Notes

AP BIOLOGY
EVOLUTION
ACTIVITY #2

NAME_____

DATE_____HOUR_____

HARDY-WEINBERG THEOREM

POPULATION

Localized group of individuals belonging to same species
Species = group of populations whose individual have potential to interbreed

GENE POOL

- **Total aggregate of genes in a population at any one time**
- **All alleles at all loci in all individuals**
- **Example – flower population with white and pink flowers**

Pop. of 500 individuals
20 white
320 homozygous pink
160 heterozygous pink

Allele frequency:

$$a = \frac{2(20) + 160}{1000} = \frac{200}{1000} = 0.2$$

$$A = \frac{2(320) + 160}{1000} = \frac{800}{1000} = 0.8$$

HARDY-WEINBERG THEOREM

Frequency of alleles and genotypes in a population's gene pool remain constant over generations unless acted upon by agents other than sexual recombination

HARDY-WEINBERG EQUILIBRIUM

Allele frequency is constant from generation to generation

REQUIRED CONDITIONS FOR HARDY-WEINBERG EQUILIBRIUM	
Very large population	**Random mating**
Isolation from other populations	**No natural selection**
No net mutations	

HARDY-WEINBERG EQUATION

$p + q = 1$
p = frequency of dominant allele
q = frequency of recessive allele

$p^2 + 2pq + q^2 = 1$
p^2 = frequency of homozygous dominant genotype (AA)
2pq = frequency of heterozygous genotype (Aa)
q^2 = frequency of homozygous recessive genotype (aa)

HARDY-WEINBERG SAMPLE PROBLEM

In a population of mice, 245 are black, 210 are brown, and 45 are white.

1. KEY

BB = Black = p^2 **B = p**

Bb = Brown = 2pq **b = q**

Bb = White = q^2

2. Calculate allele frequencies

$$B = \frac{2(245) + 210}{1000} = \frac{700}{1000} = 0.7$$

$$b = 1 - B = 1 - .7 = 0.3$$

3. Calculate genotype frequencies

BB = $(.7)^2$ = .49 = 49%

Bb = 2(.7)(.3) = .42 = 42%

bb = $(.3)^2$ = .09 = 9%

4. Question – Is the population in H-W equilibrium?

Genotypes	Expected	Actual
BB	.49(500) = 245	245
Bb	.42(500) = 210	210
bb	.09(500) = 45	45

Answer = Yes, the population is in H-W equilibrium because the expected genotype frequencies match the actual frequencies