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Activity 18.1 How is gene expression controlled in bacteria?

Fill in the chart to organize what we know about the *lac* and *trp* operons.

Operon:	<i>lac</i>		<i>trp</i>	
Is the metabolic pathway anabolic or catabolic?	<i>Catabolic</i> <i>Breaks down lactose</i>		<i>Anabolic</i> <i>Synthesizes tryptophan</i>	
What regulatory genes are associated with the operon, and what functions does each serve?	Genes:	Functions:	Genes:	Functions:
What structural genes are included in each operon, and what does each produce?	Genes:	Products:	Genes:	Products:
Is the operon inducible or repressible?				
Is the repressor protein produced in active or inactive form?				
The repressor protein becomes active when it interacts with:				

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Activity 18.2 Modeling the *lac* and *trp* Operon Systems: How can gene expression be controlled in prokaryotes?

Using the information in Activity 18.1 and in Chapter 18 of *Biology*, 7th edition, construct a model or diagram of the normal operation of both the *lac* and *trp* operon systems.

In your models or diagrams, be sure to include these considerations:

- regulatory and structural genes
- inducible versus repressible control
- anabolic versus catabolic enzyme activity
- negative versus positive controls

Use your model to answer the questions.

1. Under what circumstances would the *lac* operon be “on” versus “off”? The *trp* operon?

2. How are the *lac* and *trp* operons similar (in structure, function, or both)?

3. What are the key differences between the *lac* and *trp* operons?

4. What advantages are gained by having genes organized into operons?

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Activity 19.1 How is gene activity controlled in eukaryotes?

Human genes cannot all be active at the same time. If they were, all the cells in our bodies would look the same and have the same function(s). For specialization to occur, some genes or gene products must be active while others are turned off or inactive.

1. In eukaryotes, gene expression or gene product expression can be controlled at several different levels. Indicate what types of control might occur at each level of gene or gene product expression.

Level	Types of control
a. The gene or DNA itself	
b. The mRNA product of the gene	
c. The protein product of the mRNA	

2. Single-celled organisms like *Amoeba* and *Paramecia* often live in environments that change quickly. Which of the following types of control allow organisms like *Amoeba* to respond most quickly to frequent short-term environmental changes? Explain your reasoning.

- a. Control of mRNA transcription from DNA
- b. Control of enzyme concentration by controlling the rate of mRNA translation
- c. Control of the activity of existing enzymes
- d. Control of the amount of DNA present in the cell