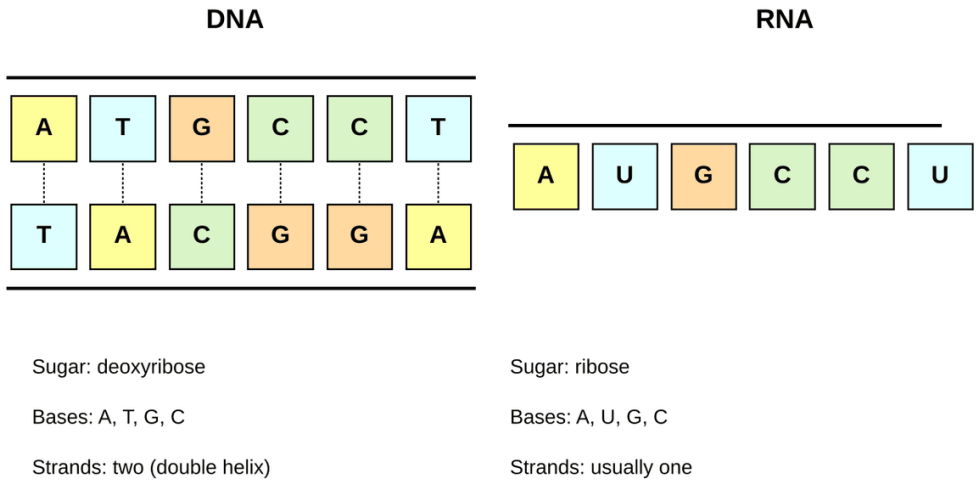
Essential Question

How is RNA different from DNA, and why does that matter?

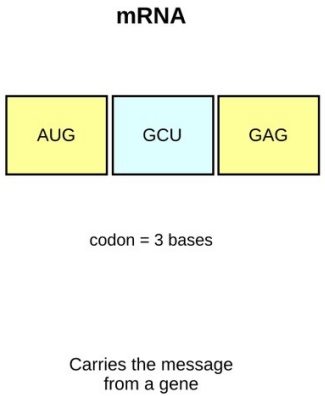
RNA Compared With DNA

- RNA (ribonucleic acid) is a nucleic acid made of nucleotides, like DNA.
- RNA has the sugar ribose, and DNA has the sugar deoxyribose.
- RNA has the base uracil (U) in place of thymine (T). In RNA, A pairs with U.
- RNA is usually a single strand, and DNA is a double helix.
- RNA molecules are much shorter than a DNA chromosome, because each one is a copy of only a gene or a small part of it.



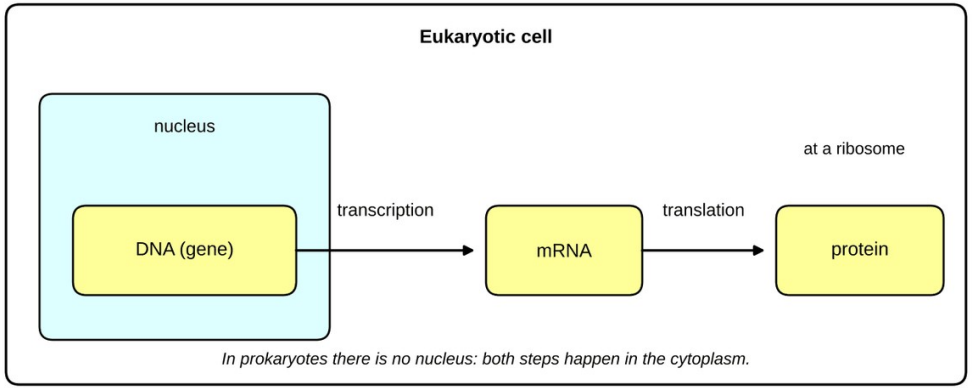
Three Main Types of RNA

- Messenger RNA (mRNA) carries the instructions from a gene. Its bases are read in groups of three called codons.
- Transfer RNA (tRNA) carries one amino acid. It has an anticodon, a set of three bases that pairs with a codon on the mRNA.
- Ribosomal RNA (rRNA) combines with proteins to make ribosomes, the structures that build proteins.
- Cells also make other kinds of RNA, but these three are the ones needed to build a protein.



