BIOLOGY

BOOKS - NEW JYOTHI BIOLOGY (TAMIL ENGLISH)

MOLECULAR BASIS OF INHERITANCE

Ncert Text Book Question

1. Group the following as nitrogenous bases and nucleosides:

Adenine, Cytidine, Thymine, Guanosine, Uracil and Cytosine.

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2. If a double stranded DNA has 20 percent of cytosine, calculate the percent of adenine in the DNA.

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3. If the sequence of one strand of DNA is written as follows:

5'-ATGCATGCATGCA'TGCATGCATGCATGC-3'

Write down the sequence of complementary strand in 5' - 3' direction.

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4. If the sequence of the coding strand in a transcription unit is written as follows:

5'-ATGCATGCATGCATGCATGCATGCATGC-3'

Write down the sequence of mRNA.

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5. Which property of DNA double helix led Watson and Crick to hypothesise semi-conservative mode of DNA replication? Explain.

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6. Depending upon the chemical nature of the template (DNA or RNA) and the nature of nucleic acids synthesized from it (DNA or RNA), list the types of nucleic acid polymerases.

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7. How did Hershey and Chase differentiate between DNA and protein in their experiment while proving that DNA is the genetic material?

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8. Differentiate between the followings:

a. Repetitive DNA and Satellite DNA b. mRNA and tRNA c. Template strand and Coding strand

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9. List two essential roles of ribosome during translation.

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10. In the medium where E. coli was growing, lactose was added, which induced the lac operon. Then, why does lac operon shut down some time after addition of lactose in the medium?

11. Explain (in one or two lines) the function of the followings:

a. Promoter b. tRNA c. Exons

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12. Why is the Human Genome Project called a mega project?

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13. What is DNA fingerprinting? Mention its applications

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14. Briefly describe the following: a. Transcription b. Polymorphism c. Translation d. Bioinformatics

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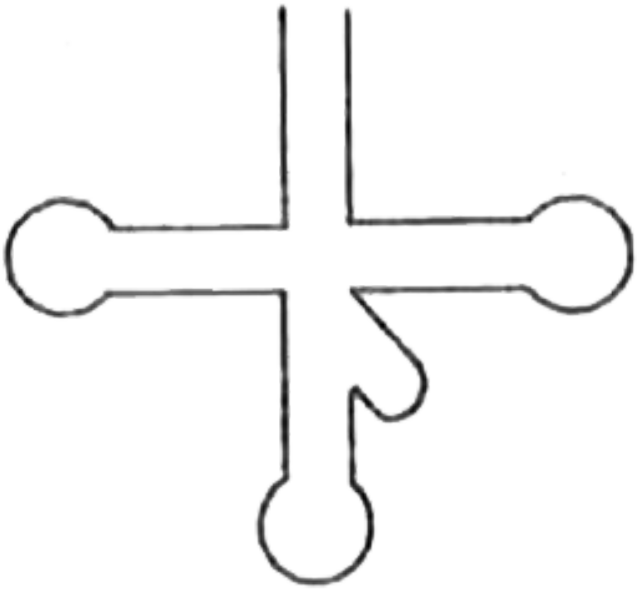
New Evaluation Type Question



1.

Identify the molecule shown here and comment on it.

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2. Capping and tailing are seen during the transcription of RNA.

a. How is this process done? b. What is the use of this process?

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3. a. Name the Indian scientist who participated in the group which established genetic code.

b. Mention the other scientists and their contribution to genetic code

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4. AUG is known as the initiation codon and UAA, UAG and UGA are known as termination codons. Then what are non-sense codons?

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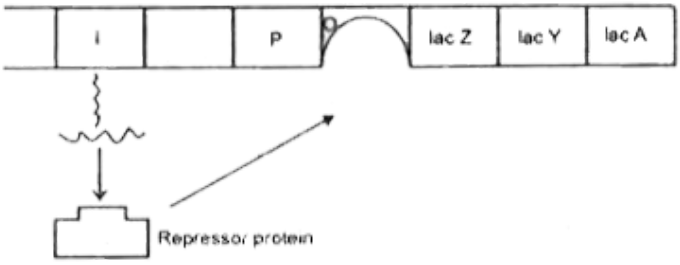
5.



The above lac operon is not working due to some reason. State the reason and redraw the figure, showing suitable changes

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6. In lac operon, there is no apo-repressor and co-repressor. But it is present in tryptophan operon. a. Who proposed tryptophan operon?

b. What is the significance of the two types of repressor given above?.

