



BIOLOGY

BOOKS - OSWAAL BIOLOGY

(KANNADA ENGLISH)

MOLECULAR BASIS OF INHERITANCE

Topic 1 Very Short Answer Type Question

1. Why eukaryotic genes are called split genes?



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2. Electrophoresis is an essential procedure that needs to be employed in genetic fingerprinting. Why?



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3. How does repressor protein prevent the transcription of structural genes ?



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4. Define transcription?



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5. Why DNA replication is called semiconservative ?



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6. Nucleotide ratio in RNA is highly variable .
Give reason .





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7. Name the process by which RNA is synthesized from DNA?



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8. What are introns?



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9. The ratio of adenine to thymine and guanine to cytosine is always unity in a DNA molecule.



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10. Name the pentose sugar present in RNA.



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11. In a nucleus, the number of RNA nucleoside triphosphates is 10 times more than the number of DNA nucleoside triphosphates, still only DNA nucleotides are added during the DNA replication, and not the RNA nucleotides. Why?



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12. During in vitro synthesis of DNA, a researcher used 2', 3' - dideoxy

cytidinetriphosphate as raw nucleotide in place of 2'-deoxy cytidine triphosphate other conditions remaining as standard. Will further polymerisation of DNA continue upto the end or not? Explain.



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13. Name the components of a nucleoside?



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14. Name the purines of DNA?



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15. Name the pyrimidines of DNA?



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16. Who proposed the double helix model for DNA?



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17. Mention the nitrogen base present in RNA but not in DNA.



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18. Mention the nitrogen base present in DNA but not in RNA



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19. Who discovered the semi conservative nature of DNA replication?



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20. What are the two components of adenosine?



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21. Heterochromatin is transcriptionally inactive when compared to euchromatin. Give reason.



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22. Write the concept of central dogma.



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23. What is the distance between two base pairs in DNA?



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24. How many base pairs are present in one full turn of DNA helix?



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25. Name the enzyme that joins the short pieces in the lagging strand during synthesis of DNA?



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26. Name one organism where RNA is the genetic material?



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27. When DNA replication does takes place in cell cycle of eukaryotes?



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28. What do you understand by the semi-conservative replication of DNA?



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29. How do the tRNA molecules appear in

(i) Two dimensional, and

(ii) three dimensional views?



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30. In which direction, is the new strand of DNA synthesised during DNA replication.



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31. What do you call the kind of mutation in which a single base is added to a base strand?



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32. Mention the role of DNA polymerase other than polymerizing deoxyribonucleotides during DNA synthesis?



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33. Name the process in which the unwanted mRNA regions are removed and the wanted regions are joined.



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34. What is the function of ligase?



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35. A DNA molecule in which both strands have radioactive thymidine is allowed to duplicate in an environment containing non-radioactive thymidine. What will be the correct number of DNA molecule that contain some radioactive thymidine after 3 duplications?



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36. What is the base pairing rule of Watson and crick





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37. What are the raw materials for DNA synthesis?



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38. Name the RNA that carries information about the sequence of amino acids in a polypeptide.



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39. What is the function of tRNA?



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40. Name the site of protein synthesis.



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41. Name the enzyme involved in the continuous replication of DNA strand. Mention the polarity of the template strand.



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42. What are histones?



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43. What is origin of replication?



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Topic 1 Short Answer Type Questions I

1. Mention the four nitrogenous bases in DNA.



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2. Name the four nitrogen bases found in mRNA



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3. Name the types of RNA.



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4. Group the following as nitrogenous bases and nucleosides: Adenine, Cytidine, Thymine, Guanosine, Uracil, and Cytosine.



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5. If a double stranded DNA has 20% of cytosines, calculate the percent of adenine in the DNA.



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6. If the sequence of one strand of DNA is written as follows: 5'ATGCATGCATGCATCGCATGCATGCA TGC-3' Write down the sequence of complementary strand in 3' → 5' direction.



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7. What changes happen during processing of RNA?



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8. What is a transcription unit?



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9. Define genetic material.



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10. How does DNA express its biological information?



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11. What is the function of non-sense strand of DNA?



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12. In which direction are the leading and lagging strands synthesized during DNA replication? Name the enzyme responsible for this process.



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13. How do histones acquire positive charge?



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14. Why DNA is considered a better hereditary material than RNA?



