

Genome and Healthcare SBL720-Minor-I exam paper-16th February 2022-AKP
LHC510, 08.00-10.00 am
Total time: 2 hours

Total Questions: 40, Total marks 40,

Please note : In MCQ, Fill in the blanks, and True false, each carry (+1) one marks for correct answers, (- 0.25) minus 0.25 marks for incorrect and zero for unanswered or unattempt.

1. Which one of the following statement is INCORRECT for Z-DNA?
 - A. Left-handed DNA
 - B. Topology of major groove is flat
 - C. deep, narrow minor groove
 - D. It has 10 number of base pairs per complete turn
 - E. Distance per complete turn (pitch) is 4.5 nm.

2. Which form of DNA is described by Watson-Crick model?
 - A. A-DNA
 - B. B-DNA
 - C. Z-DNA
 - D. Triplex -DNA
 - E. Quadraplex DNA

3. Prokaryotic and eukaryotic cells, generally have which of the following features in common?
 - A. a membrane bound nucleus
 - B. a cell wall made of cellulose
 - C. ribosomes
 - D. flagella or cilia that contains microtubules
 - E. linear chromosomes made of DNA and protein

4. Which of the following types of cells utilize DNA deoxyribonucleic acid as their genetic material but do not have their DNA encased within a nuclear envelope?
 - A. animal
 - B. Plant
 - C. Archaea
 - D. Fungi
 - E. Protists

5. According to Chargaff's rule, in a DNA molecule
 - A. The amount of adenine and thymine is equal to the amount of guanine and cytosine
 - B. The amount of adenine and guanine is equal to the amount of thymine and cytosine
 - C. The amount of adenine and uracil is equal to the amount of guanine and cytosine
 - D. The amount of adenine and guanine is equal to the amount of uracil and cytosine
 - E. The amount of adenine, thymine, guanine and cytosine are all equal

6. Which is not part of Transcriptional unit in eukaryotic gene expression model
 - A. Enhancer region
 - B. Exons
 - C. Introns
 - D. Start and stop codon
 - E. Non coding sequence

7. 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. All of the above A, B, C
 - E. None of the Above A, B, C

8. which of the following are the characteristics of Type II restriction endonucleases?

1. Bifunctional enzymes with both endonuclease and methylase activity
2. Sequences of the resulting fragments are precisely known
3. Restriction requires ATP and Mg²⁺
4. Cleavage site is at or near the restriction sites

- A. 1 & 2
- B. 2 & 4
- C. 1 & 4
- D. 3 & 4
- E. 2 & 3

9. In eukaryotes, which of the following is true about introns and exons?

- A. The mature mRNA transcript only contains the introns because the exons have been spliced out.
- B. The primary RNA transcript contains both intronic and exonic regions.
- C. Intronic regions typically code for transcription factors.
- D. Exons are repeating sequences that are typically found at the distal ends of a gene.
- E. The mature mRNA transcript contains a mix of introns and exons.

10. Where would you most likely find chromatin in the beads on a string conformation?

- A) Heterochromatin
- B) Actively transcribed chromatin
- C) Silenced chromatin
- D) Deacetylated chromatin
- E) 30 nm fiber chromatin

11. With respect to histone modifications, which, if any, of the following statements, is true?

- A. histone acetylation always means adding an acetyl group to the side chain of a lysine residue.
- B. in histone acetylation each lysine of the histone is acetylated.
- C. in histone phosphorylation a phosphate group is transferred to the side chain of a serine .
- D. in histone methylation it is the DNA that coils around a nucleosome that is methylated, not the histone itself.
- E. none of the above

12. With respect to CpG islands in our genomic DNA, which, if any, of the following descriptions is NOT CORRECT?

- 1) frequently occurring (there are about 30,000 islands in the human genome).
- 2) long DNA sequences (typically from 100 kb to 1000 kb in length).
- 3) In a somatic cell, about 70–80% of CG dinucleotides will have a methylated cytosine, but the pattern of methylation is variable across the genome and across genes.
- 4) Approximately only 5 % of CpG islands are located in the vicinity of known transcriptional start sites.
- 5) frequently associated with transcriptional start sites.