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7. Name the enzyme needed for

a. break down of lactose into glucose and galactose.

b. peptide bond formation during translation.

c. transcription of all kinds of RNA in bacteria.

d. joining okazaki fragments.

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8. Complete the flowchart showing DNA finger printing.

Isolated DNA

↓ (a)

DNA fragments

↓ (b)

Short double stranded DNA

↓ (c)

Denatured fragments

↓ (d)

Blotting of fragments

↓

Hybridisation with probe

↓

DNA hybrids

↓ (e)

DNA finger print

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9. Note the relationship between the first two words and suggest a suitable word for the 4th place.

a. Purines - Adenine and guanine :: Pyrimidines -

b. AUG - Methionine :: AUC -

c. Operon concept - Jacob and Monod :: One gene one enzyme theory -

d. DNA - Thymine and cytosine :: RNA -

e. AUG - initiation codon :: UAA -

f. Xeroderma pigmentosum - Skin cancer :: Retinoblastoma -

g. Semiconservative method of DNA replication - Watson and Crick :: Transformation experiment -

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10. Find the odd one out of the following group.

a. Thymine, Cytosine, Uracil, Adenine

b. RNA primer, DNA polymerase, DNA ligase,

DNA transcriptase

c. Initiation, Elongation, Termination, Duplication

d. AUG, UAG, UAA, UGA

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11. AUG is known as the initiation codon. Give reason

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12. Which of the following represents the "central dogma" in molecular biology?

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13. The following pictures show two personalities which biologists will not for get.

a. Who are they?

How did the world honour them for making this contribution?

c . Briefly give details of their contribution to

biology.

A 

B 

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14. The sequences of nitrogen base in an mRNA are given below. Write down the sequence of nitrogen base in its parent double strand DNA.

3' _____ 5'

AUG GAC CAG UAC UCC CUC

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15. HIV is a retrovirus. Give reason.

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16. How many non-sense codons are found in 64 codons?

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17. Define the terms cistron, recon, and muton.

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18. Distinguish between structural gene, regulatory gene and operator gene.

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19. Match the related items from B and C with column A.

A	B	C
i. Jacob & Monod	a. Genetic code	f. Diplococcus pneumoniae
ii. Griffith	b. DNA replication	g. N^{14} & N^{15}
iii. Meselson and Stahl	c. Transformation	h. Neurospora
iv. Beadle and Tatum	d. Operon concept	i. AUG
v. Nirenberg and Mathaei	e. One gene - one enzyme hypothesis	j. Structural gene

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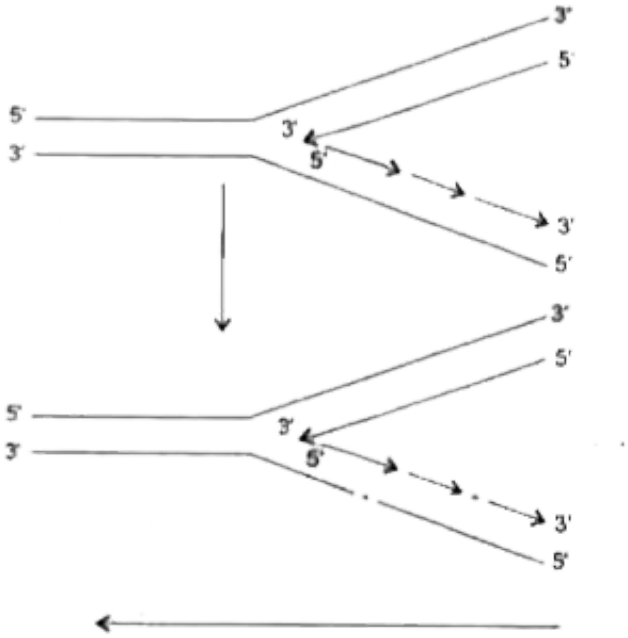
20. Copy the diagram and label the following parts.

Leading strand, okazaki fragments, lagging

strand, replication points.



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21. Give one word for the following.

a. Genes that are constantly requires for

cellular activities.

b. Sequences of nitrogen bases in mRNA containing the information for protein synthesis.

c. Transcription of DNA from RNA

d. A segment of DNA

e. Synthesis of DNA from pre-existing DNA.

f. Small genetic unit that can mutate

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22. Distinguish between transcription and reverse transcription.

