

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 a person starting life with extremely long telomeres be more likely to live a longer than average life? Why or why not? (10 pts)

No, the long telomeres mean that cells with many mutations will not die/stop dividing. So this person is more likely than average to get cancer.

2. While our immune system does help protect against cancer, a vaccine cannot directly protect against cancer cells? Why? (The HPV vaccine protects against HPV, not against the actual cancer cells.)
(10 pts)

Memory B-cells, produced by a vaccine, only protect against foreign material. Cancer cells are your own cells dividing out of control. You need T-cells to get rid of cancer/pre-cancer cells.

3. Under stressful environments, some bacteria have less reliable DNA replication, and therefore create more replication errors. This causes more mutations, and may lead to the death of some of the bacteria. Why would this increase in mutations help the bacterial species to survive an environmental stress? (10 pts)

More genetic diversity, caused by mutations, mean a greater possibility that some of the bacteria have traits that can allow them to reproduce even in the stressful conditions.

4. Can a virus infect the exterior surface of your skin? Why or why not? (10 pts)

Not unless the skin is broken. The outside of your skin is dead cells, and viruses need live cells to infect and replicate.

5. Could plants suffer from something similar to an auto-immune disease? Why or why not? (10 pts)

Yes. If the hypersensitive response kills cells not near the site of an infection.

6. In class we looked at how an energy source must be judged from the net energy produced. When plants **use** sugar as biological energy in their roots, the net energy is less than when leaves **use** sugar as biological energy. Why? (10 pts)

Plants use energy to transport sugars from the leaves to the roots. So this energy used in transport must be subtracted from the net energy of a sugar molecule in the root.