

This examination paper consists of 4 pages.

Appendices: none

Permitted materials: none

The number of answers for each question must match the number shown in brackets to the right.

1. **The genetic code**

- consists of 68 codons
 - has 3 stop codons
 - specifies 24 amino acids
 - is used in translation of mRNA
 - is used in transcription
- (2)

2. **An α -helix**

- is a DNA structure
 - is a protein structure
 - winds to the left
 - winds to the right
 - is stabilized by hydrogen bonds
 - is stabilized by disulfide bonds
- (3)

3. **RNA synthesis**

- requires deoxynucleotides
 - requires UTP (uridine triphosphate)
 - requires pyrophosphate
 - proceeds in 3'→5' direction
 - requires an RNA polymerase
- (2)

4. **Minisatellites**

- are found near the ends of eukaryotic chromosomes
 - are interspersed genome-wide repeats
 - are widely used in DNA fingerprinting
 - contain many genes
 - are usually smaller than 1000 bp
- (1)

5. **Base stacking**

- occurs in DNA
 - does not occur in RNA
 - occurs in DNA-binding proteins
 - destabilizes molecules
 - involves hydrophobic interactions
- (2)

6. Retrotransposition

- requires a reverse transcriptase
 - can be replicative or conservative
 - involves a DNA copy of the transposon
 - is only found in eukaryotes
 - involves a transposase enzyme
- (3)

7. Nucleosomes

- are features of bacterial genomes
 - are composed of 6 histones
 - are involved in packaging of DNA
 - contain ribosomal RNA
 - are only found in eukaryotes
- (2)

8. DNA

- is a polynucleotide
 - contains ribose
 - contains a pentose
 - contains pyridines
 - contains purines
 - consists of two parallel strands
- (3)

9. Telomeres are located

- at the ends of ribosomal RNA
 - in centromeres
 - in the middle of chromosomes
 - at the ends of chromosomes
 - in nuclear DNA
 - in mitochondrial DNA
 - in prokaryotes
 - in eukaryotes
- (3)

10. Mitochondrial genomes

- are always circular
 - have a high gene density
 - contain genes involved in photosynthesis
 - occur in multiple copies per cell
 - have about the same size in all organisms
- (1)

11. Bacterial 'chromosomes'

- are compacted by histones
 - are supercoiled
 - are associated with HU proteins
 - are usually larger than 5×10^6 bp
 - contain no genome-wide repeat sequences
- (2)

12. **Retroelements**

- are also called DNA transposons
 - are only found in eukaryotes
 - are transcribed into RNA
 - are tandemly repeated sequences
 - always contain long terminal repeats
- (2)

13. **A crossing over**

- occurs in mitosis
 - occurs in meiosis
 - involves four chromatids
 - was discovered by Gregor Mendel
 - is a rare event
 - generates recombinants
- (3)

14. **Expressed sequence tags (ESTs)**

- are sequences of protein coding genes
 - are sequences of ribosomal RNA genes
 - are used in STS (sequence tagged site) mapping
 - are usually larger than 5000 bp
 - are used in genetic mapping
- (2)

15. **Chain termination sequencing**

- requires four dideoxynucleotides
 - requires a DNA polymerase
 - requires two primers
 - requires a PCR machine
 - requires fluorescent dyes
 - requires a single-stranded template
- (3)

16. **Exons**

- are frequent in bacterial genomes
 - are always flanked by two introns
 - are extragenic sequences
 - contain complete open reading frames
 - are translated into an amino acid sequence
- (1)

17. **Transcriptomes**

- comprise all RNAs in a cell
 - comprise only mRNAs
 - can be characterized in microarrays
 - are not found in bacteria
 - do not change over time
- (2)

18. Open reading frames

- are protein sequences
 - are DNA sequences
 - specify polypeptides
 - can be detected by computer programs
 - are terminated by ATG codons
- (3)

19. cDNAs

- contain introns
 - are complementary to mRNA sequences
 - can be used in microarrays
 - are synthesized by reverse transcriptases
 - contain only the coding sequences of a gene
- (3)

20. Microsatellites

- are interspersed genome-wide repeats
 - are usually shorter than 150 bp
 - are not in the same position of the genome in different individuals
 - are often found in retroviruses
 - can easily be amplified by PCR
- (2)