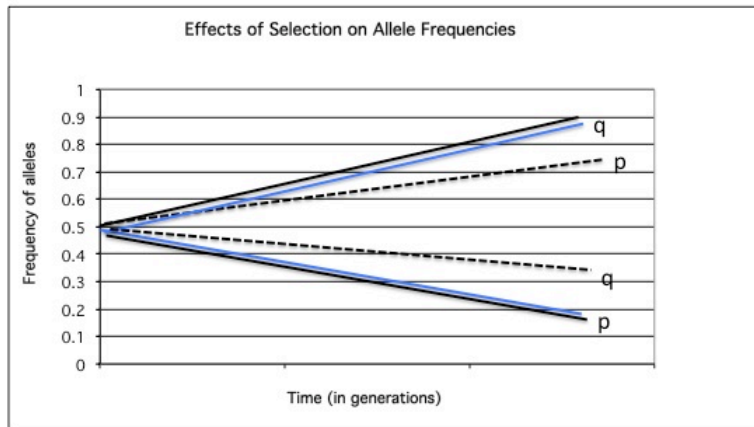


**YOU MUST TURN IN THIS SECTION BEFORE LEAVING THE EXAM!
(26 pts possible, plus 5 pts possible bonus).**

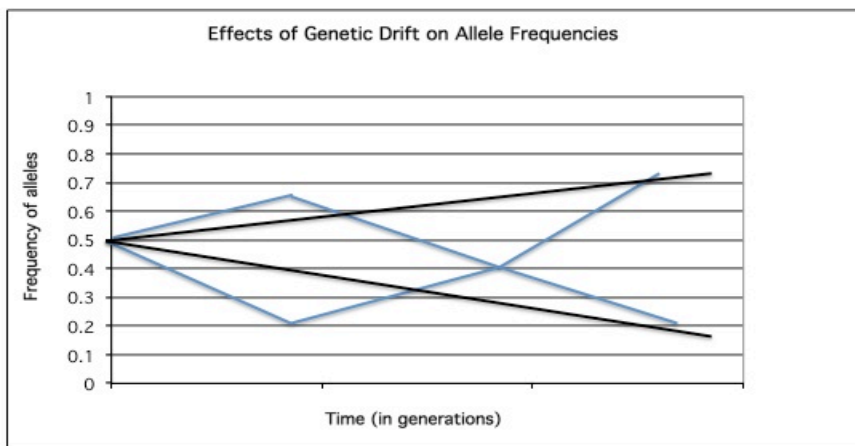
- On the graph below draw the predicted changes in allele frequencies in face of steady selective pressure against the dominant phenotype for two “runs” of the selection. Label the lines representing the dominant and recessive alleles. (3pts)



Bonus: Draw the lines (dotted) showing how you would predict the allele frequencies would change if there was selection on the recessive phenotype. Hint: not just the reverse. (2pts)

Bonus: Selection on the recessive allele would not result in as fast of a change in the allele frequencies (slower for the allele that is selected against to die out from the population) due to the fact that heterozygous, which carry a recessive allele would still be selective for, maintaining some recessive alleles in the population.

- On the graph below draw the predicted changes in allele frequencies in face genetic drift in a small population for two “runs” of the drift. Label the lines representing the dominant and recessive alleles. (3pts)



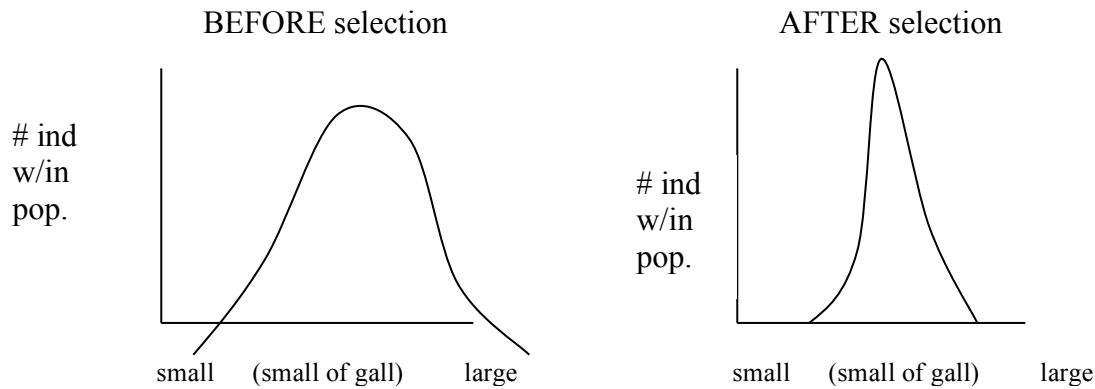
The specific lines on the graph is not what is critical. The two corresponding lines for p & q need to add to 1.0. But with Genetic Drift you would predict that the results would vary from one ‘run’ of the simulations relative to another since it is random events driving drift.

