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Before completing this extra credit assignment:

1. Carefully read the textbook pages 471-474
2. Review Table 16.2 and Figures 16.9, 10, 11
3. Complete Question #21 from the Homework section.
4. Describe the difference between a trans-acting factor and a cis-acting element in transcriptional regulation of gene expression. (3 points)
* **Trans- acting element- able to control the expression of genes on other DNA molecules, these must bind to the Cis-acting element for the gene to be expressed.**
* **Cis-acting element- able to control the expression of genes only on the same piece of DNA, tend to be near the structural parts of the gene that are required for expression.**
1. Describe a “partial diploid” and how this genetic structure can be used to determine if a regulator is a cis- or trans- acting factor. (3 points)
* **partial diploid is when a cell (autosomes) carries two copies for most but not all of the genes.**
* **Proteins can become dispersed around a cell and can influence with one of the copies of the trans-acting element.**
* **DNA binding sites can only regulate genes on the same copy of both genes rather than on different areas (known as cis-acting).**

1. Consider the partial diploid **C- E+ / C+ E-** where E is a structural gene (enzyme; E+ produces an active enzyme and E- produces an inactive protein) and C is a regulatory element (either a protein or DNA binding site; **C-** is an inactive regulator and **C+**  is an active regulator). (4 points)

Under what conditions of C will the active enzyme, E, be produced from the partial diploid? Assume that no other effector molecules are required to act as an inducer.

C’s mutation, C+ and C-(binds to C) is an active regulator so the regulatory molecule binds to the C and activates the expression of the E gene so C- the regulatory molecule does not bind, so bases downstream of the E gene cannot be transcribed. In the **C+ E-** the functional E gene is not present thus not accepting the synthesis or expression of the E gene.

**21**. Explain why mutations in the *lacI* gene are trans in their effects, but mutations in the *lacO* gene are cis in their effects.

The *lacI* gene encodes *lac* repressor protein, thus causing diffusion within the cell and has the ability to attach to any operator. This process can effect gene expression on same or different molecules of DNA. *lacO* gene encodes the operator and affects the binding of RNA polymerase to DNA and therefore affects the expression of genes only on the same molecule of DNA.