

## Worked Example. 1: DNA Base Pairing & Stability

In samples of DNA isolated from two unidentified species of bacteria, X and Y, adenine makes up 32% and 17%, respectively, of the total bases. What relative proportions of adenine, guanine, thymine, and cytosine would you expect to find in the two DNA samples? What assumptions have you made? One of these species was isolated from a hot spring (64 °C). Which species is most likely the thermophilic bacterium, and why?

According to Chargaff's rules:

1. In a DNA molecule, the amount of adenine (A) equals the amount of thymine (T), and the amount of guanine (G) equals the amount of cytosine (C).
2. The total percentage of purines (adenine and guanine) equals the total percentage of pyrimidines (thymine and cytosine)

**For species X:**

$$A = T = 32\%$$

$$A + T = 64\%$$

$$G + C = 100\% - 64\% = 36\%$$

$$G = C = 36\% / 2 = 18\%$$

**For species Y:**

$$A = T = 17\%$$

$$A + T = 34\%$$

$$G + C = 100\% - 34\% = 66\%$$

$$G = C = 66\% / 2 = 33\%$$

The species with a higher guanine-cytosine (GC) content, bacteria Y, is more likely the thermophilic bacterium, as GC pairs are more stable under elevated temperatures.