3. Gallflies produce a nutritious gall in which their larvae develop. The size of the gall the flies produce is variable and is an inherited trait. Downy Woodpeckers preferentially eat the large size galls and parasitic wasps will preferentially infest the small size galls.

The selective pressure exerted by the woodpeckers and wasps is a form of type of selection (disruptive, stabilizing or directional)? (2pts)

Stabilizing selection

DRAW the change in the distribution from prior to any selection on the flies (gall size) to after the selective pressure described above – you need to show me both the distribution BEFORE the selection and after the selective pressures (two graphs). (2pts)



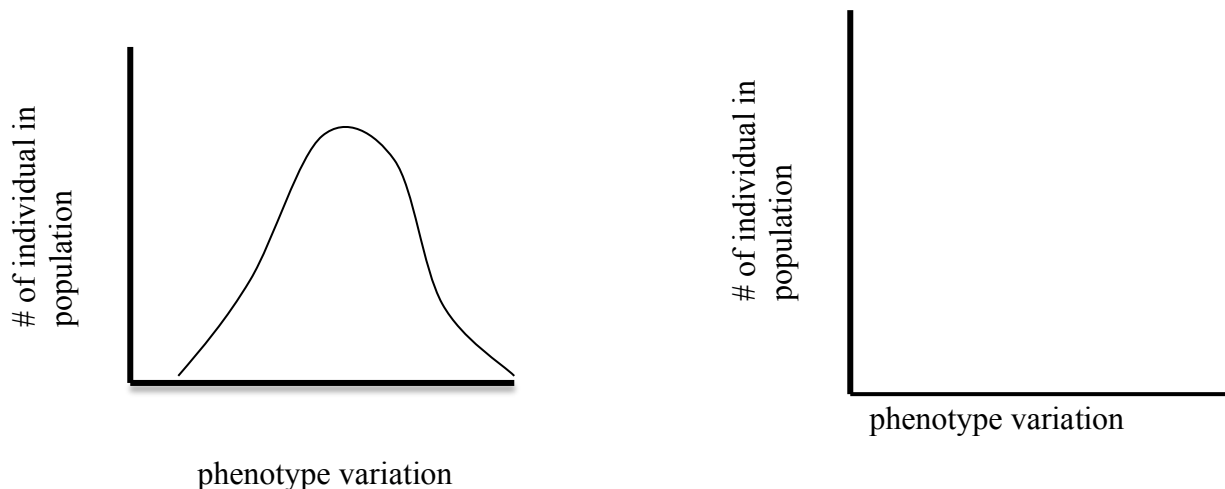
Note: that since we are discussing the change in the distribution of the galls (selection on the gall size), the x-axis should be the size of the gall and the y-axis should be the # of individuals with that trait within the population. The selective pressure changes the distribution, so you should see selection AGAINST the extremes and the distribution should be TIGHTER.

4. Choose one of the other patterns of selection (that you did NOT depict above in #1) and show it in the two graphs below. (3pts)