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23. Amino acids are the building blocks of protein. How is a protein synthesised from amino acids?

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24. State whether the following statements are true or false. If false write the correct statement.

a. Thymine and cytosine are pyrimidines.

b. The sequence of bases in a template strand does not determine the sequence of bases in the newly synthesised strand.

c. The new strand formed in a continuous stretch of 5'-3' direction is called lagging strand.

d. m-RNA is like a clover leaf.

e. AUG is a terminating codon.

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25. Now-a-days cancer-death is increasing day by day. Is this due to the change in living habits? a. What do you think about this statement? b. Give some characters of this disease. c . It is found out that mutations in some genes cause cancer. Justify this statement.

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26. If the coding region of a gene is estimated to consist of 600 nucleotide base pairs,

a. how many amino acids would the corresponding polypeptide chain contain?

b. Justify your answer.

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27. The percentage of nucleotide A in DNA isolated from human liver is observed to be 29.6%. What is the expected percentage of T, G and C? Justify.

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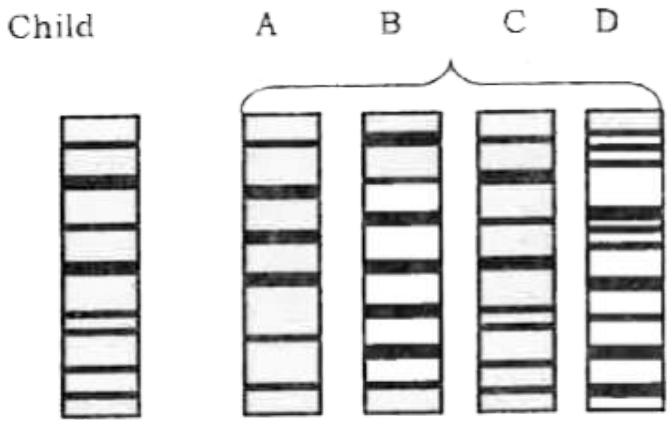
28. The following diagrams are the DNA fingerprints of a child and suspected persons as the father of the child.



a. Who do you think is the father?

b. How can you identify the father?

c. Write the principle used behind this.

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29. Match the following.

A	B
i. Human insulin	a. Treat the people having no GTH
ii. Interleukin	b. Treatment of viral infection
iii. Interferon	c. To enhance immune system
iv. Human growth hormone	d. To treat insulin dependent diabetes

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30. Who discovered first the following?

a. Recombinant DNA

b. Totipotency of cell

c. DNA fingerprinting

d. Southern blotting

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31. Define the following terms.

a. Genetic engineering

b. Plasmid

c. Vector

d. Transgenic plant

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32. Write the objectives of Human Genome project.

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33. Name the longest gene.

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34. Give one word for the following.

a. Carbon copies of a single parent

b. Vehicle used to carry gene from one cell to another.

c. Plants or animals produced by incorporating desired genes into their genotype.

d. Technology involves the production of hybrid DNA.

e. Treatment of disease using genes

f. Storehouse of DNA fragments, genes, spores, frozen sperms etc.

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35. Maternity is a fact but sometimes paternity is questionable. We can avoid the dispute connected with paternity. How is it possible? Mention the steps involved in DNA fingerprinting.

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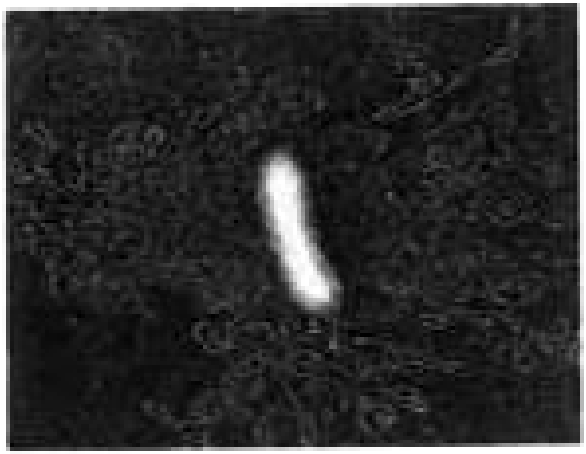
36. Identify the following figure.



