A. TRANSCRIPTION (DNA → mRNA)

Why it is needed

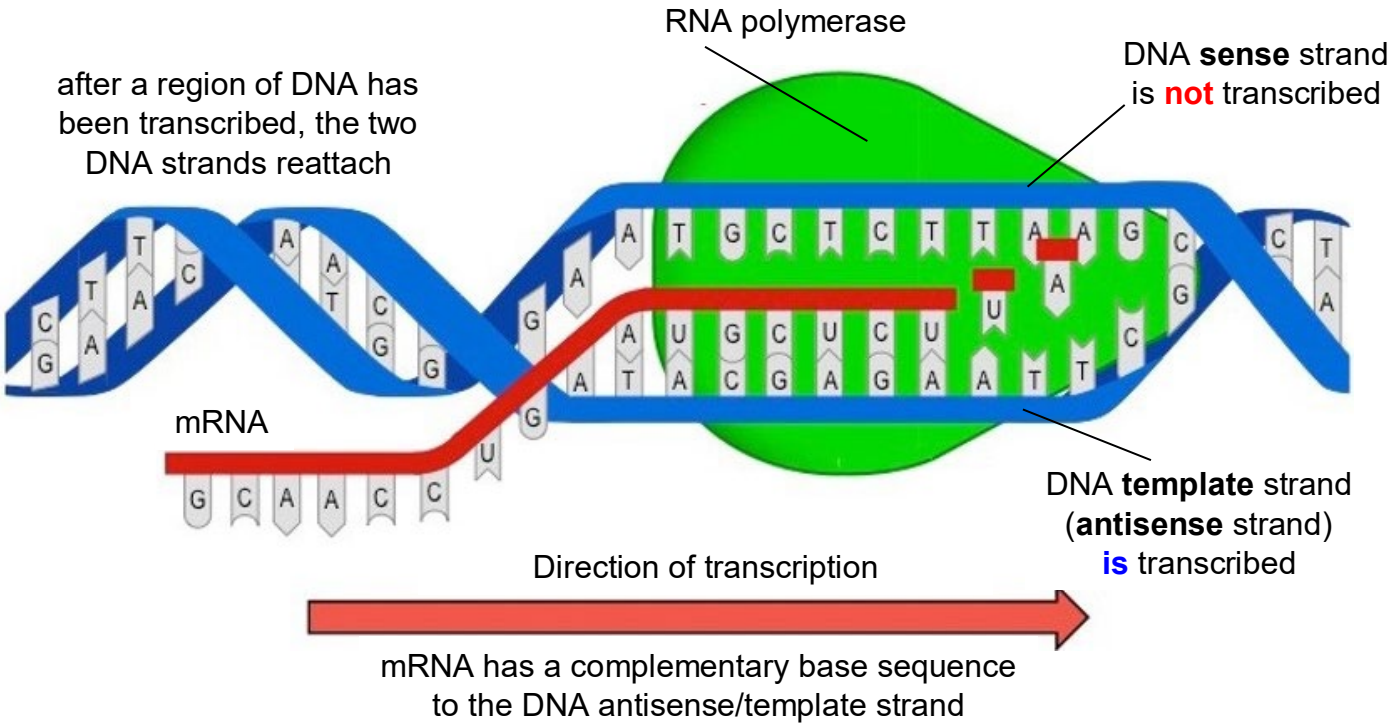
DNA is in the **nucleus** and it contains the **base sequence** that **codes** for a **protein**.

Ribosomes are in the **cytoplasm** and **read** a **base sequence** to **make** a **protein**.

However, **DNA** is **too large** to **leave** the **nucleus**.

So, the **DNA base sequence** must be **copied** onto a **smaller** molecule called **mRNA**.

mRNA then **leaves** the **nucleus** and **attaches** to a **ribosome** in the **cytoplasm**.



