

Read each question carefully!

Assume anything stated in the question is true. If your answer to a question involves contradicting something stated in that question or its background information...it isn't the right answer.

Also, **ask me questions!** If something is unclear or confusing, and you ask me about it, I may be able to clarify it. The worst I can do is say, "sorry, I can't answer that question", but most of the time I can give you some sort of clarity. Always worth trying!

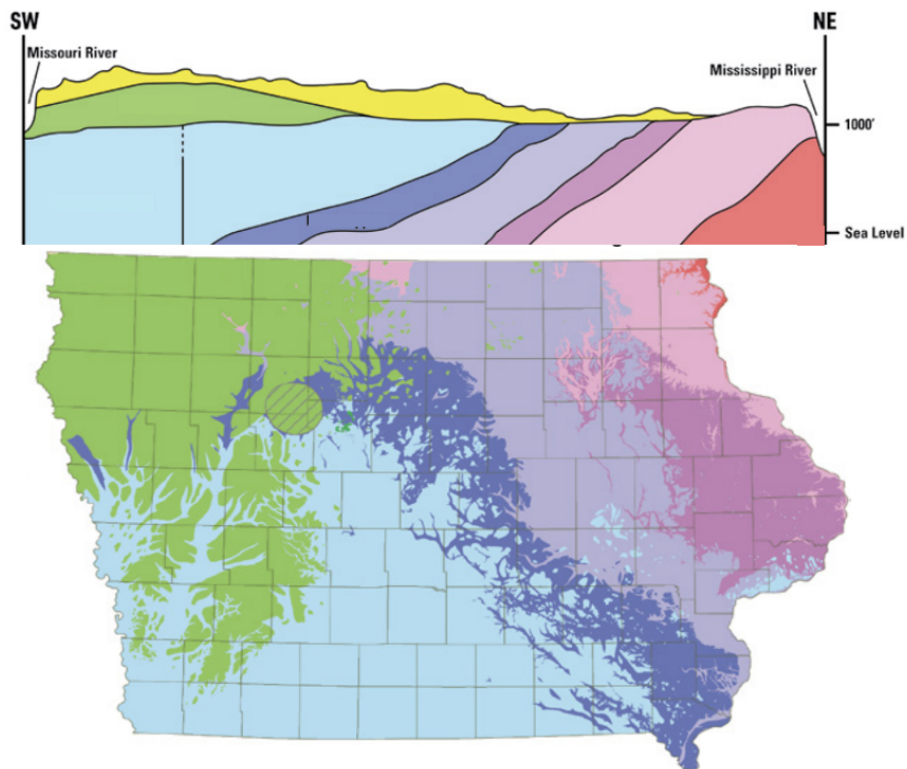
1. If I tell you that a specific creature is a salamander, what does it mean to say it *is* a salamander?

2. In a population of shore crabs, some individuals forage during the day, while others forage at night. Both behaviors are common. Observing them for a summer, you see that daytime foragers are more frequently preyed upon by birds, while night-time foragers are rarely attacked. In the next generation, the proportion of nighttime foragers is higher than it was initially.

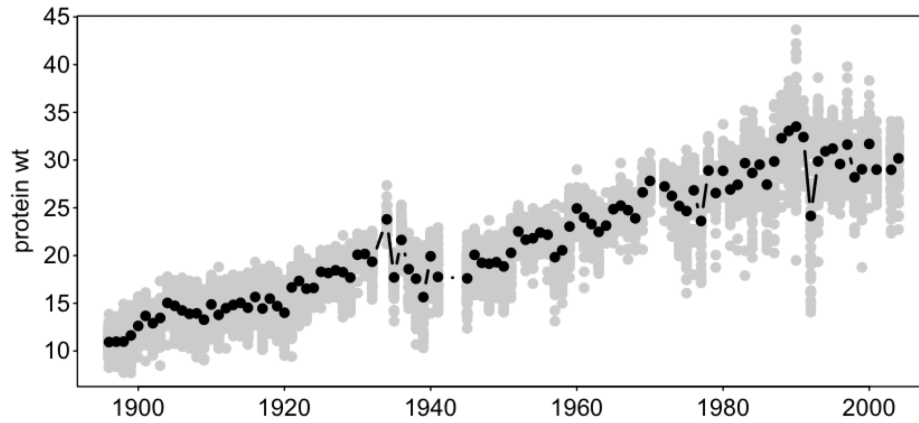
Based on the above scenario: (a) which (if any) necessary conditions for evolution by selection are clearly present & (b) which (if any) necessary conditions for evolution by selection are not clearly present

a)

b)