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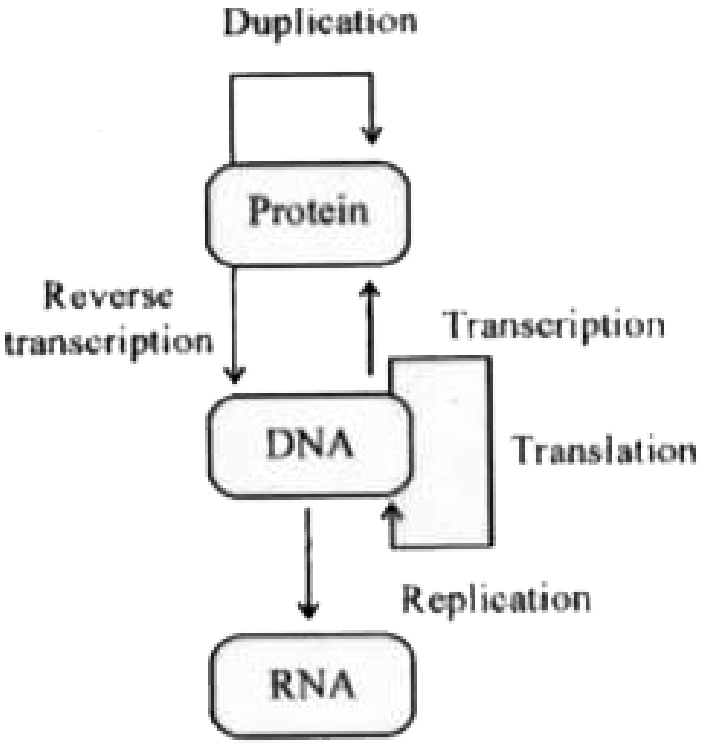
Questions From Edumate

1. Analyze the figure, find out the error and correct.



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2. Identify and differentiate between the two diagrams.

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3. The percentage of nucleotide A in DNA isolated from human liver is observed to be 29.6%. What is the expected percentage of T, G and C? Justify.

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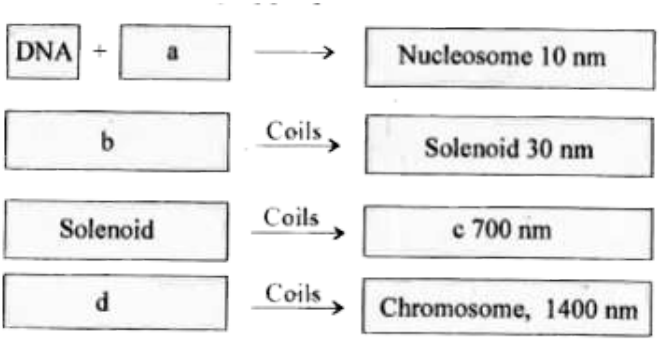
4. Fill the box a, b, c, d using appropriate words.



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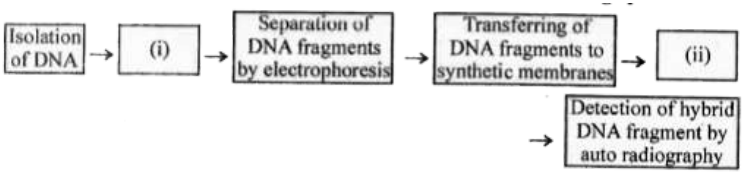
Previous Year Hse Questions

1. Steps in DNA fingerprinting are shown below.

a. Complete the flowchart given below and answer the following questions



Mention the principle behind DNA fingerprinting.

c . DNA fingerprinting is a gift to forensic science. Do you agree? Give reason.

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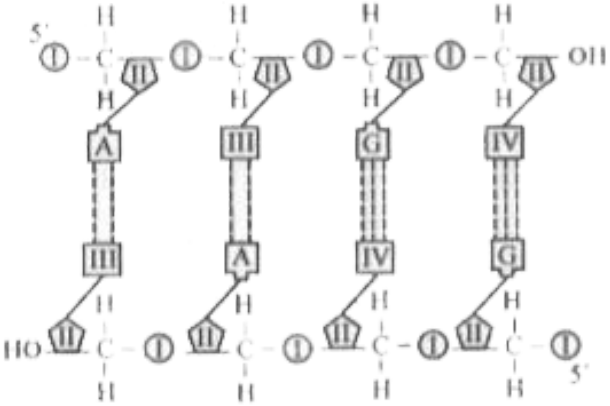
2. Diagram of a double stranded polynucleotide chain is shown below.



What do the numbers I, II, III and IV indicate?

