Topic 6: Expression of biological information

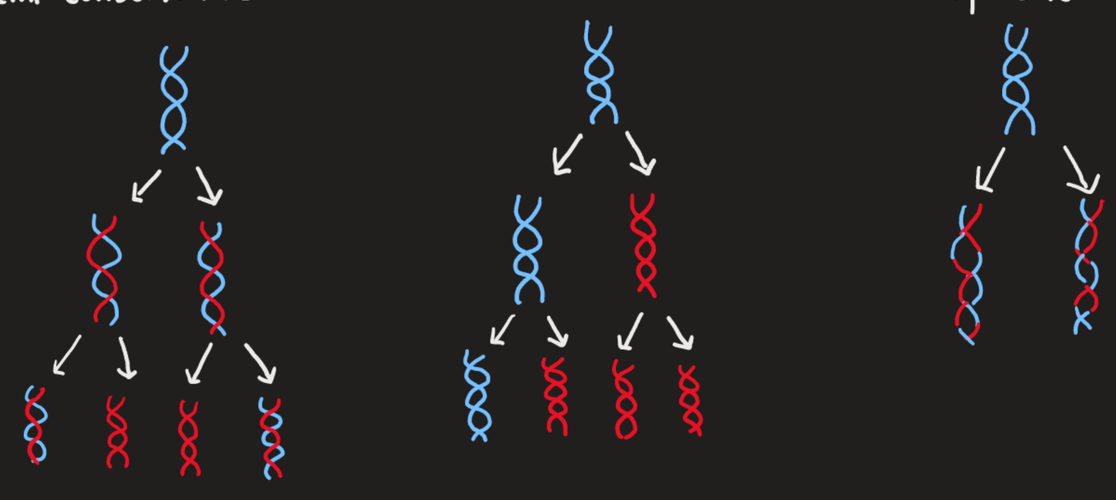
23 November 2022 23:08

6.1

1. Central dogma states that the flow of genetic information is from DNA to mRNA to protein.
   DNA → mRNA → protein.

6.2

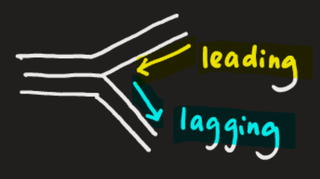
1. Semi-conservative model 2. Conservative model 3. Dispersive model.



2. Enzymes & proteins involved
   * Hi Sayang Tetaplah Percaya Dengan Diriku Love*
   (i) DNA Helicase.
   (ii) Single-stranded binding protein.
   (iii) Topoisomerase.
   (iv) DNA polymerase I.
   (v) DNA polymerase III.
   (v) DNA ligase.

