DNA

RNA = RIBONUCLEIC ACID

- Phosphate
- Sugar = ribose
- Bases = adenine pairs with uracil, guanine pairs with cytosine

3 types of RNA:
- messenger RNA (mRNA)
- transfer RNA (tRNA)
- ribosomal RNA (rRNA)
**Messenger RNA (mRNA)**

**Structure:** single uncoiled chain

**Job:** carries DNA from nucleus → cytoplasm

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**Transfer RNA (tRNA)**

**Structure:** single folded chain (hairpin)

**Job:** binds to a specific amino acid

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Ribosomal RNA (rRNA)

**Structure:** globular form (makes up ribosomes)

**Job:** place where proteins are made

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Differences between RNA & DNA

1. Uracil instead of thymine
2. Ribose instead of deoxyribose
3. 1 strand instead of 2 strands
4. 3 types of RNA, 1 type of DNA

DNA: T G G A T A C C T A G
RNA: A C C U A U G G A U C

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Protein Synthesis

We know that DNA tells the body which proteins to make, but a gene does not build proteins directly.

- Genes send instructions in the form of RNA
- The RNA then programs protein synthesis

There are two main stages to protein synthesis:
- Transcription: the transfer of genetic information from DNA to RNA
- Translation: the transfer of that information in the RNA into a protein
Transcription: copies genetic information from DNA to RNA

1. RNA polymerase (enzyme) binds to promoters on DNA
2. DNA strand separates (only 1 chain used as a template)
3. Polymerase adds complimentary RNA nucleotides
4. Continues until it reaches a terminal signal
5. Polymerase releases DNA molecule and new RNA
Products of transcription are called **transcripts**

mRNA transcripts move through the **nuclear membrane** into the **cytoplasm**

Proteins are **polymers** of one or more **polypeptides**.

What is a polypeptide?  
They are amino acids linked by peptide bonds.

How many amino acids are there?  
20

When the mRNA transcript is **translated** into an amino acid sequence = **genetic code**

3 mRNA nucleotides = **codon**

Each codon codes for 1 amino acid

There are 64 different codons.

Some codons DO NOT code for amino acids.

**Start** = AUG (methionine)  
**STOP** = UAA, UAG, UGA
TRANSLATION
Assembling polypeptides from mRNA

1. mRNA leaves the nucleus
2. mRNA goes to the ribosomes in the cytoplasm

Amino acids float freely in the cytoplasm. They are brought to the ribosomes by tRNA.

tRNA: codes for specific amino acids; helps interpret the information that is being carried
-3 nucleotides on tRNA = anticodon
- tRNA anticodon is complimentary to mRNA transcript
  tRNA = A A A
  mRNA = U U U
Ribosomes are made up of protein and rRNA
Proteins are assembled as translation continues:
3. Ribosome attaches to start codon (AUG) on mRNA
4. Start codon pairs with anticodon on tRNA (UAC) methionine

5. Ribosome moves along mRNA transcript, each codon matches to anticodon
6. Amino acids attach together by a peptide bond
7. mRNA reaches stop codon → translation ends
8. mRNA is released, and the new polypeptide folds into a 3-dimensional PROTEIN!

Components of Translation
1. mRNA = message
2. tRNA = interpreter
3. Ribosome = site of translation
How is RNA different from DNA?

a. DNA contains uracil
b. DNA contains a sugar
c. RNA is single-stranded
d. RNA contains thymine

The answer is...

C

How does genetic information get transferred from the nucleus to the ribosome?

a. DNA → RNA → protein
b. RNA → DNA → protein
c. Protein → DNA → RNA
d. Protein → RNA → DNA

The answer is...

A

Where does transcription occur in eukaryotes?

a. Cytoplasm
b. Mitochondria
c. Nucleus
d. Ribosomes

The answer is...

C
What molecule is NOT made during transcription?

a. tRNA  
b. mRNA  
c. rRNA  
d. DNA

The answer is....  
D

Which molecule carries the amino acid coded by mRNA to the ribosome?

a. tRNA  
b. rRNA  
c. Codon  
d. mRNA

The answer is....  
A

What anticodon pairs with the codon AUG?

a. UAC  
b. TAC  
c. AUG  
d. UTC

The answer is....  
A