TOPIC: HARDY-WEINBERG EQUILIBRIUM

1. The table below shows the genotypic frequencies of *A/A*, *A/a* and *a/a* individuals in three human populations. "*A*" and "*a*" are two alleles of a gene coding for a protein involved in brain development (specifically, the trigeminal nerve).
People who are heterozygous or homozygous *A/A* have one or more symptoms related to ACHOO syndrome, a very common condition whereby a person has the urge to sneeze upon sudden exposure to bright light (you may have ACHOO too!).

Population #	Frequency of A/A	Frequency of A/a	Frequency of a/a
1	0.33	0.34	0.33
2	1.00	0.00	0.00
3	0.04	0.32	0.64

    a) For each of the populations below, calculate the frequency of allele "*A*" and allele "*a*".

    b) Determine which of the populations is/are in Hardy-Weinberg equilibrium, showing all your calculations.

c) A dictatorial government with a constantly sneezing leader takes power in the country where Population 1 lives. Under the new regime, people who do not have ACHOO syndrome (that is, the *a/a* individuals) are considered non-human and are deported to an isolated tropical island, and no *a/a* individuals are allowed into the country.

   i) What will be the allele and genotypic frequencies in the remaining (non-deported) population?

   ii) Will this population be in Hardy-Weinberg equilibrium?
   Show all your logic.

d) After the departure of the *a/a* individuals, the remaining members of Population 1 are very concerned about potentially having *a/a* children. If they mate randomly with respect to *A/A* vs. *A/a* genotype, what proportion of the next generation will be homozygous recessive?

e) Will the strategy of the dictatorial government eventually be able to ensure the loss of the *a* allele (and fixation of the *A* allele) in Population 1?
   Explain and defend your answer in light of the mechanisms of evolution.

   (If you are interested in ACHOO, check
   http://www.omim.org/entry/100820?search=ACHOO&highlight=achoo)