3. Above is a cross-section through Iowa showing the rock layers, and a geological map of which rocks are present at the surface of Iowa. Please indicate with a dark point a place on the *map* where the oldest rocks may be found.



4. In 1896, in Illinois, a long term experiment began. Researchers took a stock of corn and at harvest time, examined it & only used the kernels with the highest protein as seed for the next year's batch. They have repeated this process every year since 1896 with their criteria for only planting the highest-protein corn having stayed perfectly consistent.

Above are data showing the protein weight of sampled kernels (gray) with the year's average protein weight across all kernels (black) for the corn from this field.

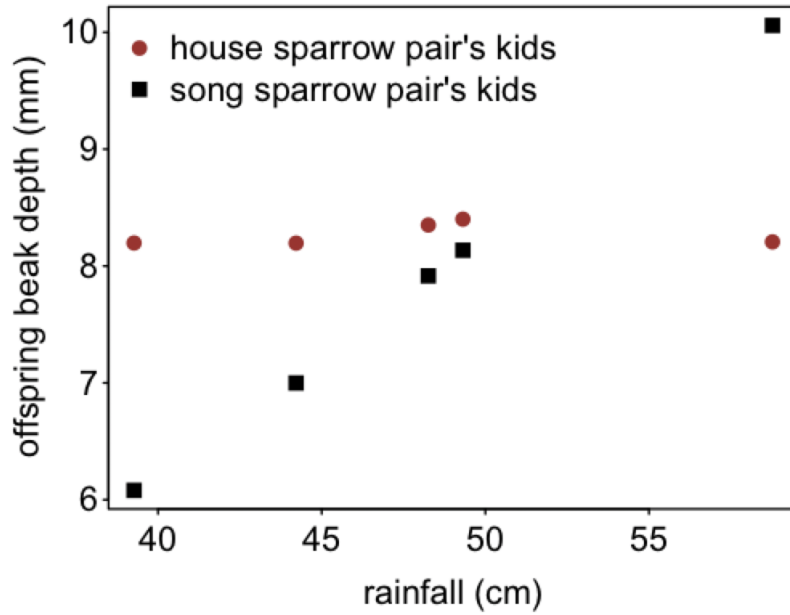
(a) Based on the method, has the corn been under selection the whole time? (b) Based on the data from 1896 to 1980, was the corn *evolving* by selection? (c) Based on the data from ≈ 1990 to now is the corn **still** evolving by selection? (d) Provide a rationale for your answer in c consistent with a.

a)

b)

c)

d)



5. An ornithologist has two bird nests on their window. A pair of house sparrows use one nest, while a pair of song sparrows use the other nest. The same birds come back year after year for five years. Each time, the ornithologist checks genetically to make sure that they are the same parents and that all of the baby birds belong to them. Each year, the ornithologist also measures the beaks of the baby birds right before they fledge. After five years, the ornithologist plots the data against each year's rainfall in the graph above.

- (a) Which kind of sparrow (house or song) seems most appropriate for an evolutionary study?
 (b) Why?

a)

b)

6. Your coolest friend asks you one day, “Say, about 400 million years ago there were zero species alive with webbed feet, and zero species alive with true hair. Nowadays there are about 8,000 species with true hair, ranging from kangaroos to zebras to humans to mice! There are also about 8,000 species alive with webbed feet, ranging from ducks to turtles to frogs to beavers! Evolutionarily, what do you think the biggest difference between the rise of these two traits is?”

How do you answer?

Extra Credit

What extremely exciting biological concept came from a Frenchman named Cuvier and was doubted by U.S. President Thomas Jefferson?

Please correctly spell the genus name of the “fishapod” Neil Shubin described from Alaska