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3. The figure given below is that of a nucleosome.

a. Name the parts labelled as (i) and (ii).

b. How many histone units constitute the main core of the nucleosome?

c. Histones are considered as basic proteins. Why?

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4. During the eukaryotic transcription, the genetic information encoded in the DNA will

be transferred to m-RNA. The m-RNA thus formed will be processed and utilized to synthesize a protein.

a. Both the DNA strands are not copied during transcription. Why?

b. What do template and coding DNA strands represent?

c. What will be the result, if RNA is not spliced before translation?

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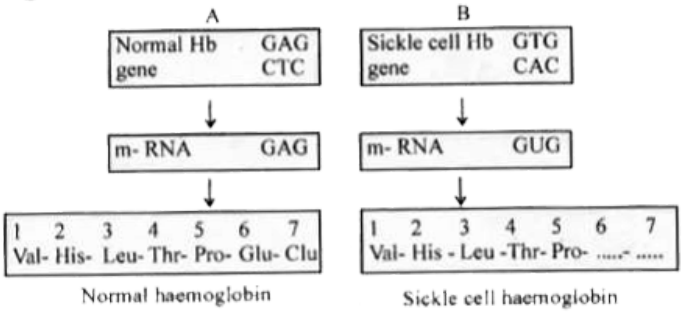
5. The flowcharts A and B given below represent the inheritance of normal haemoglobin and sickle cell haemoglobin.



a. Observe the flowchart A and complete the flowchart B.

b. Note down the genotype of a sickle cell anaemia patient and mention the symptom of the disease.

c. Mention the peculiarity of Hb^AHb^S phenotype.

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Previous Year Competitive Exam Questions

1. DNA synthesis takes place during

A. a]S phase

B. b]G_1 phase

C. c]G_2 phase

D. d]M phase

Answer: A

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2. DNA is

A. a] right handed coiling and parallel

B. b]right handed coiling and antiparallel

C. c]left handed coiling and antiparallel

D. d]left handed coiling and parallel

Answer: B

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3. The hereditary material present in the bacterium E. coli is

A. single stranded DNA

B. RNA

C. double stranded DNA

D. protein

Answer: C

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4. How is genetic recombination achieved in bacteria?

A. Transformation

B. Translation

C. Transduction

D. Conjugation

Answer: B

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5. Which of the following RNAs picks up specific amino acid from amino acid pool in the cytoplasm, to ribosome during protein synthesis?

A. a]mRNA

B. b]rRNA

C. c]tRNA

D. d]All of these

Answer: C

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6. How many base pairs are found in one turn of DNA?

A. a]11

B. b]10

C. c]9

D. d]12

Answer: B

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7. Transcription is the transfer of genetic information from

A. A]chromosome to cytoplasm

B. B]tRNA to mRNA

C. C]DNA to mRNA

D. D] mRNA to rRNA

Answer: C

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8. Semiconservative DNA replication was first demonstrated by

A. a] Taylor

B. b] Watson and Crick

C. c] Meselson and Stahl

D. d] Khorana

Answer: C

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9. The codons causing chain termination are

A. TAG, TAA, TGA

B. GAT, AAT, AGT

C. AGT, TAG, UGA

D. UAA, UGA, UAG

Answer: D

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10. The chemical knives of DNA are

A. ligases

B. endonucleases

C. transcriptase

D. polymerases

Answer: B

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11. In operon model, regulator gene

A. stops the formation of r RNA

B. stops transcription

C. prevents the movement of RNA

D. inactivates the substrate

Answer: B

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12. Transformation experiments were done by

A. Tautum

B. Zinder

C. Lederberg

D. Griffith

Answer: D

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13. Which of the following represents the "central dogma" in molecular biology?

A. a] DNA $\rightarrow$ RNA $\rightarrow$ Protein

B. b] RNA $\rightarrow$ Protein $\rightarrow$ DNA

C. c] RNA $\rightarrow$ DNA $\rightarrow$ Protein

D. d] DNA $\rightarrow$ Protein $\rightarrow$ RNA

Answer: A

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14. RNA has the bases

A. a] Adenine, Guanine, Thymine and Cytosine

B. b] Adenine, Guanine, Thymine and Uracil

C. c] Adenine, Uracil, Thymine and Cytosine

D. d] Adenine, Guanine, Uracil and Cytosine

Answer: D

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15. The codon AUG specifies

A. a] phenyl alanine

B. b] valine

C. c] tyrosine

D. d] methionine

Answer: D

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16. The terminator codons are

