# Objective Questions on Cell & Mol. Biol. and Advanced Technique

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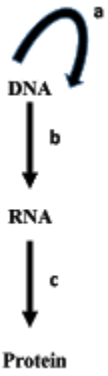
1) In most organisms, DNA is a genetic material which stores the information template for the synthesis of RNA and subsequently protein. Name the processes a, b, c represented in the figure:




Central Dogma of Molecular Biology

2) In some viruses, RNA serves as the storage of genetic materials and DNA is synthesized from RNA by the enzyme known as:
a) DNA synthetase
b) DNA polymerase
c) Reverse transcriptase
d) DNA convertase

3) Which of the following process does not occur in prokaryotes

a) Replication
b) Transcription
c) Translation
d) Splicing

4) Phosphodiester bond links two nucleotides together and maintains polarity which refers to:
a) the 5' hydroxyl group of pentose of one nucleotide to 3' hydroxyl group of adjacent nucleotide through a phosphate group.
b) 5' end with a phosphate group and 3'end with hydroxyl are free.
c) addition of new nucleotide occurs via attachment of 5' phosphate group of new nucleotide to 3' phosphate group of an existing chain.
d) All of the above

5) DNA helices exist in various form. Which of the following form is predominantly expressed in cells
a) A-Helix
b) B- Helix
c) E-Helix
d) Z-Helix

6) Which one of the following statement is true regarding the DNA double helical structure?
a) The DNA double helix is coiled around a common axis know as the axis of symmetry
b) The hydrophilic deoxyribose-phosphate backbone of each chain is on the outside.
c) The hydrophobic nitrogen bases are stacked inside.
d) All of the Above

7) The spatial arrangement DNA helical structure creates a major and minor groove which are important for
a) kinking and bending of the helical structure
b) providing recognition and binding sites for various DNA binding proteins
c) All of Above
d) None of Above

8) Aminoglycoside antibiotics such as kanamycin, tobramycin, neomycin are known inhibitors of DNA synthesis. It contains a cyclitol ring linked to a five or six membered sugars by glycosidic bonds. These antibiotics are
a) Positively charged compound that to DNA and intercalates it.
b) Positively charged compound that binds to DNA polymerase activity.
c) Negatively charged compound to DNA and denatures it.
d) Negatively charged compound that binds to histones

9) The Chargaff rules state that the number of purines and pyrimidines are equal (A+G = T + C)in any double-stranded DNA molecules. Watson and Crick later solved the structure of DNA and nitrogen base pairings. Which of the following base pairing rule is true:
a) Adenine pairs with Guanine and Thymine pairs with Cytosine
b) Adenine pairs with Thymine and Guanine pairs with Cytosine
c) Adenine pairs with Cytosine and Guanine pairs with Thymine
d) DNA base pairing is nonspecific

10) The DNA replication occurs in a semi-conservative manner which means
a) Two daughter cells with one consisting of double helical parent DNA, others have newly synthesized DNA.
b) Two daughter cells each consisting one parental strand and one newly synthesized DNA.
c) Two daughters cells each consisting of one-half parental and another half newly synthesized DNA resulting from the crossover.
d) None of the above

11) Which of the followings are the characteristic feature of DNA replication
a) DNA replication is template directed
b) DNA replication requires short RNA primers
c) DNA replication is a highly accurate process
d) All of the Above

12) In prokaryotes, DNA replication begins at a single site that is rich in AT nucleotide sequence, where two strands unwind and separate. This ATP dependent process catalyzed by a protein
a) DnaA protein
b) Single strand binding protein
c) DNA polymerase
d) Topoisomerase

13) The short strand of …….. primer is required for the replication of DNA:
a) DNA
b) RNA
c) Histone
d) hnRNA

14) As the two strands of the double helix are separated, the positive supercoiling interferes with the further unwinding of DNA. Which of the following enzyme makes a break in a strand of DNA to release the supercoiling and facilitate the replication to occur?
a) DnaA protein
b) Single-strand binding protein
c) DNA polymerase
d) Topoisomerase

