Faculty of Agriculture **Benha University**

Department of Genetics **Answer of the final exam**

Course: Biochemical Genetics

Postgraduate students

I-Fill the following spaces with appropriate answers. (20 degrees)

1. **Housekeeping genes role…….**

Answer: Some of the gene products are required by the cell under all growth conditions

2. **Housekeeping genes include……**

Answer: These include the genes that encode such proteins as DNA polymerase, RNA polymerase, and DNA gyrase. Many other gene products are required under specific growth conditions. These include enzymes that synthesize amino acids, break down specific sugars, or respond to a specific environmental condition such as DNA damage.

3. **Types of gene regulation…..,……,……**

Answer: transcriptional regulation- translational regulation- post-transcriptional or post-translational regulation

4. **Steps of transcriptions…,….,…..,….**

Answer: promoter recognition; chain initiation; chain elongation; and chain termination

5. **Core RNA polymerase contains……..,…..,……**

Answer: is a complex composed of the proteins b, b¢ and two subunits of α

6. **When core RNA polymerase is converted to holoenzyme ……..**

Answer: Core RNA polymerase is converted to **holoenzyme** when one additional protein, **sigma factor** (s) is associated with it**.**

7. **…….directs RNA polymerase to promoters.**

Answer: σ factor

8. **Promoters contain two distinct sequence motifs……,……**

Answer: -10 region and -35 region

9. **RNA polymerase starts transcriping at ……**

Answer: the +1 site

10. Transcription continues until core RNA polymerase encounters…

Answer: a transcription termination signal or **terminator** where RNA polymerase and the newly synthesized RNA dissociate from the DNA to end transcription.

II- Define the following terms. (20 degrees)

- **Stem loop structure:** Inverted repeat sequences are often found as part of a terminator along with a stretch of uracils found at the end of the RNA transcript. The inverted repeat sequences are able to hydrogen bond with each other and create a stretch of double-stranded RNA.
- **Shine-Dalgarno sequence:** Ribosomes are able to bind the **ribosome binding site** (RBS) in the mRNA and initiate translation at the starting methionine codon (AUG) even if RNA polymerase is still transcribing the RNA.
- **Operators:** are found adjacent to or overlapping the -35 and -10 regions of the promoter. Specific DNA binding proteins recognize these control regions and exert an effect on holoenzyme's ability to initiate transcription.
- **Repression:** Regulatory proteins can bind to their control region and prevent transcription.
- **Activation:** Regulatory proteins can also bind to their control regions and promote RNA polymerase binding to the promoter.
- **Operon:** is a group of genes physically linked on the chromosome and under the control of the same promoter(s).
- **Polycistronic mRNA:** In an operon, the linked genes give rise to a single mRNA that is translated into the different gene products.
- **Regulon:** is a group of genes all needed for the same process but physically located in different parts of the chromosome and containing their own promoter(s)**.** In a Regulon, the promoters are all regulated in the same fashion and allow for coordinate expression of the necessary genes.
- **Catabolic process:** When a compound is broken down**.**
- **IPTG substrate:** an **inducer** of the *lac* operon.

