

This examination paper consists of 4 pages.

Appendices: none

Permitted materials: none

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

1. Pseudogenes

- do not contain introns
- are only expressed at certain developmental stages
- are mutated but functional genes
- are not found in bacteria
- are non-functional genes
- are likely to degenerate in evolution (2)

2. DNA supercoiling

- is involved in packaging of DNA
- is not found in eukaryotes
- does not require enzymes to occur
- promotes transcription and replication
- can be positive or negative (3)

3. Centromeres

- are found in bacteria
- regulate gene expression
- are found in most proteins
- are found at the ends of chromosomes
- consist of DNA and proteins (1)

4. A nucleoid

- contains histones
- contains DNA
- stains strongly with DNA staining dyes
- is found in eukaryotes (1)

5. An open reading frame (ORF)

- includes intron sequences
- begins with a translation start codon
- starts at the beginning of mRNAs
- is a protein motif (1)

6. A genomic library

- contains only the sequences of the genes in a genome
- contains only the sequences in between the genes in a genome
- can be used in sequencing of DNA
- contains only the sequences of expressed genes
- contains the complete sequence of a genome (2)

7. Microsatellites

- are genome-wide repeats
- are common in bacterial genomes
- are DNA transposons
- are retroelements
- have a length of up to 300 bp
- are used in DNA profiling
- can be used as DNA markers (2)

8. The human genome

- has a size of $\approx 2 \times 10^9$ bp
- contains at least 40,000 genes
- consists of 22 chromosomes
- contains more than 2 million retroelements (1)

9. Recombination frequencies

- are used to place markers on a genome map
- were introduced by Gregor Mendel in the 19th century
- are used in physical mapping of a genome
- depend on the distance of DNA markers on a chromosome
- are usually high for markers on different chromosomes (2)

10. RNA transposons (retroelements)

- transpose conservatively
- consist of RNA
- occur only in eukaryotes
- contain always a DNA polymerase gene
- are genome-wide repeats (2)

11. Viroids

- consist of DNA
- consist of RNA
- consist of RNA and proteins
- are longer than 500 nucleotides
- are circular molecules (2)

12. Reverse transcriptases

- are DNA polymerases
- are RNA polymerases
- are encoded in viral genomes
- are found in bacteria
- synthesize RNA (2)

13. Organelle genomes

- are always circular
- occur in multiple copies
- code for most of the proteins in an organelle
- do not contain introns
- contain operons (2)

14. A codon bias

- is found in all organisms
- is commonly found for methionine and tryptophan
- is found in ribosomal RNAs
- is found in intron sequences
- can be used to identify genes in a genome sequence (2)

15. Genes can be inactivated by

- transposon tagging
- mass spectrometry
- homologous recombination
- RNA interference
- phage display (3)

16. Operons

- are repressor-binding sites
- are DNA sequences
- contain more than one gene
- contain more than one promoter
- are not found in eukaryotes (2)

17. Chain termination sequencing

- requires dideoxynucleotides
- has been developed in the 1970s
- yields sequences of more than 1000 bp
- requires double-stranded DNA
- requires fluorescent dyes (2)

18. Microarrays

- are used to analyze transcriptomes
- are used to analyze genomes
- are used to analyze metabolomes
- contain RNA sequences
- contain DNA sequences (2)

19. Nucleosomes

- are present in archaeobacteria
- consist of DNA and at least 10 proteins
- contain histones
- are not present in telomeres
- are not present in centromeres
- are not present in heterochromatin
- are part of 30 nm fibers (2)

20. The yeast two hybrid system

- is used to identify DNA-protein interactions
- is used to identify RNA-protein interactions
- is used to identify protein-protein interactions
- requires a genomic library
- uses an inducible promoter (2)

21. Telomers

- consist of minisatellites
- are found in bacteria
- are usually less than 1000 bp in size
- contain no genes
- are found in the middle of chromosomes (2)

22. β -sheets are stabilized by

- hydrophobic bonds
- ionic bonds
- hydrogen bonds
- covalent bonds
- all of the above
- none of the above (1)

Total number of correct answers: (41)