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15. Draw a labelled diagram of a transcription unit.



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16. A short length of a DNA molecule contains 120 adenine and 120 cytosine bases. What is the total number of nucleotide in that DNA fragment?



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17. A DNA contains 20,000 base pairs. How many nucleotides would be present in it?





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18. Draw a schematic representation of the structure of a transcription unit and show the following in it

- (i) Direction in which the transcription occurs
- (ii) Polarity of the two strands involved
- (iii) Template strand
- (iv) Terminator gene



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19. Mention the function of promoter gene in transcription.



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20. Why RNA is not a suitable genetic material in comparison with DNA ? Explain



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21. Differentiate between euchromatin and heterochromatin.



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22. What do you understand by the antiparallel arrangement of DNA strands?



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23. What is a promoter in a transcription unit?

Where is it located in DNA with reference to the structural gene?



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24. What is a terminator? What is its significance in transcription?



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25. What is a nucleotide? Give an example.



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26. Mention 4 differences between RNA and DNA.



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27. Write a note on central dogma of molecular biology.



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28. Differentiate between continuous and discontinuous synthesis of DNA.



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Topic 1 Short Answer Type Questions Ii

1. With the help of suitable diagrams, explain the process of transcription in bacteria.



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2. Describe! briefly the Watson and Crick model of DNA.



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3. Describe the Semiconservative method of DNA replication.



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4. You are repeating the Hershey-Chase experiment and are provided with two isotopes : ^{32}P and ^{15}N (in place of ^{35}S in the original experiment). How do you expect your results to be different?



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5. What background information did Watson and Crick have made available for developing a model of DNA ? What was their contribution ?



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6. How did Hershey and Chase prove that DNA is the hereditary material?



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7. How did Griffith explain the transformation of R-strain (non-virulent) Bacteria into S-strain (virulent)?



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8. Explain how Macleod, Mc Carty and Avery determined the biochemical nature of the molecule responsible for transforming R strain bacteria into S-strain bacteria.



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9. Explain the post transcriptional events in eukaryotes.



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10. Give reasons for

(i) Both strands of DNA are not copied during transcription.

(ii) Transcription and translation in bacteria can be coupled.



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11. Differentiate between the process of transcription in prokaryotes and eukaryotes.



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12. Draw a labelled schematic sketch of replication fork of DNA. Explain the role of the enzymes involved in DNA replication.



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13. (a) Draw a schematic representation of the structure of a transcription unit and show the following in it : (i) Direction in which transcription occurs (ii) Polarity of the two strands involved (iii) Template strand (iv) Terminator gene.

(b) Mention the function of promoter gene is transcription.



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14. Describe the initiation process of transcription in bacteria.



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15. Who revealed biochemical nature of transforming principle ? How was it done?



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16. The base sequence in one of the strands of DNA is TAGTCATGAT

Give the sequence of its complementary strand.



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17. The base sequence in one of the strands of DNA is TAGTCATGAT

How are these base pair held together in a DNA molecule ?



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18. The base sequence in one of the strands of DNA is TAGTCATGAT

Explain the base complementarity rules. Name the scientist who framed this rule.



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19. How is nucleosome formed? Draw a diagram of the nucleosome.



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20. Define the terms splicing, capping and tailing.



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21. Where and when does replication occur?



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22. How are these base pairs held together in a DNA molecule?

Explain the base complementarity rules. Name the scientist who framed this rule.



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Topic 1 Long Answer Type Questions

1. Draw the schematic structure and explain the different regions of a transcription unit.



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2. What are the salient features of double helical structure of DNA?



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3. Describe the double helix model of DNA with a labelled diagram



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4. Describe the semiconservative method of DNA replication .



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5. Explain how Macleod, Mc Carty and Avery determined the biochemical nature of the molecule responsible for transforming R strain bacteria into S-strain bacteria.



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6. Describe the transcription of RNA from DNA.



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7. Represent diagrammatically Hershey-Chase experiment . What did this experiment prove ?



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8. Draw the schematic structure and explain the different regions of a transcription unit.



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9. Describe the transcription of RNA from DNA.



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10. Give the structure of DNA molecule.



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Topic 2 Very Short Answer Type Question

1. Mention the function of codon UAG.



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2. Give reason - Genetic code is degenerate.