How it happens

- DNA → mRNA
- **RNA polymerase separates DNA strands**/breaks H-bonds between strand
- **One DNA strand/antisense strand** acts as a **template**
- Free **RNA nucleotides attach**
- By **complementary base pairing** / adenine, uracil and guanine, cytosine pair;
- **RNA polymerase joins RNA nucleotides** together;
- **mRNA** strand made;
- (mRNA is) **complementary** to the **DNA template/antisense** strand;
- mRNA contains **uracil** instead of **thymine**;
- **DNA strands go back together** / H-bonds reform;

B. THE GENETIC CODE

- The **base sequence** of a **mRNA** molecule **codes for** the production of a **polypeptide**
- This **base sequence** is read by a ribosome in **triplets of bases** called **codons**
- Each **codon** codes for one **specific amino acid** in a protein chain
- The **order** of the **codons** in an **mRNA** determines the **order** of **amino acids** in a protein

The **genetic code** is **UNIVERSAL**

The **same mRNA codons** code for the **same amino acids** in **all organisms**

Second letter

First letter	U	C	A	G	Third letter
U	UUU, UUC: Phe UUA, UUG: Leu	UCU, UCC, UCA, UCG: Ser	UAU, UAC: Tyr UAA, UAG: Stop	UGU, UGC: Cys UGA: Stop UGG: Trp	U C A G
C	CUU, CUC, CUA, CUG: Leu	CCU, CCC, CCA, CCG: Pro	CAU, CAC: His CAA, CAG: Gln	CGU, CGC, CGA, CGG: Arg	U C A G
A	AUU, AUC, AUA: Ile AUG: Met	ACU, ACC, ACA, ACG: Thr	AAU, AAC: Asn AAA, AAG: Lys	AGU, AGC: Ser AGA, AGG: Arg	U C A G
G	GUU, GUC, GUA, GUG: Val	GCU, GCC, GCA, GCG: Ala	GAU, GAC: Asp GAA, GAG: Glu	GGU, GGC, GGA, GGG: Gly	U C A G

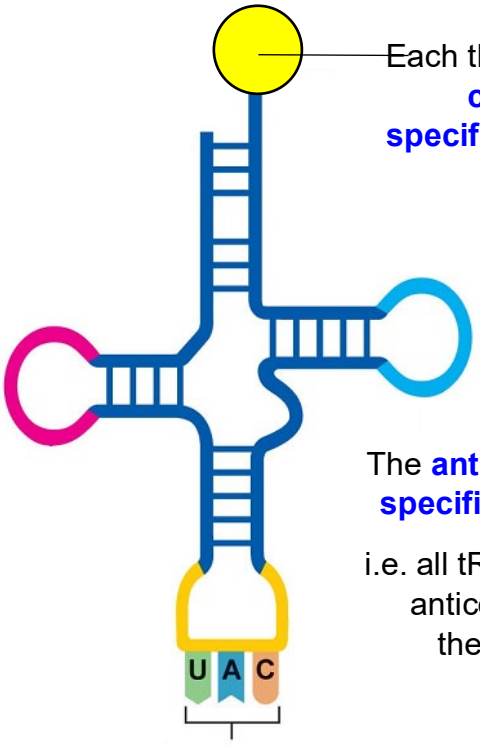
mRNA codons and the amino acids they code for

The **genetic code** is **DEGENERATE**

Different mRNA codons can code for the **same amino acid**

- The **mRNA codon** CCU codes for the **amino acid** Proline

C. tRNA (TRANSFER RNA)



Each tRNA molecule **carries** a **specific amino acid**

The **anticodon** determines the **specific amino acid carried**

i.e. all tRNA molecules with the anticodon **UAC** will carry the same amino acid