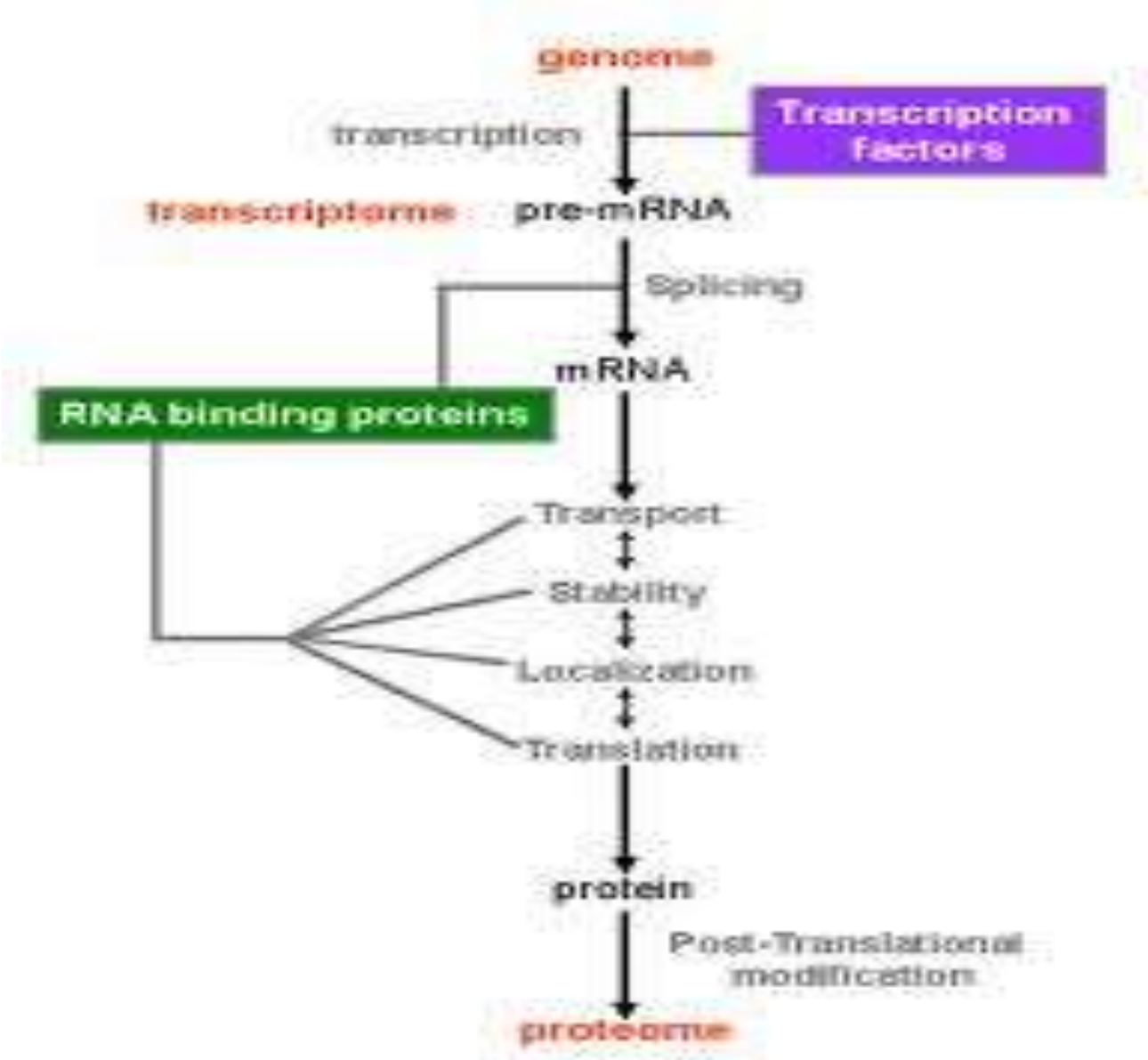
III- Draw the simple scheme of the following. (20 degrees)

1- **The four major steps of transcription. انظر صـ192**
2- **The structure of RNA polymerase and the regions in the promoter binding. انظر صـ193**
3- **Multiple rounds of transcription and translation take place at the same time. انظر صـ195**
4- **There are two widely used organizational schemes in bacteria for multiple genes that are coordinately regulated.انظر صـ197**