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3. Name the enzyme produced by lac Z gene present in lac operon.



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4. Give reason - Genetic code is universal.



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5. Mention the contribution of genetic maps in human genome project.



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6. Why hnRNA is required to undergo splicing?



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7. Mention the two additional processing which hn RNA needs to undergo after splicing so as to become functional.



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8. When and at what end does the tailing' of hn RNA take place?



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9. Mention two functions of the codon AUG.



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10. Which base triplets code for the amino acid phenylalanine?



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11. The amino acid arginine has 6 mRNA codons :

CGU, CGC, CGA, CGG, AGA and AGG. Give the DNA codons for it.



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12. What do you call a noncoding intervening nucleotide sequence in a eukaryotic gene?



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13. Who proposed the operon model?



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14. What is codon?



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15. What is an anticodon?



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16. What is a genetic code?



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17. Name the three non-sense codon?



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18. How many bases code for one amino acid?



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19. Name the amino acids which have only one codon each.



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20. The genetic code is non-overlapping and degenerate. Is it so?



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21. Is there any base triplet that codes for more than one amino acid?



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22. A polypeptide of 600 amino acids will be coded for by a linear-sequence of how many bases in (a) mRNA and (b) DNA?



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23. Of the 64 possible code triplets, how many code for amino acids and how many for stop signals ?



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24. Are there any base triplets that code for amino acids and also for start signals? Name these.



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25. Khorana and his colleagues synthesized an RNA molecule with repeating sequence of AG nitrogenous bases (AG AGAGAGAG AG). It produced a tetrapeptide with alternating sequence of valine and tyrosine. It proves that codon for valine and tyrosine are?



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26. A change in a sequence of DNA occurs so that the mRNA codon reads AUC rather than AUU. Both of these codes for the amino acid is leucine. Argue that this is not a mutation.



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27. While an mRNA strand is being translated in the ribosome subunit, the triplets in sequence were UAC and UAG. One of them

codes for tyrosine, What is the significance of the other? Pick out the codon and specify.



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28. Name the amino acid first coded in protein synthesis?



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29. What are the termination codon on mRNA?



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30. Name the inducer of the lac-operon concept?



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31. What are variable number of tandem repeats or VNTRs?



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32. What is translation?



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33. Define Cistron?



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34. Name the types of RNA.



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35. What is polycistronic mRNA?



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36. Would it be appropriate to use DNA probes such as VNTR in DNA fingerprinting of a bacteriophage?



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Topic 2 Short Answer Type Question I

1. tRNA is an adaptor molecule. Comment



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2. List the components of Operon concept.



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3. Name any two enzymes produced by the structural genes of Lac-operon.



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4. List any four applications of DNA fingerprinting.



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5. List any four characters of genetic code?



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6. Define transcription and translation.





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7. Differentiate between sense and antisense strands of DNA.



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8. A single base mutation in a gene may not 'always' result in loss or gain of function. Do you think the statement is correct? Defend your answer.



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9. A low level of expression of lac operon occurs at all the time. Can you explain the logic behind this phenomenon?



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10. What are the functions of (i) methylated guanosine cap, (ii) poly-A"tail" in a mature mRNA?



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11. Comment on the utility of variability in number of tandem repeats during DNA fingerprinting.



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12. Give an account of mRNA.



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13. Differentiate between Exons and Introns.



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14. How is a polypeptide chain synthesis terminated during protein synthesis?



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15. What are structural genes? Name the three structural genes present in the lac operon of

Escherichia coli?



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16. What do you understand by UTR ? Mention its role in translation.



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17. Enumerate the goals of human genome project.



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18. Three codons on mRNA are not recognized by transfer RNA. What are they? What is the general term used for them? What is their significance in protein synthesis?



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19. Why is it essential that tRNA binds to both an amino acid and an mRNA codon during protein synthesis?



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20. What will these DNA codons be translated into TAC, AAA, ATC?

(b) What are the DNA codons that would have transcribed these RNA codons AUGUUUUAG?



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21. Two petitioner fathers filed case against a lady claiming to be the father of her only

daughter. How could this case be settled identifying the real biological father?



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22. Draw the structure of the initiator tRNA adaptor molecule.



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23. Why is tRNA called an adaptor molecule?



