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**Describe the mechanism involved
with miRNA**



Describe the mechanism involved with miRNA





What is the function of the promoter?

- A. Activators bind to promote transcription**
- B. Motor proteins binds with actin for transcription**
- C. Repressors bind to initiate transcription**
- D. Site of RNA polymerase binding for transcription**

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What is the function of the promoter?

D. Site of RNA polymerase binding for transcription



The promoter is the region of DNA where the RNA polymerase binds to initiate transcription.

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What is the function of transcription factors?

What is the function of transcription factors?



Molecules bind to the enhancer region to promote transcription

The binding of transcription factors enhances the binding of RNA polymerase to promoter region to facilitate transcription

They are component of the initiation transcription complex



What is the function of RNA polymerase?

- A. Binds to DNA to synthesize an RNA primer**
- B. Binds to DNA to synthesize an RNA transcript**
- C. Binds to RNA to base pair with other RNA strand**
- D. Binds to RNA to seal phosphodiester linkages**

What is the function of RNA polymerase?

B. Binds to DNA to synthesize an RNA transcript



RNA polymerase is an enzyme that initiates transcription. The RNA polymerase binds to the DNA at the promoter. It uses the DNA as a template to synthesize a RNA transcript.

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What is differential gene expression?

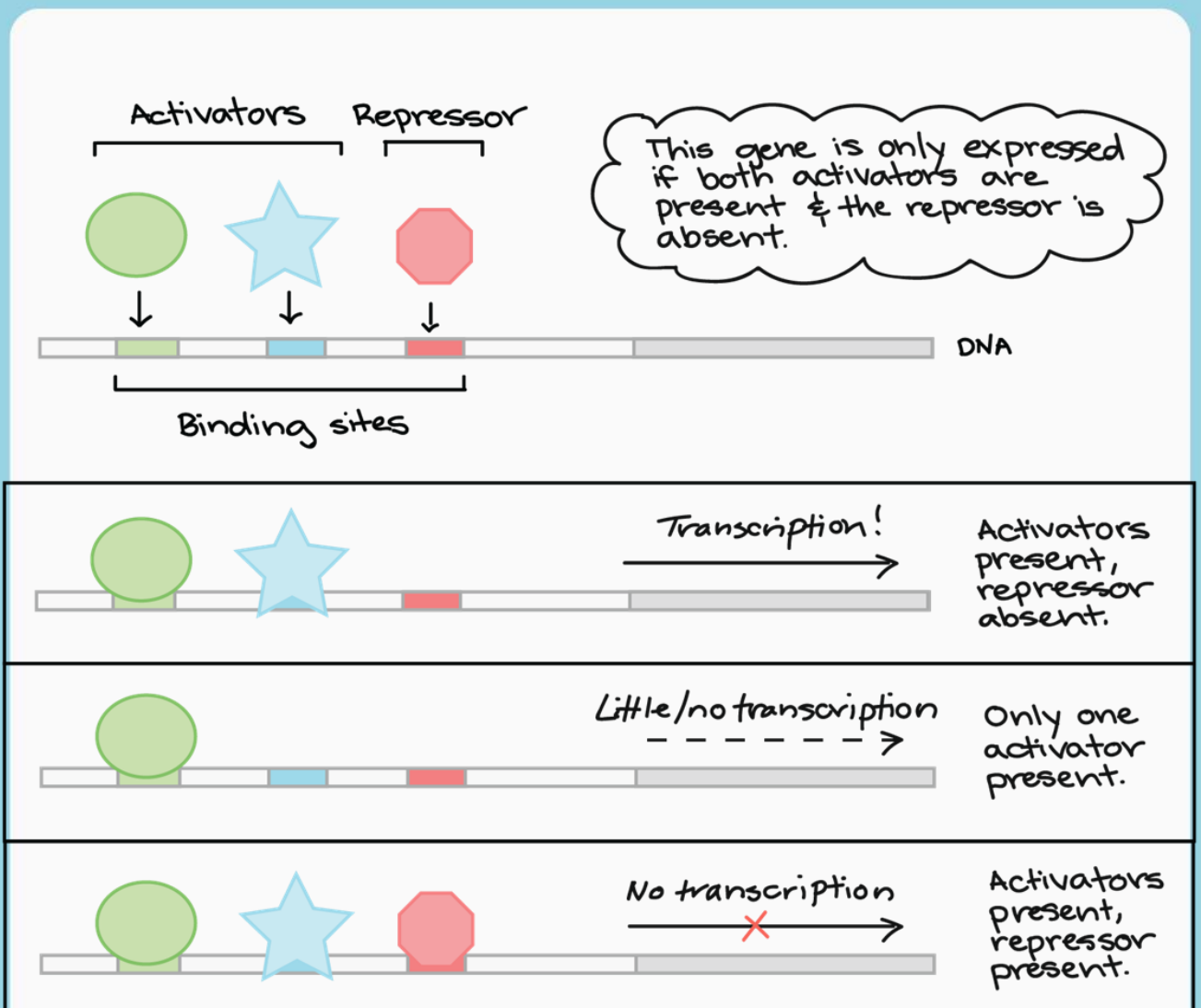
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What is differential gene expression?



Credit: Khan Academy

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What is the function of transcription factors?

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What is the function of transcription factors?



Different genes are expressed by different cells

So even though all of your cells have the same DNA, a liver cell has the components and functionality of a liver cell vs your lens (eye) cell has the components and functionality of a lens cell.



What is siRNA?

- A. Small RNA strand that binds to mRNA to inhibit translation**
- B. Small RNA strand that binds to DNA to inhibit transcription**
- C. Small RNA strand that removes introns from mRNA**
- D. Small RNA strand that removes exons from mRNA**

What is siRNA?

A. Small RNA strand that binds to mRNA to inhibit translation



siRNA is a small interfering RNA. This single stranded RNA will bind to mRNA to inhibit translation or degrade the mRNA.