Quadrant II – Notes

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Ribosomes are small, dense, granular, ribonucleoprotein particles. They occur in all prokaryotic and eukaryotic cells. They also occur in organelles - mitochondria and plastids.

Ribosomes are measured in Svedberg units, which are a measure of how long it takes a molecule to sediment out of solution in a centrifuge. Prokaryotic ribosomes are typically 70S, or Svedberg units. A eukaryotic ribosome is usually 80S.

Structure of Eukaryotic Ribosomes

Eukaryotes have 80S ribosomes.

- Larger subunit - 60S.
- Small subunit - 40S.
- Occurs in algae, fungi, higher plants and animals.

The cytoplasmic ribosomes of eukaryotes (80S) are similar in morphology to prokaryotes. The 40S ribosomal subunit is divided into head and base segments by a transverse groove. The 40S ribosomal subunit is smaller in size and occurs above the 60S subunit forming a cap – like structure.

The 60S ribosomal subunit is generally rounder in shape than the small subunit, although its one side is flattened. This is the side that becomes confluent with the small subunit during formation of the functional 80S ribosome. Bounded ribosomes - the 60S subunit remains attached with the membranes.

Chemical composition

Ribosomes are composed of RNA, proteins and certain divalent metallic ions. The RNA / protein ratio is 1:1 in the 80S ribosome.

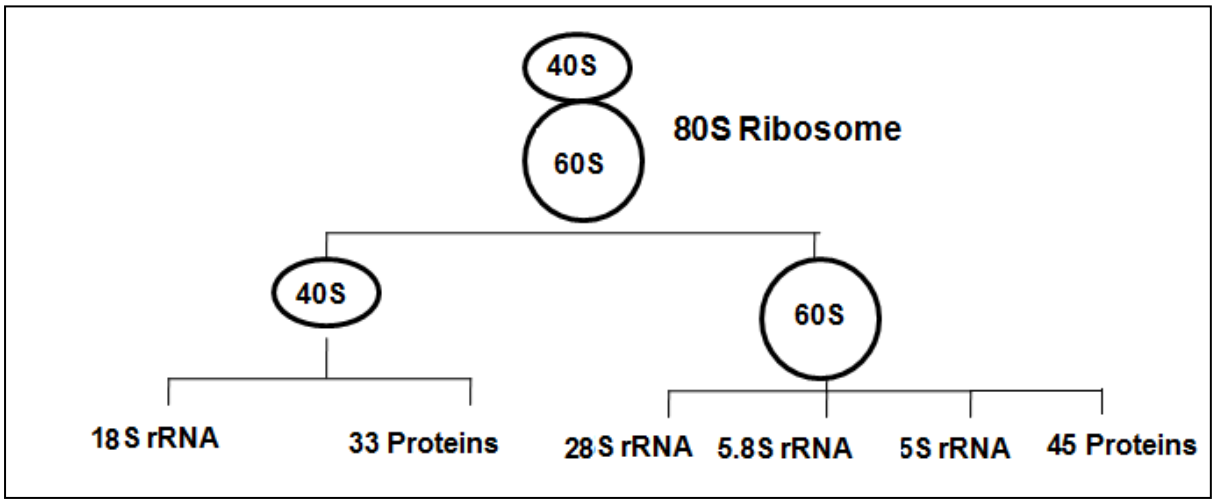
Ribosomal proteins

- The 40S subunits - 33 different proteins.
- The 60S subunits - more than 45 different proteins.

Ribosomal RNA (rRNA)

Four types of rRNA have been found in 80S ribosomes.

- 28S rRNA, 18S rRNA, 5S rRNA, 5.8S rRNA.
- The smaller 40S ribosomal - of one molecule of 18S rRNA.
- 60S ribosome consists of three types of rRNA molecules i.e., 28S rRNA, 5.8 rRNA and 5S rRNA.



Components of the 80S ribosome

Metal ions

The most important low molecular weight components of ribosomes are the divalent metallic ions such as Mg++, Ca++ and Mn++. Mg^{++} Play an important role in holding the two subunits together.

Comparison of 70S and 80S ribosomes

Eukaryotic 80S ribosomes differ from pokaryotic 70S ribosomes in the following respects:

- Considerably larger.
- Contain a large number of proteins (70S – 80S types instead of 53S).
- Have four types of rRNA instead of three types.
- Their proteins and nucleic acids are large sized.
- The RNA –protein ratio is near to 1:1 instead of 2:1.
- Several antibiotics, such as chloramphenicol, inhibit bacterial but not eukaryotic ribosomes. Protein synthesis by eukaryotic ribosomes is inhibited by cycloheximide.

Functions of Ribosomes

Eukaryotic ribosomes do not differ functionally from those in prokaryotes. Ribosomes take part in protein synthesis. Ribosomes Serves as the site of biological protein synthesis (translation).

Translation of information from the nucleus

A ribosome is used to translate the encoded information carried by the mRNA from the nucleus. Two subunits join together. Numerous ribosomes attach to a single strand of mRNA. After synthesis of a polypeptide chain - two subunits separate.

Protective function

The polypeptide chains passing through the tunnel or channel between the subunits are protected against the action of protein digesting enzymes.