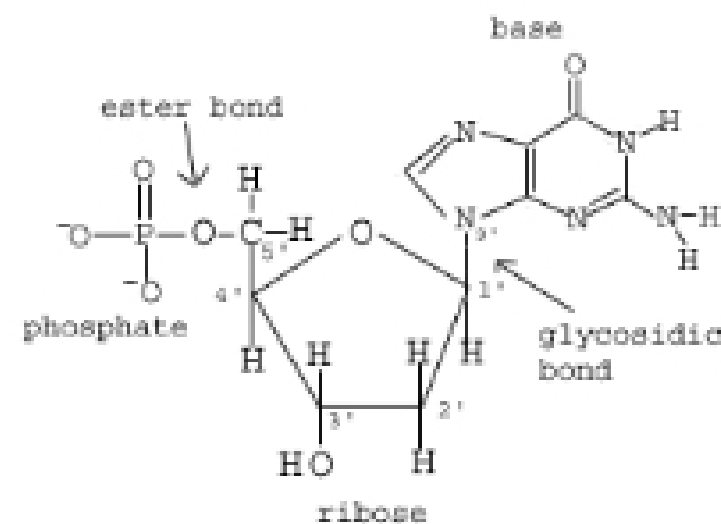


Exam 2 Review

Chapter 3:

- **Central dogma** (Fig 3.3) - order of information processing
 - Level of mRNA is elevated --- effect on **gene transcription**, as opposed to an increase in protein translation
- Basic building blocks of DNA (Fig 3.4)
 - Base + Deoxyribose sugar + Phosphate group



- DNA structure:
 - 4 bases – adenine, thymine, cytosine, guanine
 - Differences between purines and pyrimidines
 - purines – two rings (A + G)
 - pyrimidines – one ring (T + C)
 - **Phosphodiester bond**
 - Covalent bond that connect sugars in the backbone of DNA
 - Connects 3' carbon of one nucleotide to 5' carbon of the next
 - **Polarity** of DNA strands
 - One end differs from the other (5' versus 3')
 - 5' end – free 5' phosphate
 - 3' end – free 3' hydroxyl
 - Double strands are **anti-parallel**
 - Major groove & minor groove
 - Complementary base pairing (based on H-bonding)
 - A to T – two hydrogen bonds
 - C to G – three hydrogen bonds

You can skip: topoisomerase, chromatin structure (3.9-3.10); skip "RNA World", 3.11

▪ **Transcription:**

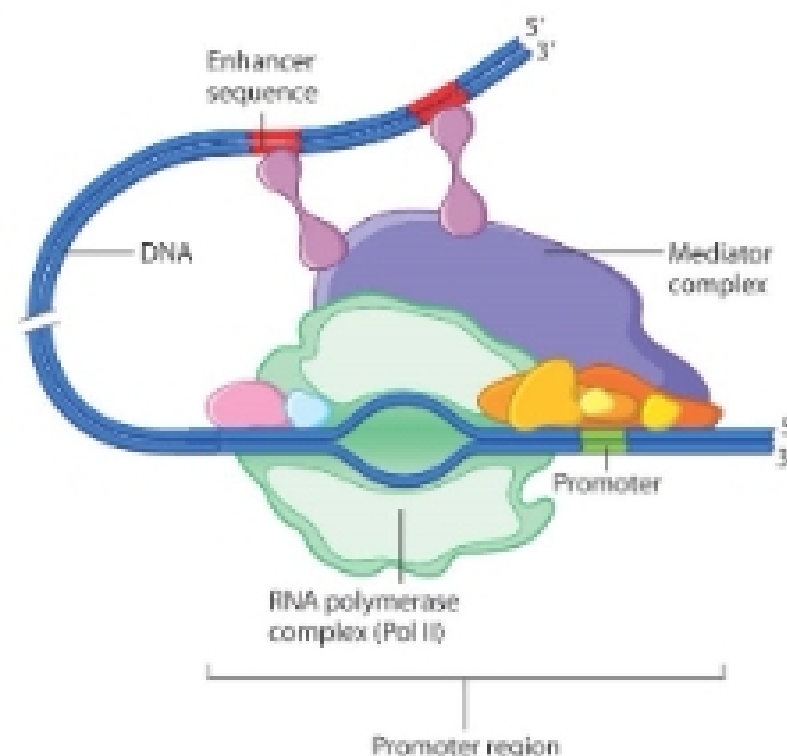
- Differences between DNA and RNA (bases, ribose, etc)
 - Ribose sugar, uracil instead of thymine
- **Template versus non-template** strand in transcription (but individual genes can be on either one)
 - Template strand is transcribed by RNA polymerase
 - Adds nucleotides to 3' end (grows 5' to 3')
- **Promoters** – regions of base pairs where RNA polymerase binds to DNA
 - TATA box – TATA sequence is present
 - **General transcription factors** (6) – attract RNA polymerase and associated proteins to site
 - **RNA polymerase II** – responsible for transcription of protein-coding genes
 - **Mediator complex and activators** – transcriptional activator proteins bind to enhancers – recruit a mediator complex of proteins – interacts with Pol II complex
 - Initiation of transcription depends on availability of transcriptional activator proteins