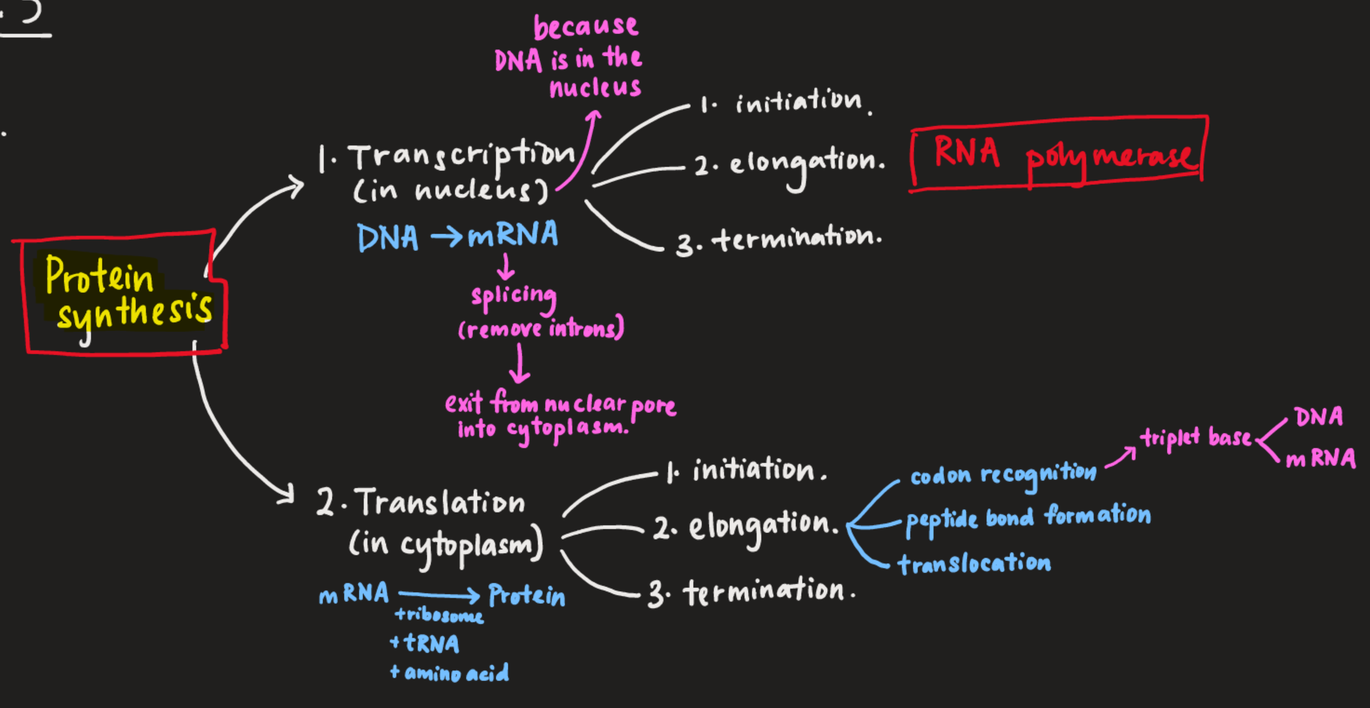
3 (i) Helicase → catalyses the unwinding of parental double helix at replication fork.
(ii) Single-stranded binding protein → bind to & stabilizes single-stranded DNA until it can be used as a template.
(iii) Topoisomerase → catalyses the relieve of the strain by breaking, swiveling and rejoining DNA strands due to the unwinding process.
(iv) DNA primase → Leading strand : catalyses the synthesizing of single RNA primer at the 5'end of the leading strand.
→ Lagging strand : catalyses the synthesizing of single RNA primer at the 5'end of each Okazaki fragment.
(v) DNA polymerase III → catalyses the continuation of synthesizing the leading strand, adding on to the primer. (leading)
→ catalyses the elongation of each Okazaki fragment, adding on to its primer. (Lagging)
(vi) DNA polymerase I → catalyses the degradation and replacement of RNA primer with DNA nucleotide. degrade RNA → replace DNA nucleotide (because we want DNA but it can only create RNA at first.)
(exonuclease)
(vii) DNA ligase → catalyses the annealing of Okazaki fragments.

4. Leading strand : move towards replication fork.
   Lagging strand : move away from replication fork.



6.3

1.



2.

DNA	ATC	GAT
mRNA	UAG	CUA
tRNA	AUC	GAU

3.
Start codon : AUG (Methionine)
Stop codon : UAA, UAG, UGA

4. Transcription
Stage① Initiation
- RNA polymerase binds to promoter region & unwind the double helix DNA.
- only ONE strand of the DNA acts as template.

Stage② Elongation
- RNA polymerase moves along the template.
  ↓
  catalyse addition of free RNA nucleotide
- elongation of RNA transcript (mRNA) is in 3' to 3' direction.

Stage③ Termination
- process proceeds until RNA polymerase transcribes a terminator sequence in the DNA.
- mRNA is released from the template and DNA is then released.

5. In eukaryotic cells, mRNA is modified after transcription.
   (✓ nucleus)
- RNA splicing removes introns and join exons to create an mRNA molecule. (with coding sequence ONLY)

Introns : non-coding regions
Exons : coding regions
Catalysed by spliceosome

6. Translation
- process of translating the genetic code (codon) carried by mRNA to synthesise protein.