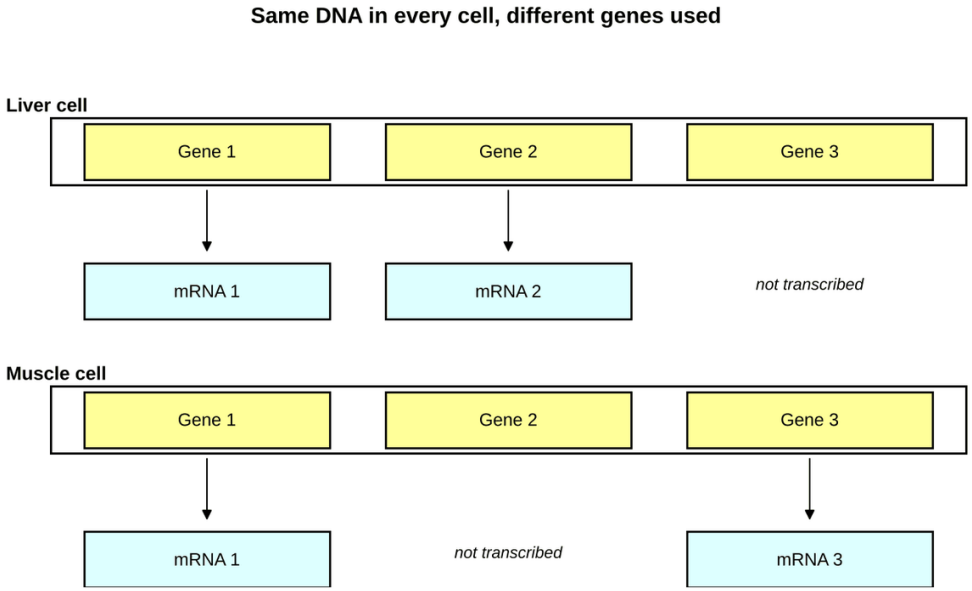
From DNA to Protein

- Information flows from DNA to RNA to protein.
- Transcription makes an mRNA copy of a gene. Translation uses the mRNA to build a protein. You will study each in the next lessons.
- In eukaryotes, transcription takes place in the nucleus and translation takes place at ribosomes in the cytoplasm.
- Prokaryotes have no nucleus, so both steps happen in the cytoplasm.
- Proteins carry out most of the work of cells, so the sequence of a gene ends up affecting the traits of an organism.



Why a Temporary Copy Helps

- DNA is the master copy and stays in the nucleus. Using RNA copies protects it from damage.
- One gene can be copied many times, so a cell can make a lot of one protein quickly.
- mRNA does not last forever, so a cell can change which proteins it makes.
- All cells in an organism have the same DNA, but different cell types use different genes. This is how a liver cell and a muscle cell can differ.



Example: DNA or RNA?

Three nucleic acid samples were analyzed (percent of each base). These are sample values for practice. For each sample, decide whether it is DNA or RNA and whether it is likely single-stranded or double-stranded. Write your answer as Claim, Evidence, Reasoning.

Sample	% A	% T	% U	% G	% C
Sample 1	30	30	0	20	20
Sample 2	26	0	31	24	19
Sample 3	22	29	0	21	28

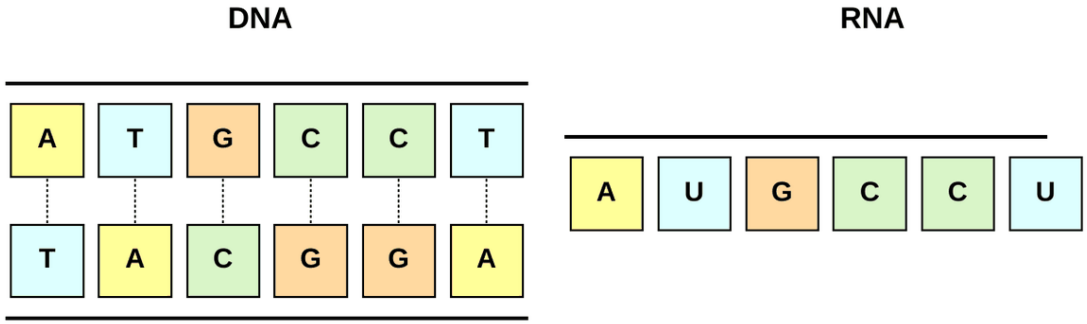
Example: Match the RNA to the Job

Use the table. Write mRNA, tRNA, or rRNA for each description.

Description	Which RNA?
Has an anticodon that pairs with a codon	
Is a part of the ribosome	
Is read three bases at a time as codons	
Carries one amino acid	

Example: Base Percentages in RNA

A 100-nucleotide RNA molecule has 22 adenine, 31 uracil, and 26 guanine nucleotides. How many cytosine nucleotides are there, and what percent of each base is present? Does this RNA follow the rule A = U and G = C?



DNA	RNA
Sugar: deoxyribose	Sugar: ribose
Bases: A, T, G, C	Bases: A, U, G, C
Strands: two (double helix)	Strands: usually one

Types of RNA

Big Ideas

- RNA has ribose, uracil instead of thymine, and is usually single-stranded.
- mRNA carries a gene's message, tRNA brings amino acids, and rRNA helps make ribosomes.
- Information flows from DNA to RNA to protein.
- Different cell types use different genes, so they make different RNAs and proteins from the same DNA.