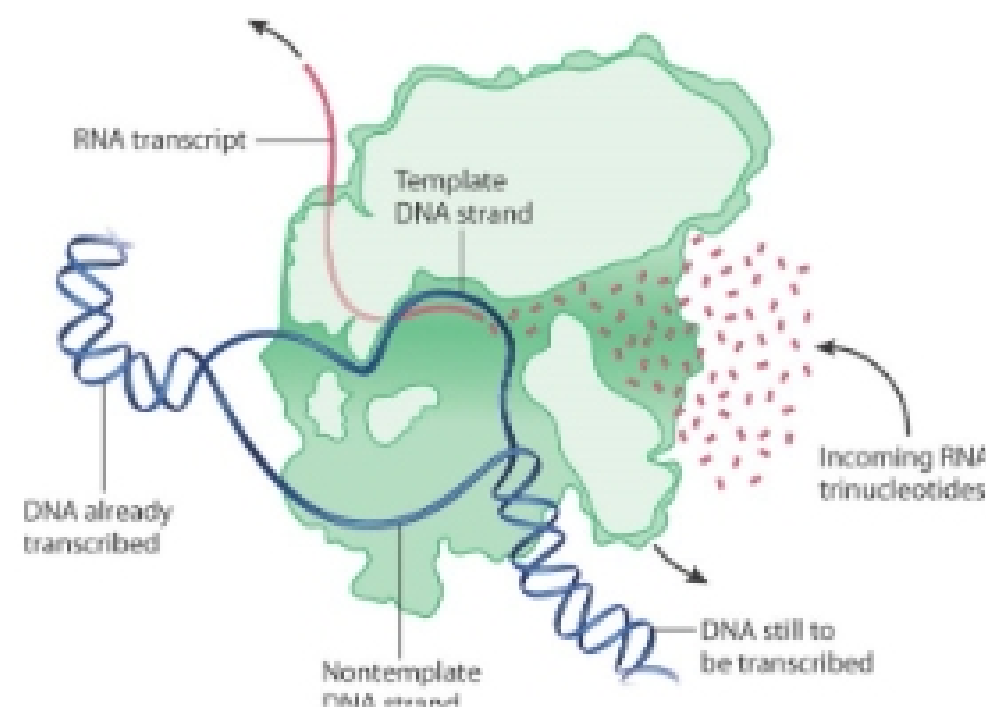
1 General transcription factors bind to the promoter, and transcriptional activator proteins bind to enhancers.