What type of selection are you showing: **DISRUPTIVE SELECTION**

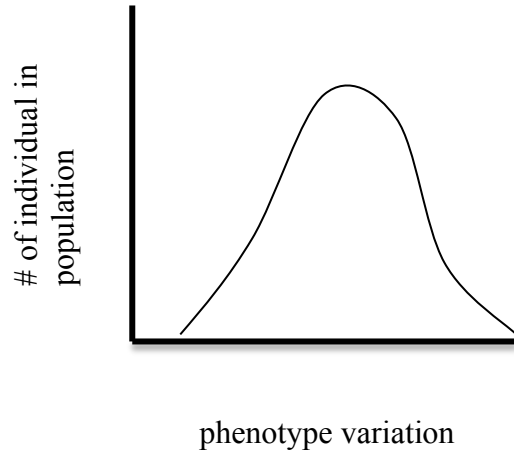
BEFORE selection

AFTER selection

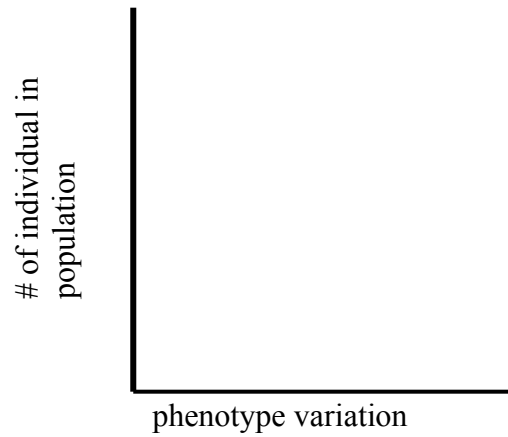


OR: What type of selection are you showing: **Directional Selection**

BEFORE selection



AFTER selection

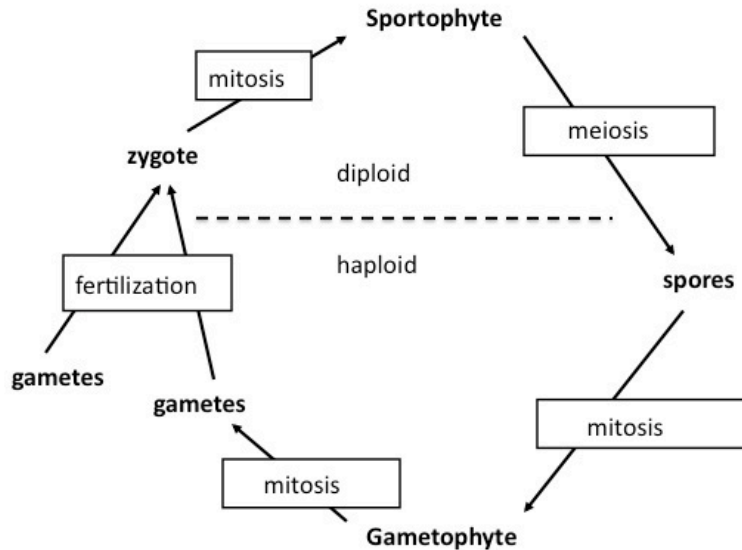


5. In your own words explain the phrase, "survival of the fittest," as it is meant in evolutionary terms. (2pts)

Survival of the fittest is referring to the fact that individuals with the best adaptations, most suited for their particular environment, will be the ones that survive, reproduce and pass their genes down to the next generation (perpetuating those traits / adaptations across generations).

"Fittest" is defined as those individuals in the population who produce the most offspring.

6. Complete the diagram of the plant's alternation of generations below. In the squares you need to indicate the process by which the structures are produced (meiosis, mitosis or fertilization). Keep in mind that a process may be used more than once! In addition, you need to indicate whether the top half of the diagram (above the dotted line) is haploid or diploid, and whether the bottom half of the diagram is haploid or diploid. (3.5pts)



7. Match the following animal with the appropriate structures. (3.5pts)

A. echinoderms (star fish)
 D. sponges
 G. Annelids (leeches)

B. arthropods (insects)
 E. mollusks (clams)

C. Cnidarians (jellyfish)
 F. flatworms

- __C__ gastrovascular cavity, extracellular digestion, radial symmetry, stationary or free-floating
 __A__ radial symmetry as an adult (bilateral larvae), endoskeleton, true tissues, deuterostome
 __D__ multicellular, no true tissues, no symmetry, intracellular digestion
 __B__ multicellular, exoskeleton made of chitin, specialized segments, extensive cephalization
 __G__ segmentation, body cavity, hydrostatic skeleton, bilateral, no exoskeleton
 __E__ multicellular, bilateral symmetry, body cavity, complete gut, no segmentation
 __F__ no body cavity, bilateral symmetry, no segmentation

8. Match the following animal with the appropriate structures. (3pts)

A. bony fishes (perch)
D. mammals

B. reptiles
E. birds

C. amphibians
F. cartilaginous fishes (sharks)

 E endotherms, hollow but reinforced bones, keel-like breasted bone, amniotic eggs

 C tetrapod, metamorphosis, eggs lack shells, dependent on water for reproduction

 A operculum, swim bladders, reinforces calcium skeleton

 F jaws, paired fins, flexible skeleton of cartilage, gills

 B amniotic egg, ectotherm, waterproof skin

 D hair, differentiated teeth, endothermic, amniotes

9. Why are frogs still tied to water? (1pt)

Frogs need water for reproduction. They lay their eggs in water. The eggs would dry out if laid on land. Frogs also breathe through their moist skin. The skin needs to be moist for gas exchange to take place.

BONUS: What adaptation(s) must toads have evolved that allow them to be in drier habitats than frogs? Explain your reasoning; keeping in mind toads are still tied to water for the same reason you should have given above. THINK about the characteristics of amphibians as a group and what must have been modified. (3pts)

Toads are still tied to water in order to reproduce, since like frogs they lay their eggs in the water. However, since they spend more time in terrestrial habitats away from water than cutaneous breathing (though the skin) is not viable. As a result, the lungs of toads are well developed and they breath entirely through their lungs, instead of combining it with cutaneous breathing as frogs do.