A. UAA, UAG and UGA

B. GUU, UAG and GCC

C. UAA, UAG and GCC

D. GUU, UAG and UGA

Answer: A

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17. Three enzymes required to break down lactose into glucose and galactose are

A. β -galactosidase, Permease and Transacetylase

B. β -galactosidase, Phosphoglucose isomerase and Pyrophosphorylase

C. Phosphoglucomutase, Permease and Glycogen synthetase

D. β -galactosidase, Phosphate-isomerase and Transacetylase

Answer: A

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18. The branch which deals with scientific enquiry of life in outer space is known as

A. palaeobotany

B. exobiology

C. investigative biology

D. cytology

Answer: B

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19. A restriction enzyme called ECORI from E. coli is expected to cleave DNA at the following sequence .

A. AAGTTC

B. GAATTC

C. AAGCTT

D. GTATATC

Answer: B

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20. Initiation codon is

A. UAA

B. AUG

C. UAG

D. GUA

Answer: B

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21. RNA polymerase I catalyzes

A. tRNA synthesis

B. mRNA synthesis

C. rRNA synthesis

D. elongation in transcription

Answer: C

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22. Okazaki fragments are

A. short DNA fragments on the lagging strand

B. short DNA fragments on the leading strand

C. the RNA primers required for initiation of DNA synthesis

D. the DNA fragment produced due to radiation action

Answer: A

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23. A mixture of heat-killed NL cells (dead cells) and live L-cells is injected into mice. NL- type cells are pathogenic, develop a disease and kill

the animals. On the other hand L-type cells are non-pathogenic. The expected result could be

A. mice develop disease and die

B. mice die without developing disease

C. mice do not develop disease and also do not die

D. 50% mice develop disease and die

Answer: A

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24. RNA polymerase which is on the promoter, moves to the structural genes to transcribe them. However, it happens when

A. there is no repressor on the operator

B. there is repressor on the operator

C. inducer binds to structural genes

D. RNA polymerase shifts first to regulator gene

Answer: A

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25. Southern blot technique is related to

A. DNA profiling

B. widal test

C. ELISA test

D. blood test

Answer: A

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26. The four nitrogen base sequence which form the code words for DNA language are

A. UTAC

B. ACTU

C. AGCU

D. ATCG

Answer: D

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27. The regulatory genes are located

A. along with the structural genes

B. in between operator and the structural genes

C. in the middle of the structural genes

D. in front of the structural genes

Answer: D

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28. The codons causing chain termination are

A. UAA, UAG, UGA

B. AUG, UAG, UGA

C. UAC, AUG, UAG

D. DCC, UAA, CAC

Answer: A

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29. Which of the character is not applicable to t-RNA?

A. It is the smallest of the RNAs

B. It acts as an adapter for amino-acid

C. It has a clover leaf like structure

D. It is the largest of the RNAs

Answer: D

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30. Southern blot technique is related to

A. DNA profiling

B. widal test

C. ELISA test

D. blood test

Answer: A

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31. The enzyme DNA polymerase was discovered by

A. Kornberg

B. Okazaki

C. Watson and Crick

D. Stahl and Meselson

Answer: A

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32. Restriction endonuclease, an enzyme used in genetic engineering is employed for

A. probing exons

B. cutting double stranded DNA

C. cutting single stranded DNA

D. join strands of DNA

Answer: B

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33. Molecular scissors which cut DNA at specific site

A. restriction endonuclease

B. ligase

C. cellulose

D. pectinase

Answer: A

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34. The DNA stands are antiparallel because of

__

A. H-bonds

B. Peptide bonds

C. Disulphide bonds

D. Phosphate-diester bonds

Answer: A

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35. The length of the DNA having 23 base pairs is

A. 78Å

B. 78.4Å

C. 78.2Å

D. 74.2Å

Answer: D

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36. Initiation codon is

A. AUU

B. AUG

C. AGU

D. GUA

Answer: B

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37. Find the correct combination that can form a nucleotide of RNA

A. Adenine + deoxyribose + phosphate

B. Thymine + ribose + phosphate

C. Uracil + deoxyribose + phosphate

D. Uracil + ribose + phosphate

Answer: D

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38. Identify the correct match between the codons and coding function

I	II
a. AUG	a. Phenylalanine
b. UAA	b. Methionine
c. UUU	c. Tryptophan
d. UGG	d. Termination

A. a = a, b = d, c = b, d = c.

B. a = b, b=d, c = a, d=c

C. a = d, b = c, c = b, d = a.

D. a = d, b = a, c = c, d = b

Answer: B

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39. Which one of the following is correctly matched?

