1 - Selection and Speciation

1. Body size and number of Individuals
2. Directional, Disruptive, and Stabilizing
3. This could be due to random mutation, or having multiple selective environments across the population
4. 4
    I. They are on average heavier
    II. The heavier ones, since they are being selected for
    III. Perhaps the heavier ones have more muscle mass, allowing them to run faster and evade predators or aid in predation
5. 5
    I. The new population will be larger or smaller than the old average, but not the old average
    II. Either heavier ones or lighter ones, but not average ones
    III. Heavier ones could have more muscle mass and aid in running away or chasing prey, while lighter ones may be smaller and harder to spot, providing more camo and surprise over prey
6. 6
    I. The new population is closer to the average, meaning the spread of the weight is less
    II. Those of average weight
    III. This could be because heavier ones would be easier to spot and predate upon, and too small would not have muscle mass and cannot evade predators
7. 7
    I. Directional selection means that over time and generations, a particular phenotypic trait - more or less than the current average of that trait - of the population will be selected for as they are more well fit for the environment they fit in.
    II. Disruptive selection means that over time and generations, a particular phenotypic trait of the population will be selected against as they are unfit for the environment they fit in, so phenotypes displaying either more or less of that trait would be selected for instead.
    III. Directional selection means that over time and generations, the current average phenotypic trait of the population will be selected for as they are more well fit for the environment they fit in.
8. 8
    I. Directional, it will select for larger beaks
    II. Stabilizing, as both large and small are unfavorable, so the average will thrive
    III. Disruptive, as there is no "best" for the average, but benefits for those on the outskirts of the trait
    IV. Directional, as larger salmons are more likely to be predated upon, so only the smaller ones reproduce
9. AB, CD, EF
10. AB
11. Unable to produce fertile offspring
12. No, all mules are unable to reproduce so their parents - the horse and donkey - are not of the same species
13. No, as they are highly unlikely to mate at all so would likely undergo divergent speciation and at some point be unable to produce fertile offspring
14. Possibly, if a particular population of a species is being direction-ally selected upon, then those of that species in a different population would be diverging from this population. Over time, they could diverge far enough that they would no longer be able to mate with each other anymore due to custom, environment, or infertility

15. Yes, it would split the population into two groups, those above average and those below. These two populations may be selecting for separate things and may be unlikely to mate. For example, if some of them are selected for colder temperatures, and the other for hotter temperatures, they would likely migrate away, undergo more selective pressures, diverge, and likely never mate or produce fertile offspring due to environmental factors
16. No, because all it does is make the most common traits even more common, which would not change anything about the population in comparison to other populations
17. Table 1

	1st Generation	2nd Generation	3rd Generation	4th Generation
Light	4	2	1	0
Medium	4	5	5	6
Dark	4	5	6	6

18. They are all of equal frequency
19. This is considered a bottleneck situation, as it is a small population and by chance the phenotypic ratios were changed by random chance (the death of two of the same phenotype) This means that the phenotypic frequency of the light phenotype will be lower for coming generations, and will be even more susceptible for random change in future generations
20. Since there is significantly less light phenotype in this population due to small population size, that phenotype will become less likely to be passed on to the next generation. And in such a small population it is not uncommon that it will be completely lost from the population by random events.
21. No, you can only inherit phenotypes that are already present within the population. It has a low chance of reappearing through random mutation if being selected for by the environment.
22. No, in a larger population, losing two individuals of a particular allele would be easily stabilized over time, as the impact on a larger population is minuscule.