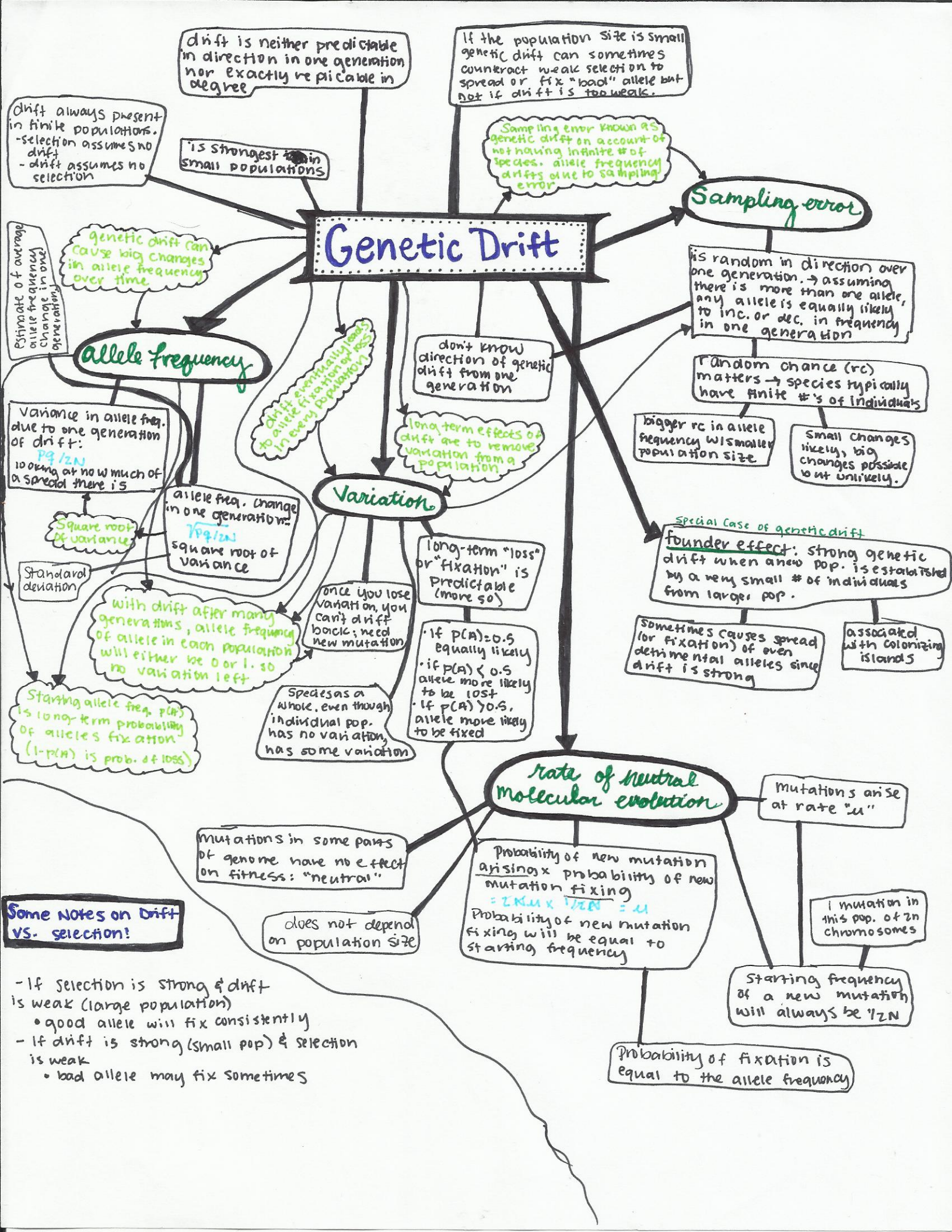
Genetic Drift
drift is neither predictable in direction in one generation nor exactly replicable in degree
If the population size is small genetic drift can sometimes counteract weak selection to spread or fix "bad" allele but not if drift is too weak.
drift always present in finite populations.
- selection assumes no drift
- drift assumes no selection
is strongest in small populations
Sampling error known as genetic drift on account of not having infinite # of species. allele frequency drifts due to sampling error
Sampling error
is random in direction over one generation. → assuming there is more than one allele, any allele is equally likely to inc. or dec. in frequency in one generation
random chance (rc) matters → species typically have finite #'s of individuals
bigger rc in allele frequency w/ smaller population size
small changes likely, big changes possible but unlikely.
genetic drift can cause big changes in allele frequency over time
Estimate of average allele frequency change in one generation
allele frequency
Variance in allele freq. due to one generation of drift: pq/2N
looking at how much of a spread there is
Square root of variance
Standard deviation
allele freq. change in one generation: √pq/2N
square root of variance
drift eventually leads to allele fixation or loss in every population
don't know direction of genetic drift from one generation
long term effects of drift are to remove variation from a population
Variation
with drift after many generations, allele frequency of allele in each population will either be 0 or 1. so no variation left
once you lose variation, you can't drift back; need new mutation
Species as a whole, even though individual pop. has no variation, has some variation
long-term "loss" or "fixation" is predictable (more so)
• if p(A)=0.5 equally likely
• if p(A) < 0.5 allele more likely to be lost
• if p(A) > 0.5, allele more likely to be fixed
Starting allele freq. p(A) is long-term probability of alleles fixation (1-p(A)) is prob. of loss)
Special case of genetic drift
founder effect: strong genetic drift when a new pop. is established by a very small # of individuals from larger pop.
sometimes causes spread (or fixation) of even detrimental alleles since drift is strong
associated with colonizing islands
rate of neutral molecular evolution
mutations arise at rate "u"
mutations in some parts of genome have no effect on fitness: "neutral"
does not depend on population size
Probability of new mutation arising x probability of new mutation fixing
= 2Nu x 1/2N = u
Probability of new mutation fixing will be equal to starting frequency
1 mutation in this pop. of 2n chromosomes
Starting frequency of a new mutation will always be 1/2N
Probability of fixation is equal to the allele frequency
Some Notes on Drift vs. selection!
- If selection is strong & drift is weak (large population)
• good allele will fix consistently
- If drift is strong (small pop) & selection is weak
• bad allele may fix sometimes