

Read each question carefully and ask if a question seems unclear. If possible, answer each question in the space provided, but you may continue on the back. If you use a drawing as part of your answer, be sure to also include a written explanation. The questions have specific answers, although for some, more than one answer is possible. To receive full credit you must clearly and fully answer the question being asked. If you add incorrect extraneous information, points will be deducted. The points for each question are noted in parentheses totaling 60 points. Exams in non-permanent ink will **not** be eligible for a regrade.

1. Would poor proofreading by DNA polymerase or poor mismatch repair be a more serious problem? Why? (8 pts)

Mismatch repair. It happens after proofreading and is the last chance to fix mutations.

2. After an infection, a few B-cells have shorter telomeres while the rest of the B-cells' telomeres have not changed in length. Why? (8 pts)

Only a very few B-cells recognize a pathogen. The few activated B-cells will divide, shortening their telomeres.

3. What are **two** reasons that people infected with HIV have an increased risk of getting cancer? (6 pts)

HIV enters the lysogenic cycle integrating its DNA into the host cell's DNA potentially causing mutations in genes regulating the cell cycle. HIV kills helper T-cells that are necessary to activate killer T-cells that kill cells with mutations; this reduced T-cell activity increases the risk of cancer.

4. Malibu needs a kidney transplant. After the transplant she will need to take drugs that suppress her immune system. She will get the flu vaccine several weeks before the kidney transplant. After the transplant, will she have gained **any** protection against the flu from the vaccine given before the transplant? Why or why not? (8 pts)

Yes, memory B-cells last for years, so since the vaccine was given before the immune system suppression, Malibu produced anti-flu memory B-cells which will help protect her from the flu.

5. June smokes, and is planning on getting pregnant. She stops smoking, but is using a nicotine patch. Has she reduced the probability of her child being obese as an adult? Why or why not? (8 pts)

Not by much. Nicotine suppresses appetite and constricts blood flow leading to the adaptation to thriftiness response. Nicotine can also directly affect the fetuses brain development. The only reduced risk is from no longer exposing the fetus to CO.

6. George has problems with swelling (fluid buildup) in his feet, and neither walking nor massage helps reduce the swelling. Why? Where is the problem, and what is the problem? (8 pts)

The one way valves in his veins/lymph vessels are not closing correctly. Even when squeezed, the blood/lymph fluid is not flowing toward the heart.

7. If someone had a small intestine with smooth walls, what problem would they have? (8 pts)

They would have poor absorption of nutrients. The undulated small intestine wall increases surface area allowing more absorption to occur.

8. Based on these graphs, does smelling food reduce the lifespan of flies on a normal diet? Why or why not? (The lines with circles, labeled "odorant", represent flies that, in addition to eating food, were allowed to smell food.) (6 pts)

No. Without calorie restriction the flies already live a normal lifespan. Smelling the additional food will not stress them or cause a shorter lifespan.