- A. 1 & 4
- B. 2 & 4
- C. 1, 2 & 4
- D. 3 & 4
- E. 2, 3 & 4

13. Chromosome aberrations does not include

- A. Replications
- B. inversion
- C. deletion
- D. duplication
- E. translocations

14. Which of the following is the right sequence of steps in Polymerase Chain Reaction (PCR)?
A) Denaturation of DNA followed by annealing of primers and primer extension
B) Annealing of primers followed by denaturation of DNA and primer extension
C) Primer extension followed by denaturation of DNA and annealing of primers
D) Denaturation of DNA followed by primer extension and primer annealing
E) Denaturation of DNA followed by renaturation of DNA and primer annealing

15. Which is most correct about the approximate numbers?
(A). genome ~ 30,00,000 genes, transcriptomes ~ 1,00,000 transcripts and proteome ~ 10,000 proteins
(B). genome ~ 30,00,000 genes, transcriptomes ~ 10,000 transcripts and proteome ~ 1,00,000 proteins
(C). genome ~ 30,000 genes, transcriptomes ~ 10,00,000 transcripts and proteome ~ 10,000 proteins
(D). genome ~ 30,000 genes, transcriptomes ~ 1,00,000 transcripts and proteome ~ 10,00,000 proteins
(E). genome ~ 30,000 genes, transcriptomes ~ 1,00,000 transcripts and proteome ~ 10,000 proteins

16. Which of the following statements is true about the metaphase?
A. A chromosome is the thickest during the metaphase
B. A chromosome is the shortest during the metaphase
C. A chromosome is the longest during the metaphase
D. Both (A) and (B)
E. Both (A) and (C)

17. Which of the following statements is true of DNA damage?
A. All DNA damage results in diseases such as cancer
B. Most DNA damage is repaired by the cell
C. All DNA damage is caused by physical, chemical or biological agents
D. Most DNA damage is advantageous to the cell
E. All DNA damage occur only by endogenous sources

18. Human Genome project started in 1990, took 15 years to get complete genome about 3.2 billion base pair DNA, it shows about 33 % coding region and and rest of it junk (repetitive DNA). True or False

19. Mouse is just 6 inch long, human body is 60 inch in height. That's why mouse will have 10 times less gene than human. True or False

20. If the mutation has a negligible effect on the function of a gene, it is known as a _____

- A. Silent mutation
- B. Frame shift mutation
- C. Substitution mutation
- D. Insertion mutation
- E. Functional mutation

21. Explain the two experiments that suggested that genes are made of DNA. (1 Mark)

22. Explain contributions of Prof Frederick Sanger and his methods in DNA sequencing. (1 Mark)

23. Briefly explain the applications of genomics to medicine, agriculture and farm animals. (1 Mark)

24. Define: Alternative splicing. (1 Mark)

25. Explain Classification of Viruses, provide few structures of Viruses. (1 Mark)

26. Define Mosaicism. (1 Mark)
27. What are the various factors that control of gene expression? (1 Mark)
28. Explain words gene and nucleosome. (1 Mark)
29. What is meant by chromatin remodelling? (1 Mark)
30. Illustrate few examples of histone modifications. (1 Mark)
31. What is the functions and implications of DNA methylation in mammalian cells. (1 Mark)
32. Compare Klenow polymerase and sequenase enzyme. (1 Mark)
33. What are the sources can cause damage to DNA. (1 Mark)
34. Explain DNA damage , Oxidative damage. (1 Mark)
35. Expalin Trisomies of Chromosomes. (1 Mark)
36. What are the different types of Structural Chromosomal Abnormalities. (1 Mark)
37. Expalin Base excision repair (BER). (1 Mark).
38. What is meant by endonuclease? (1 Mark).
39. Explain role of DNA polymerase. (1 Mark).
40. Explain Nonhomologous end joining (NHEJ). (1 Mark).