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24. One of the codons on mRNA is AUG. Draw the structure of tRNA adaptor molecule for this codon. Explain the uniqueness of this tRNA



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25. Explain the dual function of AUG codon. Give the sequence of bases it is transcribed from and its anticodon.



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26. How can DNA segments, separated by gel electrophoresis, be visualized and isolated?



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27. What is satellite DNA in a genome ? Explain their role in DNA fingerprinting .



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Topic 2 Short Answer Type Questions Ii

1. List any six features of genetic code.



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2. What is genetic code? Explain any four of its characteristic features.



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3. Write any five application of DNA fingerprinting technique.



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4. Briefly explain the tools used in genetic engineering.



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5. Explain the steps involved in DNA finger printing?



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6. There is only one possible sequence of amino acids when deduced from a given nucleotides. But multiple nucleotide sequences can be deduced from a single amino acid sequence. Explain this phenomenon.





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7. Do you think that the alternate splicing of exons may enable a structural gene to code for several isoproteins from one and the same gene? If yes, how? If not, why so?



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8. Unambiguous, universal and degenerate are some of the terms used for the genetic code.

Explain the salient features of each one of them.



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9. Describe the structure of t-RNA.



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10. Describe the role of ribosome in translation.



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11. Define the terms splicing, capping and tailing.



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12. Explain the steps involved in the elongation of polypeptide chain during protein synthesis.



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Topic 2 Long Answer Type Questions

1. Explain the different steps involved in translation.



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2. List any six features of genetic code.



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3. List the salient features of Human Genome.



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4. Mention the steps involved in DNA fingerprinting.



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5. Enlist the goals and applications of Human Genome project.



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6. Briefly explain the process of Translation during protein synthesis?



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7. Discuss lac-operon model with the help of diagrams.



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Topic 2 Multiple Choice Questions

1. In a DNA strand the nucleotides are linked together by :

- A. Glycosidic bonds
- B. Phosphodiester bonds
- C. Peptide bonds .
- D. Hydrogen bonds.

Answer: B



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2. A nucleoside differs from a nucleotide . It lacks the :

A. Base

B. Sugar

C. Phosphate group

D. Hydroxyl group.

Answer: C



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3. Both deoxyribose and ribose belong to a class of sugars called :

A. Trioses

B. Hexoses

C. Pentoses

D. Polysaccharides .

Answer: C



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4. The fact that a purine base always paired through hydrogen bonds with a pyrimidine base leads to , in the DNA double helix :

- A. The antiparallel nature
- B. The semiconservative nature .
- C. Uniform width through out DNA.
- D. Uniform length in all DNA.

Answer: B



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5. The net electric charge on DNA and histones is :

- A. Both positive
- B. Both negative
- C. Negative and positive, respectively
- D. Zero

Answer: A



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6. The promoter site and the terminator site for transcription are located at:

A. 3' (downstream) end and 5' (upstream) end, respectively of the transcription unit.

B. 5' (upstream) end and 3' (downstream) end, respectively of the transcription unit.

C. The 5' (upstream) end.

D. The 3' (downstream) end.

Answer: B



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7. Which of the following statements is the most appropriate for sickle cell anaemia?

A. It cannot be treated with iron supplements.

B. It is a molecular disease.

C. It confers resistance to acquiring malaria.

D. All of the above.

Answer: C



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8. One of the following is true with respect to

AUG:

A. It codes for methionine only.

B. It is also an initiation codon.

C. It codes for methionine in both prokaryotes and eukaryotes.

D. All of the above

Answer: B



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9. The first genetic material could be:

A. Protein

B. Carbohydrates

C. DNA

D. RNA

Answer: D



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10. With regard to mature mRNA in eukaryotes

:

A. Exons and introns do not appear in the mature RNA.

B. Exons appear but introns do not appear in the mature RNA.

C. Introns appear but exons do not appear in the mature RNA.

D. Both exons and introns appear in the mature RNA.

Answer: B



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11. The human chromosome with the highest and least number of genes in them are respectively

A. Chromosome 21 and Y.

B. Chromosome 1 and X.

C. Chromosome 1 and Y.

D. Chromosome X and Y.

Answer: A



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12. Who amongst the following scientists had no contribution in the development of the double helix model for the structure of DNA?

