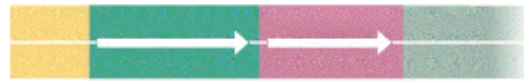
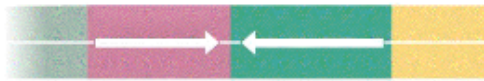


The suggested problems provide a variety of good problems to work to apply your knowledge to bacterial and phage genetics. Here are some extras for topics that did not have problems in the text.

The following two diagrams show DNA transposable elements that are not functional due to a deletion of DNA. Below each diagram indicate why they are not able to move.



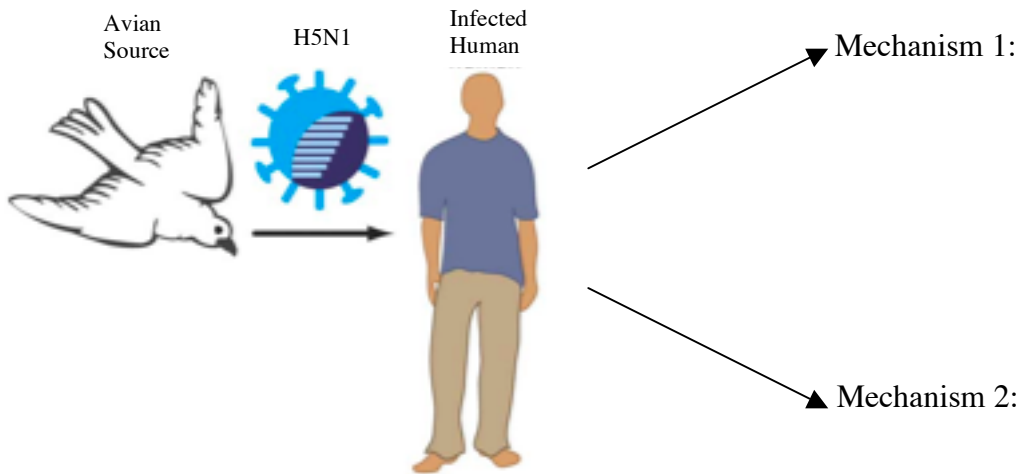
- a. In the space below, state whether the two elements pictured above would become mobile in the presence of an autonomous DNA transposable element? *Justify your answer.* (5 points)

2. The Hemagglutinin protein is essential for the avian influenza virus' ability to infect host cells. The protein has two regions that are important for either cell infection or the body's response to infection. In the space provided below, name these regions of the protein and **briefly** describe the role of each region in influenza virus infection.

1.

2.

3. A new avian virus, H5N1, has shown the ability to infect humans directly from bird hosts. The virus has yet to evolve the ability to efficiently transmit from human to human. The World Health Organization is currently monitoring the H5N1 virus for signs of the formation of a highly infective version of the virus. In class we have discussed two different genetic mechanisms by which the Avian Influenza A virus could evolve into a new pandemic strain. In the spaces provided name the two different genetic mechanisms. Then, beneath the diagram, *briefly* describe how **one** of the mechanisms could lead to an H5N1 virus that would be more easily transmittable. (10 points)



4. As we discussed in class, some physicians have advocated drug holidays as way of helping HIV patients cope with the increase in drug resistant viruses within their bodies. Under this plan, every so often the patient would stop taking drugs for a while. In the space below, describe how the virus population evolves in a patient's body in the presence of and then in the absence of a drug being used to treat the virus. Why does the drug holiday work? Make sure to include the idea of relative fitness in your answer. (15 points)

a. Viral evolution in the presence of the drug:

b. Viral evolution in the absence of the drug: