

COLLEGE BOARD · AP BIOLOGY

AP Biology Formula Sheet

The AP Bio equations and formulas reference sheet, topic by topic.

1 Statistical analysis and probability

Degrees of freedom = number of distinct possible outcomes minus one.

Mean	$\bar{x} = \frac{1}{n} \sum x_i$
Standard deviation	$s = \sqrt{\left(\frac{\sum (x_i - \bar{x})^2}{n - 1} \right)}$
Standard error of the mean	$SE_x = \frac{s}{\sqrt{n}}$
Chi-square	$\chi^2 = \sum \frac{(o - e)^2}{e}$
Chi-square critical values, $p = 0.05$	df 1–8: 3.84, 5.99, 7.81, 9.49, 11.07, 12.59, 14.07, 15.51
Chi-square critical values, $p = 0.01$	df 1–8: 6.63, 9.21, 11.34, 13.28, 15.09, 16.81, 18.48, 20.09
Mutually exclusive events	$P(A \text{ or } B) = P(A) + P(B)$
Independent events	$P(A \text{ and } B) = P(A) \times P(B)$
Hardy–Weinberg equations	$p^2 + 2pq + q^2 = 1, p + q = 1$
Mode, median and range	most frequent value; middle value; greatest – smallest

2 Rate, growth and diversity

Population growth and Simpson's Diversity Index.

Rate	$\frac{dY}{dt}$
Population growth	$\frac{dN}{dt} = B - D$
Exponential growth	$\frac{dN}{dt} = r_{\max} N$
Logistic growth	$\frac{dN}{dt} = r_{\max} N \left(\frac{K - N}{K} \right)$
Simpson's Diversity Index	diversity index = $1 - \sum \left(\frac{n}{N} \right)^2$

3 Water potential

In an open container the pressure potential is zero, so ψ equals the solute potential.

Water potential	$\psi = \psi_P + \psi_S$
Solute potential	$\psi_S = -iCRT$
Pressure constant and temperature	$R = 0.0831 \text{ liter bars/mole K}, T = ^\circ\text{C} + 273$

4 Surface area and volume

Sphere, rectangular solid, cylinder and cube.

Sphere	$SA = 4\pi r^2, V = \frac{4}{3}\pi r^3$
Rectangular solid	$SA = 2lh + 2lw + 2wh, V = lwh$
Cylinder	$SA = 2\pi rh + 2\pi r^2, V = \pi r^2 h$
Cube	$SA = 6s^2, V = s^3$