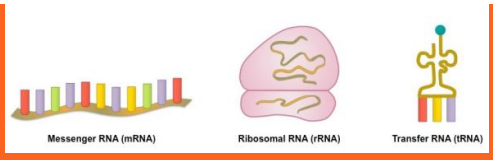
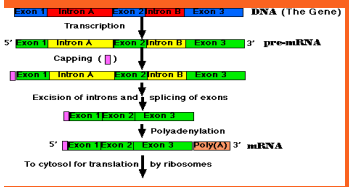
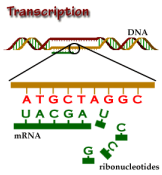


6.3 Transcription and RNA Processing



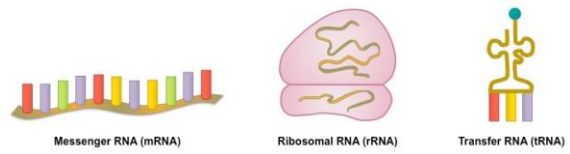


ENDURING UNDERSTANDING

IST-1 Heritable information provides for continuity of life.

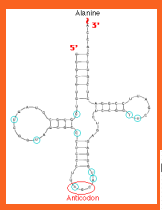
IST-1.N Describe the mechanisms by which genetic information flows from DNA to RNA to protein.

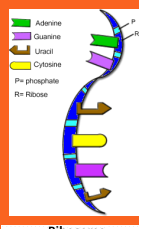
- The sequence of the RNA bases, together with the structure of the RNA molecule, determines RNA function

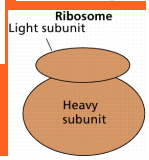


Functions of RNA

- Messenger RNA (**mRNA**) takes a message from DNA in nucleus to ribosomes in cytoplasm.
- Transfer RNA (**tRNA**)
  - bind specific amino acids
  - have anti-codon sequences that base pair with the mRNA.
  - tRNA is recruited to the ribosome during translation to generate the primary peptide sequence based on the mRNA sequence.
- Ribosomal RNA (**rRNA**) and proteins are functional building blocks of ribosomes.

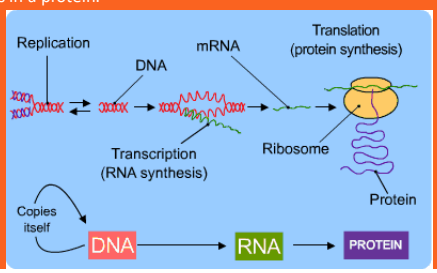






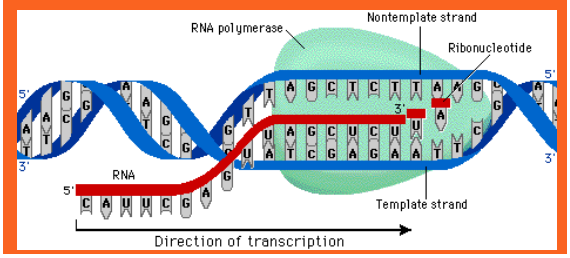
IST-1.N Describe the mechanisms by which genetic information flows from DNA to RNA to protein.

- Genetic information flows from a sequence of nucleotides in DNA to a sequence of bases in an mRNA molecule to a sequence of amino acids in a protein.



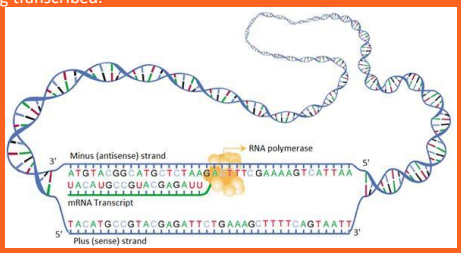
IST-1.N Describe the mechanisms by which genetic information flows from DNA to RNA to protein.

- RNA polymerases use a single template strand of DNA to direct the inclusion of bases in the newly formed RNA molecule. This process is known as transcription.



