Name: _____ Period: _____

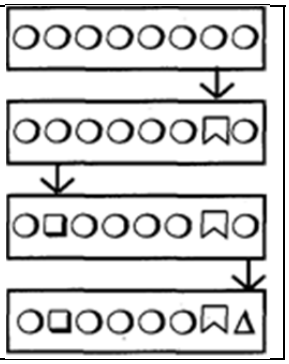
Selection pressures are those factors in the environment of a population that favor certain adaptations.

Selection pressures result in the survival of those members of the population that possess these adaptations and make survival less likely for those who do not have them. In this way, selection pressures contribute to evolutionary changes.

Of interest to microbiologists is a selection pressure that developed as a result of the long-term use of medication designed to kill bacteria that cause TB. When the drug isoniazid is used to kill TB bacteria, enzymes in a TB cell normally cause the isoniazid molecules to split; the split molecules are harmful to the membrane of the TB cell. Destroying the membrane kills the TB cell. In one mutation of the TB bacteria, however, this enzyme is deleted, which renders the isoniazid molecule harmless. Eventually, only molecules resistant to the drug survive and multiply, and a new strain of drug-resistant TB evolves.

1. If no TB cells in a population were treated with isoniazid, do you think there would be more or fewer TB cells that lack the enzyme? Explain.

A similar selection pressure occurs with drugs used to control the HIV virus that causes AIDS. The figure below shows how scientists hope to use a combination of three drugs, AZT, and pyridinone as a trio of selection pressures that will eventually lead to the evolution of a harmless form of HIV.

The original genetic structure of HIV looks like this.	
In response to AZT, the first drug, ddl genetic sequence changes. Even so, the virus remains viable and able to replicate.	
Resistance to a second drug, requires another mutation, but-still the virus is able to reproduce itself.	
The third drug, pyridinone, provokes a final mutation, which, with the previous changes, robs the virus of its ability to replicate.	

2. HIV-infected people often experience relief of symptoms for about two years after beginning to take AZT. Then the symptoms often return. Use what you know about selection pressures to explain this phenomenon.

3. Why do you think people taking AZT are sometimes switched to the drug when HIV symptoms return?

4. Those who first take AZT and then often develop a third mutation of the virus, resistant to both drugs. Scientists have learned, however, that when the genetic sequence of a virus mutates several times, the virus often loses its ability to replicate. Why might combining three drugs prove effective?