Anticodon

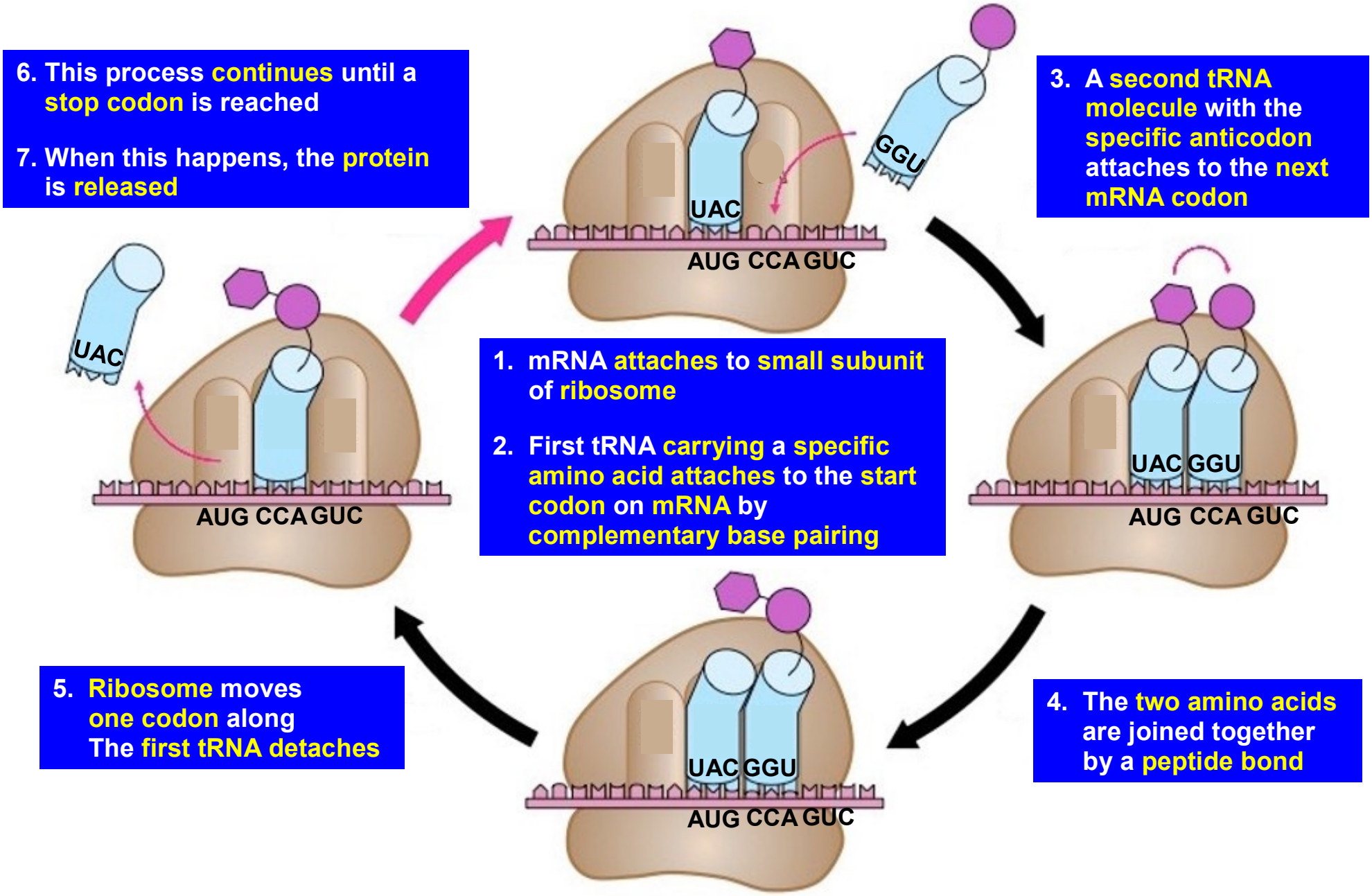
Three bases ('triplet) that bind to a **codon** on **mRNA**

Comparing and contrasting mRNA and tRNA

	mRNA	tRNA
Sugar	Ribose	
Bases	Adenine (A); Uracil (U); Guanine (G); Cytosine (C)	
Amino acid binding site	No	Yes
Contains	Codons	Anticodon
Shape	Linear	'Clover-leaf'
Half life	Shorter	Longer

D. TRANSLATION (mRNA → POLYPEPTIDE)

Each mRNA codon codes for a specific amino acid



The anticodon on tRNA determines the specific amino acid that it carries

E. COMPARE AND CONTRAST DNA REPLICATION & TRANSCRIPTION

DNA replication	Transcription
DNA → **DNA**	DNA → **mRNA**
Involves **DNA polymerase**	Involves **RNA polymerase**
Involves **thymine**	Involves **uracil**
Product is **double stranded**	**Product** is **single stranded**
Both strands act as **templates**	**One strand** acts as a **template**
Complete strand copied	**Part** of a strand copied
Happens in the **nucleus**	
DNA **unzips/strands separate**	
Complementary copy/strand produced	
DNA molecule **zips back up** (at the end)	

F. WHY IS THE DNA BASE SEQUENCE SO IMPORTANT?

DNA base sequence determines:

mRNA base sequence determines:

amino acid sequence determines:

tertiary structure of protein determines:

if the protein is functional or non-functional