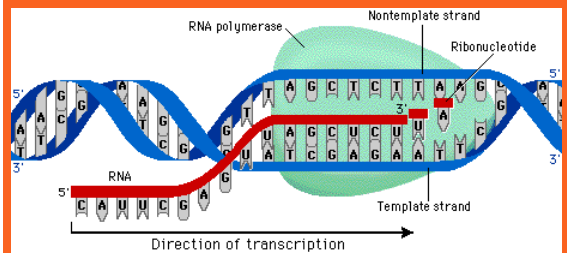
IST-1.N Describe the mechanisms by which genetic information flows from DNA to RNA to protein.

- The DNA strand acting as the template strand is also referred to as the noncoding strand, minus strand, or antisense strand. Selection of which DNA strand serves as the template strand depends on the gene being transcribed.



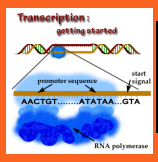
IST-1.N Describe the mechanisms by which genetic information flows from DNA to RNA to protein.

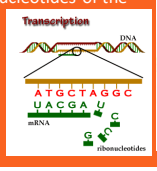
- The enzyme RNA polymerase synthesizes mRNA molecules in the 5′ to 3′ direction by reading the template DNA strand in the 3′ to 5′ direction.

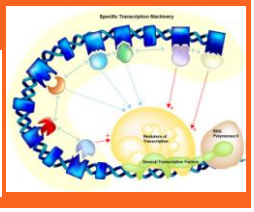


Transcription

- **RNA polymerase** attaches to a **promoter** on DNA.
- Promoter defines start of gene, direction of transcription, and strand copied. (**TATA Box** in Eukaryotes)
- **Transcription factor** is needed for polymerase to bind to DNA.
- Complementary RNA nucleotides pair with DNA nucleotides of the strand.

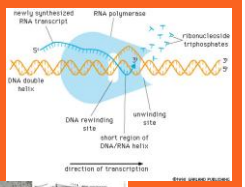


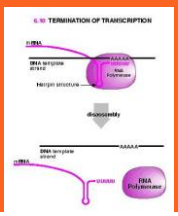


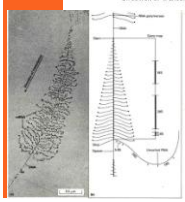


Transcription

- RNA polymerase covalently bonds RNA nucleotides.
- **Terminator sequence** causes RNA polymerase to stop transcribing DNA, and to release mRNA
- Many copies of mRNA are made from the DNA molecule at the same time.

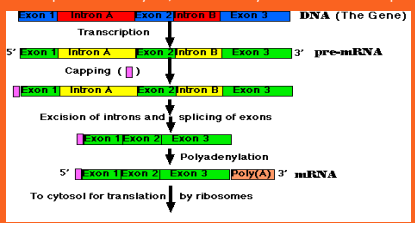






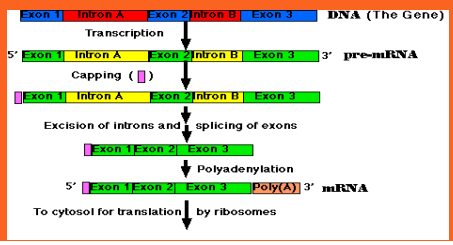
IST-1.N Describe the mechanisms by which genetic information flows from DNA to RNA to protein.

- In eukaryotic cells the mRNA transcript undergoes a series of enzyme-regulated modifications
  - Excision of introns and splicing and retention of exons (by spliceosomes)
    - **Exon** is portion of mRNA transcript eventually expressed.
    - The simpler the eukaryote, the less likely that introns will be present.



IST-1.N Describe the mechanisms by which genetic information flows from DNA to RNA to protein.

- In eukaryotic cells the mRNA transcript undergoes a series of enzyme-regulated modifications
  - Addition of a poly-A tail.
  - Addition of a GTP cap.



IST-1.N Describe the mechanisms by which genetic information flows from DNA to RNA to protein.

- Excision of introns and splicing and retention of exons can generate different versions of the resulting mRNA molecule; this is known as alternative splicing.