A. Rosalind Franklin.

B. Maurice Wilkins

C. Erwin Chargaff.

D. Meselson and Stahl.

Answer: B



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13. DNA is a polymer of nucleotides which are linked to each other by 3-5'phosphodiester bond. To prevent polymerisation of nucleotides, which of the following modifications would you choose?

A. Replace purine with pyrimidines.

B. Remove/Replace 3' OH group in deoxy ribose.

C. Remove/Replace 2 OH group with some other group in deoxyribose.

D. Both 'b' and 'c'

Answer: D



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14. Discontinuous synthesis of DNA occurs in one strand, because :

A. DNA molecule being synthesised is very long.

B. DNA dependent DNA polymerase catalyses polymerisation only in one direction (5'-3').

C. It is a more efficient process.

D. DNA ligase has to have a role.

Answer: B



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15. Which of the following steps in transcription is catalysed by RNA polymerase?

A. Initiation

B. Elongation

C. Termination.

D. All of the above.

Answer: A



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16. Control of gene expression takes place at the level of:

- A. DNA-replication
- B. Transcription
- C. Translation
- D. None of the above

Answer: B



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17. Regulatory proteins are the accessory proteins that interact with RNA polymerase and affect its role in transcription. Which of the following statements is correct about regulatory protein?

A. They only increase expression.

B. They only decrease expression.

C. They interact with RNA polymerase but do not affect the expression.

D. They can act both as activators and as repressors.

Answer: C



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18. Which was the last human chromosome to be completely sequenced?

A. Chromosome 1

B. Chromosome 11

C. Chromosome 21

D. Chromosome x

Answer: B



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19. Which of the following are the functions of RNA?

A. It is a carrier of genetic information from DNA to ribosomes synthesizing

polypeptides.

B. It carries amino acids to ribosomes.

C. It is a constituent component of
ribosomes.

D. All of the above.

Answer: D



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20. While analysing the DNA of an organism a total number of 5386 nucleotides were found out of which the proportion of different bases were: Adenine = 29%, Guanine = 17%, Cytosine = 32%, Thymine = 17%. Considering the Chargaff's rule it can be concluded that:

- A. It is a double stranded circular DNA.
- B. It is single stranded DNA.
- C. It is a double stranded linear DNA.
- D. No conclusion can be drawn.

Answer: B



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21. In some viruses, DNA is synthesised by using RNA as template. Such a DNA is called :

A. A-DNA.

B. B-DNA

C. C-DNA.

D. R-DNA

Answer: C



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22. If Meselson and Stahl's experiment is continued for four generations in bacteria, the ratio of $^{15}\text{N}/^{15}\text{N}$: $^{15}\text{N}/^{14}\text{N}$: $^{14}\text{N}/^{14}\text{N}$ containing DNA in the fourth generation would be:

A. 1 : 1 : 0

B. 1 : 4 : 0

C. 0 : 1 : 3

D. 0: 1: 7

Answer: B



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23. If the sequence of nitrogen bases of the coding strand of DNA in a transcription unit is 5'- A T GAATG - 3', the sequence of bases in its RNA transcript would be:

A. 5' - AU GAAUG-3'.

B. 5'-UACUUAC-3'.

C. 5'-CAUUCAU-3'.

D. 5'-GUA AGUA-3'.

Answer: D



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24. The RNA polymerase holoenzyme transcribes

- A. The promoter, structural gene and the terminator region.
- B. The promoter, and the.
- C. The structural gene and the terminator regions.
- D. The structural gene only.

Answer: B



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25. If the base sequence of a codon in mRNA is 5' AUG-3', the sequence of tRNA pairing with it must be:

A. 5'-UAC-3'

B. 5' - CAU - 3'

C. 5'-AUG-3'.

D. 5' - GUA -3'

Answer: b



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26. The amino acid attaches to the tRNA at its :

A. 5'-end

B. 3'-end

C. Anti-codon site

D. DHU loop

Answer: B



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27. To initiate translation, the mRNA first binds to :

- A. The smaller ribosomal sub-unit,
- B. The larger ribosomal sub-unit
- C. The whole ribosome
- D. No such specificity exists.

Answer: A



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28. In E.coli, the lac operon gets switched on when :

- A. Lactose is present and it binds to the repressor.
- B. Repressor binds to operator.
- C. RNA polymerase binds to the operator.
- D. Lactose is present and it binds to RNA polymerase.

Answer: B



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