15) Which of the following enzyme has a unique ability to introduce positive and negative supercoiling of the DNA and it is the target for antibacterial agents such as ciprofloxacin/quinolones?
a) DnaA protein
b) DNA helicase
c) DNA gyrase
d) DNA polymerase

16) DNA replication is bidirectional and anti-parallel. Which of the statement is FALSE regarding the DNA replication?
a) The DNA synthesis i.e. addition of nucleotide occurs from 5'-3' position
b) The DNA synthesis is semi-continuous with continuous leading strand and discontinuous lagging strand.
c) The synthesis of leading and lagging strands occurs simultaneously
d) None of the Above

17) The DNA polymerase is a template-directed enzyme that synthesizes new complementary strand from a parent strand but it requires the existing short nucleotide sequence for its elongation. Which of the following enzyme is required for the synthesis of this primer?
a) Primase/RNA polymerase

b) RNA synthase
c) DNA synthase
d) Helicase

18) DNA polymerase III holoenzyme possesses:
a) polymerase activity only
b) 3'→ 5' endonuclease activity
c) 3'→ 5' exonuclease activity and polymerase activities
d) 5'→ 3' exonuclease activity

19) Which of the following statement is true regarding an enzyme DNA polymerase that catalyzes the elongation of complementary DNA strand?
a) DNA polymerase III is a highly processive enzyme.
b) DNA polymerase III possess 5'-3' polymerase activity required for elongation.
c) DNA polymerase III possess 3'-5' exonuclease activity important for maintaining fidelity.
d) All of the above

20) In prokaryotes, the RNA primer from the lagging strand is removed and replaced by the DNA sequence. This process is catalyzed by an enzyme ..... which possess 5'-3' exonuclease activity and 5'-3' polymerase activity.
a) DNA polymerase I
b) DNA polymerase II
c) DNA polymerase III
d) DNA polymerase IV

21) In eukaryotes, DNA polymerase alpha is a multi-subunit enzyme with different functions. They include:
a) Elongation of the leading strand
b) 3'-5' exonuclease activity
c) Initiation and synthesis of RNA primer
d) High processivity

22) In eukaryotes, which of the following DNA polymerase is highly processive and required for the elongation phase of DNA replication?
a) Pol alpha
b) Pol beta
c) Pol gamma
d) Pol delta

23) In eukaryotes, which of the following DNA polymerase is required for mitochondrial DNA replication?
a) Pol alpha
b) Pol beta
c) Pol gamma
d) Pol delta

24) Telomeres are the repetitive sequence of T's and G's that are present in the eukaryotes to protect the random cleavage from nucleases. These telomeres are synthesized by the enzyme telomerase. Which of the following are the properties of enzyme telomerase?
a) Telomerase is a reverse transcriptase enzyme
b) Telomerase consist of an RNA sequence that serves as a template
c) After completion of each cycle, telomerase translocates to 3'end of DNA to synthesize repetitive sequence.
d) All of the above

## Answers

1- a)- Replication, b-Transcription, c- Translation
2- c) Reverse transcriptase
3- d) Splicing
4- d) All of the above
5- b) B- Helix
6- d) All of the Above
7- b) providing recognition and binding sites for various DNA binding proteins
8- a) Positively charged compound that to DNA and intercalates it.
9- b) Adenine pairs with Thymine and Guanine pairs with Cytosine
10- b) Two daughter cells each consisting one parental strand and one newly synthesized DNA
11- d) All of the Above
12)- a) DnaA protein
13- b) RNA
14 d) Topoisomerase
15- c) DNA gyrase
16- d) None of the Above
17- a) Primase/RNA polymerase
18- c) 3'→ 5' exonuclease activity and polymerase activities
19- d) All of the above
20-a) DNA polymerase I
21- c) Initiation and synthesis of RNA primer
22- d) Pol delta
23- c) Pol gamma
24- d) All of the above