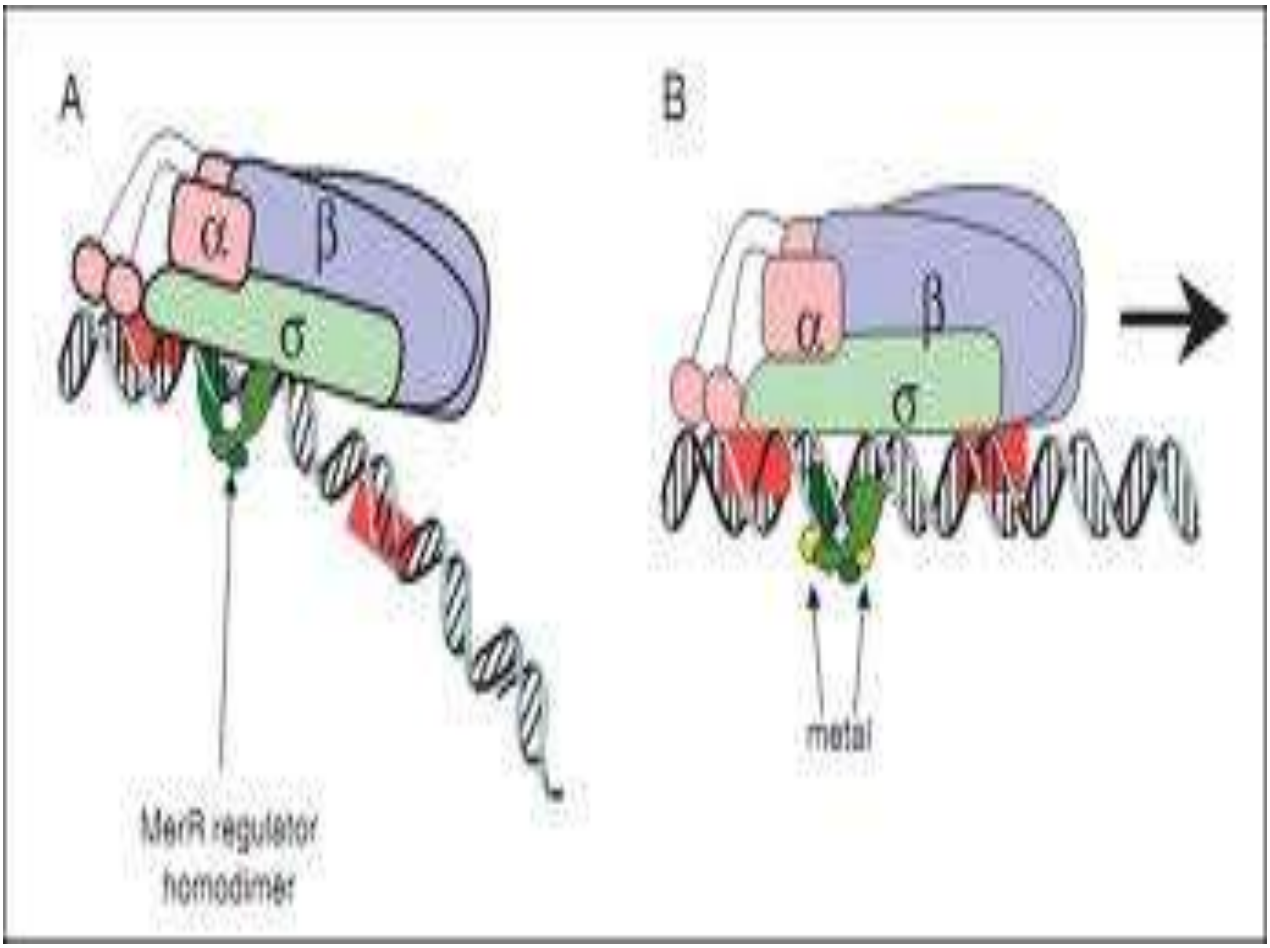
5- The genes that encode the proteins used to transport and degrade lactose from an operon. انظر صـ199

