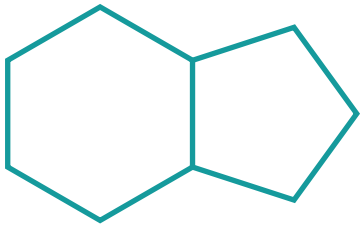
Five bases, two structural families

Purine and pyrimidine describe the ring structure of a nitrogenous base. They do not describe its sugar, its phosphate groups or the number of DNA strands.

PURINES



Two fused rings

Adenine (A)

Guanine (G)

PYRIMIDINES



One ring

Cytosine (C)

Thymine (T)

Uracil (U)

Ring-count schematics only: atom labels, double bonds and side groups are omitted. Each outline is a base ring system, not a complete nucleotide. Structural formulae are not required for this outcome.

REMEMBER THE TWO PURINES

"Pure As Gold": A and G are purines. C, T and U belong to the pyrimidines. Check the structural fact too: purines have two rings; pyrimidines have one.

Count rings inside the base only. The pentose sugar can also be drawn as a ring, but it is a different component of the nucleotide and is not counted in this classification.

Base families and ring structures: OpenStax Biology 2e, section 3.5.

Scope: Cambridge Biology 9700 syllabus, section 6.1, outcome 2, p. 24.

Classify first, then locate the base

The same base belongs to the same family whether it occurs in DNA or RNA. Adenine and guanine are purines in both.

1. THE FIVE STANDARD BASES

BASE	FAMILY	RINGS	DNA	RNA
Adenine (A)	Purine	2	Yes	Yes
Guanine (G)	Purine	2	Yes	Yes
Cytosine (C)	Pyrimidine	1	Yes	Yes
Thymine (T)	Pyrimidine	1	Yes	No
Uracil (U)	Pyrimidine	1	No	Yes

DNA: A, T, C, G. RNA: A, U, C, G. Thymine and uracil differ between the standard alphabets; both are pyrimidines. This table describes the usual unmodified bases.

2. CONNECTION TO DNA PAIRING

A (purine)	pairs with	**T (pyrimidine)**
G (purine)	pairs with	**C (pyrimidine)**

Each standard DNA pair combines a two-ring base with a one-ring base.

Family is not enough to choose the partner: A pairs with T, not C, even though both T and C are pyrimidines. Specific complementary pairing is developed in the next lesson.

Keep the levels separate: adenine is a base; an adenine-containing nucleotide also includes a sugar and phosphate. Two rings do not mean two bases.

DNA and RNA base sets: NHGRI, Nucleotide.
Complementary DNA partners: NHGRI, Base Pair.

Scope: Cambridge Biology 9700 syllabus, section 6.1, outcome 2, p. 24.