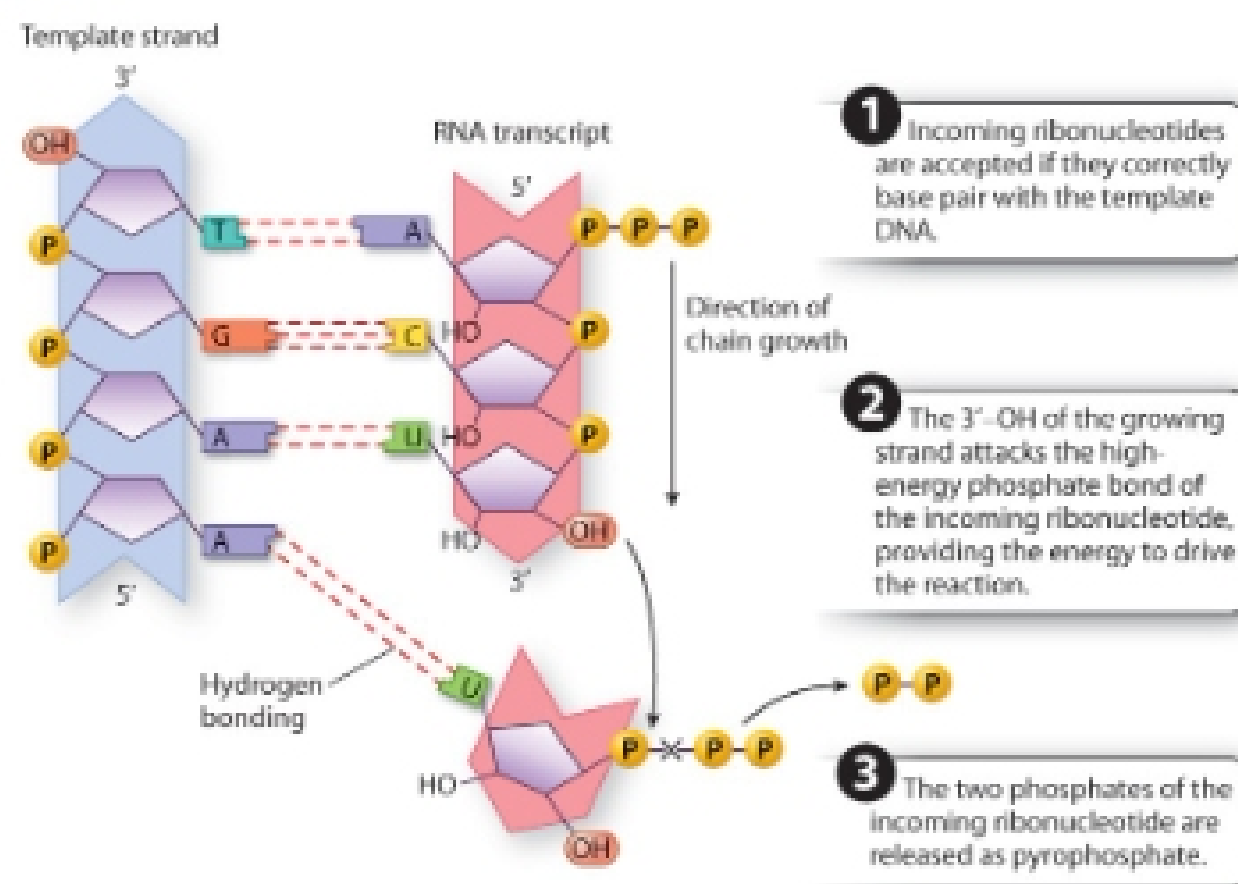
2 Through looping of DNA, transcriptional activator proteins, mediator complex, RNA Pol II, and general transcription factors are brought into close proximity, allowing transcription to proceed.



- Be able to draw a "map" of a typical gene and the primary RNA transcript
- **Primary transcript** – messenger RNA (mRNA) – carries genetic info from DNA to ribosome
- **Glucocorticoid receptor** (GR) as a transcription activator, acting on enhancer sequences
 - When GR is bound – receptor moves to nucleus and acts as activators
- RNA polymerase as a **molecular machine**
 - Channels for DNA input/output
 - Nucleotide input & RNA output
 - Features that disrupt DNA double helix, stabilize RNA-DNA duplex & allow DNA double helix to reform



- **Polymerization of mRNA:** new nucleotides added as triphosphate bases (fig 3.19)



- **RNA processing** – converts primary transcript into finished mRNA
 - **5' cap** added to 5' end – addition of special nucleotide