With best wishes
Genetics Family

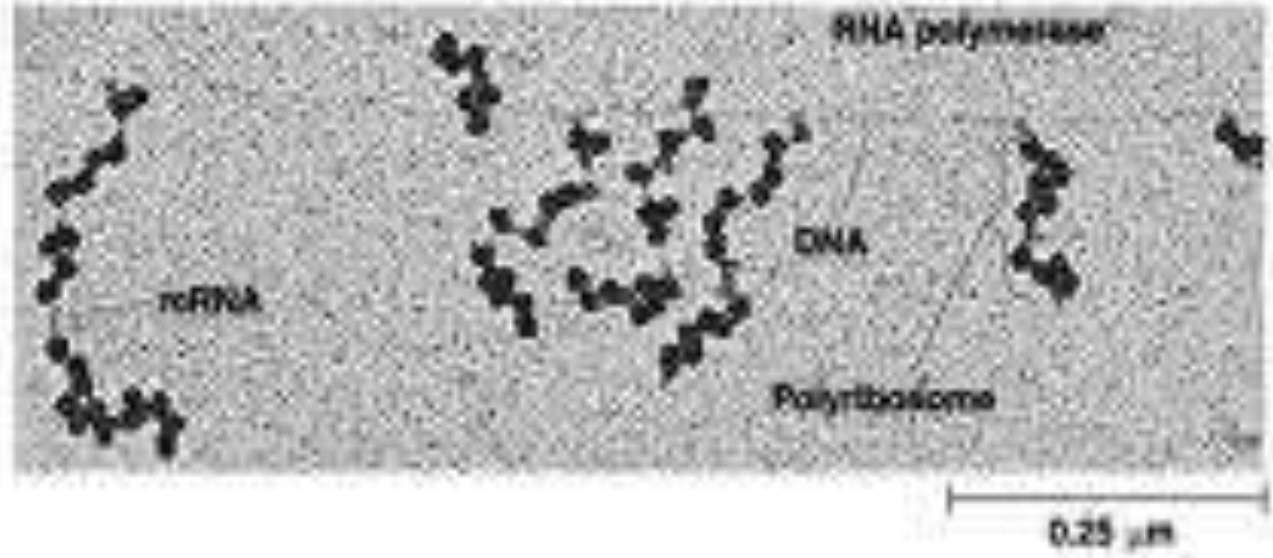
1-The four major steps of transcription

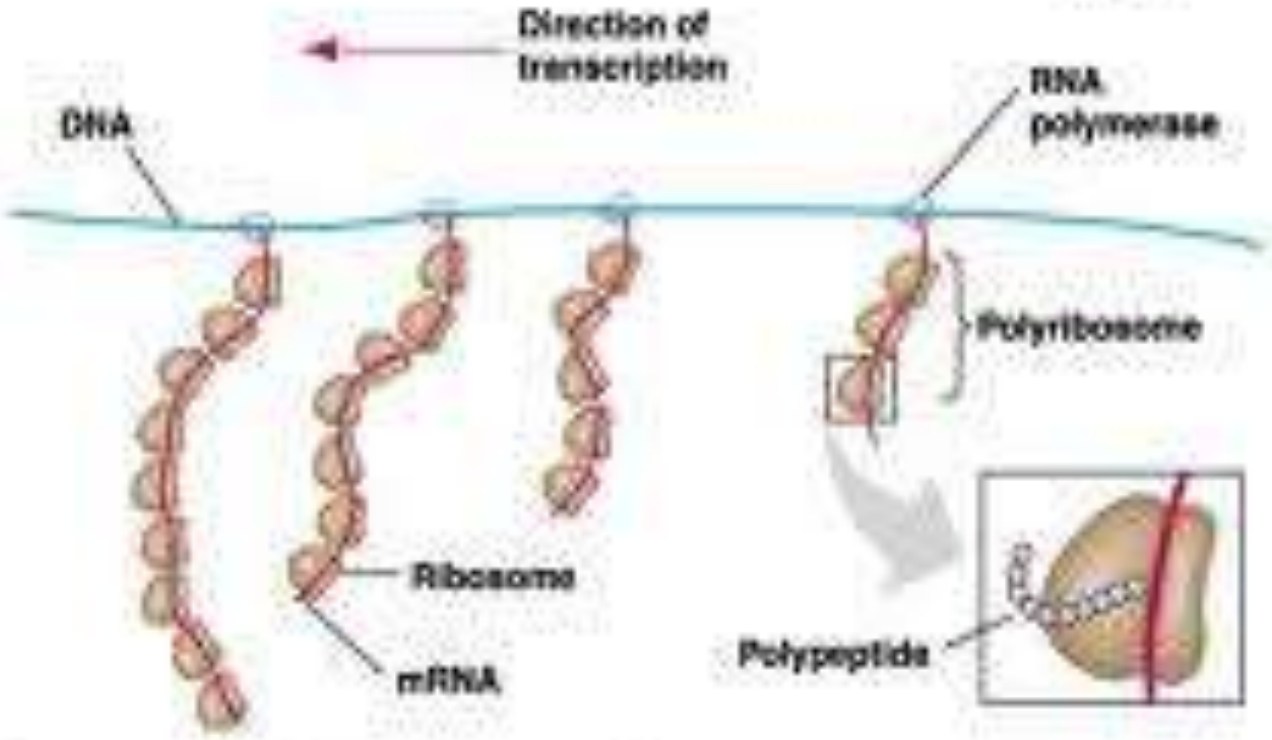


2- The structure of RNA polymerase and the regions in the promoter binding.



3-Multiple rounds of transcription and translation take place at the same time


RNA polymerase
DNA
rcRNA
Polyribosome
0.25 μm


Direction of transcription
DNA
RNA polymerase
Polyribosome
Ribosome
mRNA
Polypeptide