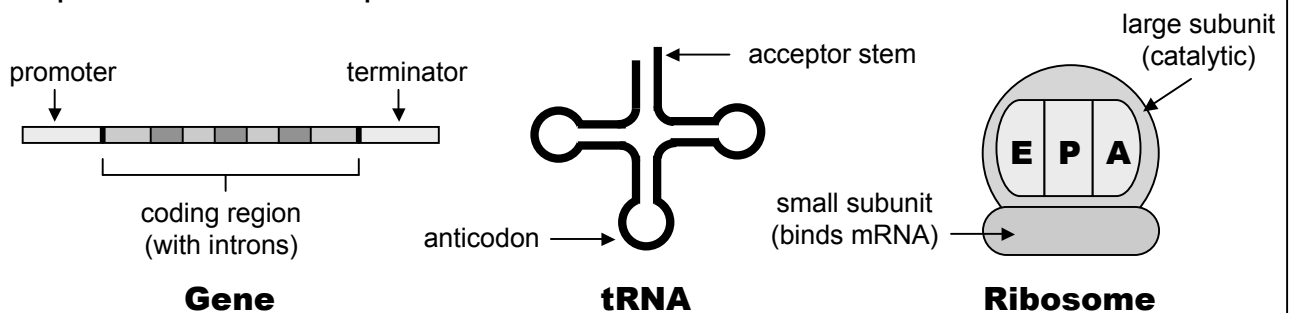


Transcription (7.3) & Translation (7.4)

Explain the process of transcription (7.3.1 - 7.3.4)

- Transcription is the conversion of a DNA sequence into an RNA copy
- The DNA strand that is transcribed is called the *antisense* strand, while the complementary strand is called the *sense* strand
- Transcription begins when RNA polymerase binds to a region of the gene called a **promoter** and unwinds and separates the DNA strands
- Ribonucleoside triphosphates (NTPs) line up opposite their complementary bases
- RNA polymerase moves along the **coding sequence** and hydrolyse the extra phosphate groups to join the nucleotides together in a 5' → 3' direction
- Transcription stops when RNA polymerase reaches a **terminator** sequence
- In eukaryotes, the introns must be post-transcriptionally removed from the RNA to make mature mRNA

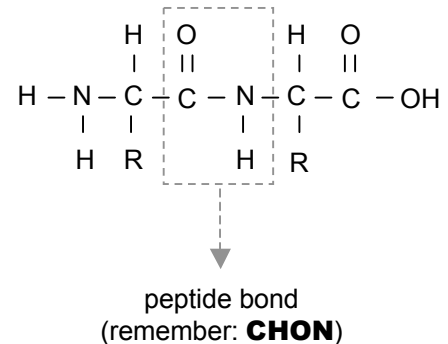
Components of transcription and translation



Outline ribosome structure (7.4.2 / 7.4.7)

- Ribosomes contain protein (structure) and rRNA (catalysis)
- They consist of two subunits:
 - The small subunit binds to the mRNA
 - The large subunit is the site of polypeptide assembly
- The large subunit has 3 tRNA binding sites:
 - The **P site** binds the tRNA with the growing polypeptide chain
 - The **A site** binds the next incoming tRNA with an amino acid
 - The **E site** binds the deacylated tRNA prior to its release
- Ribosomes in prokaryotes, chloroplasts and mitochondria) are smaller (70S) than in eukaryotic organisms (80S)
- Free ribosomes = cellular proteins, ER-bound = secretion

Draw a peptide bond (7.4.5)



Explain the process of translation (7.4.1 / 7.4.3 / 7.4.4 / 7.4.6)

Pre-Initiation

- A tRNA-activating enzyme bind specific amino acids to tRNA molecules (according to the anticodon) using ATP for energy

Initiation

- The small ribosomal subunit binds mRNA & moves along it until it reaches the start codon (AUG)
- The appropriate tRNA (with an amino acid) binds to the start codon
- The large subunit then completes the complex (requires GTP) by binding the tRNA at the P site
- Multiple ribosomes may translate an mRNA transcript concurrently (forming a polysome)

Elongation

- A new tRNA binds to the next codon at the A site
- The large subunit catalyses the formation of a peptide bond between the two amino acids

Translocation

- The ribosome moves along in a 5' → 3' direction
- The deacylated tRNA is released from the E site, while a new tRNA enters the A site

Termination

- When a stop codon is reached, proteins called releasing factors release the polypeptide chain and the ribosome disassembles