A. Frederick Griffith - discovered the phenomenon of transformation

B. Linus Pauling - isolated DNA for the first time

C. Francis Crick - proposed one gene one polypeptide hypothesis

D. George Beedle - proposed the concept of inborn errors

Answer: A

40. Okazaki fragments are joined in a correct sequence by

A. DNA polymerase

B. DNA ligase

C. RNA polymerase

D. primase

Answer: B

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41. In the lac operon, the structural genes are switched off when

A. repressor binds to the operator

B. repressor binds to the promotor

C. repressor binds to the regulator

D. repressor binds to the inducer

Answer: A

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42. The process of reverse transcription' was brought to light by the work of

A. George Beadle and Edward Tatum

B. Garrod

C. H.M. Temin and D. Baltimore

D. R.W. Holley and Grover

Answer: C

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43. The technique of DNA fingerprinting was pioneered and perfected by

A. Alec Jeffreys

B. Francois Jacob

C. Jacques Monad

D. Beadle and Tatum

Answer: A

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44. Statements

i. The four nucleotide bases are not necessarily present in DNA in exact equal proportions.

ii. The total amount of purines are equal to the total amount of pyrimidines.

iii. DNA ligase enzyme act to hydrolyse or break down a polynucleotide chain into its component nucleotides.

iv. Nuclease enzymes are capable of restoring an intact DNA duplex.

Of the above statements

A. ii is correct but i, iii and iv are wrong

B. i and ii are wrong but iii and iv are correct

C. i, ii and iii are correct but iv is wrong

D. i and ii are correct but iii and iv are wrong

Answer: D

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45. Which of the following group of codons code for amino acid serine?

A. CUU, CỤC, CỦA and CUG

B. UAU, UAC, UGU and UGC

C. UCU, UCC, UCA and UCG

D. UGU, UGC, UGA and UAG

Answer: C

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46. Choose the wrong statement in the process of protein synthesis.

A. After uncoiling of DNA molecule, one strand acts as a template for the

formation of m-RNA.

B. In the presence of DNA, polymerase enzyme the m-RNA is formed based on the triplet codes.

C. The m-RNA that leaves nucleus reaches cytoplasm and gets attached' with 30 S ribosomal subunit.

D. The amino acids are transferred from the intra-cellular amino acid pool to the active ribosomes by the t-RNA.

Answer: B

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47. In regulation of gene expression in prokaryotes

I. Lactose acts as the suppressor for gene expression

II. Tryptophan acts as the inducer for gene expression

III. Regulator gene is the one that produces the repressor molecule

A. I alone correct b

B. II alone correct

C. III alone correct

D. II and I arc correct

Answer: C

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48. Which of the following is not relevant to the structure of double helical DNA?

A. The helix makes one complete spiral turn every 34 Å

B. The diameter of the helix is 20 Å

C. The distance between adjacent nucleotide is 3.4 Å

D. Each strand of helix has a back bone made up of alternating ribose sugar and phosphate.

Answer: D

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49. The length of the haploid content of human DNA is

A. $3.3 \times 10^9 bp$

B. $3.3 \times 10^9 kbp$

C. $4.6 \times 10^6 bp$

D. $48502 bp$

Answer: A

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50. Meselson and Stahl experiment proved

A. a] DNA is genetic material

B. b] central dogma

C. c] transformation

D. d] semi conservative DNA replication

Answer: D

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51. The basis of DNA fingerprinting is

A. the double helix

B. errors in base sequence

C. polymorphism in sequence

D. DNA replication

Answer: C

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52. Select the correct bases of DNA, RNA and amino acid of beta chain resulting in sickle cell anaemia

DNA	RNA	Amino acid
a. CTC/GAG	GUG	Glutamic acid
b. CAC/GTG	GUG	Valine
c. CAC/GTG	GAG	Valine
d. CTC/GAG	GUG	Valine
e. CAC/GUG	GAG	Glutamic acid

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53. When a segment of a chromosome breaks and later rejoins after 180° rotation, it is known as

A. deletion

B. duplication

C. inversion

D. interstitial translocation

Answer: C

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54. What would be the correct base sequence in mRNA for the given DNA strand?

5'-AATGCCTTAAGC-3'

A. 5'-GCUUAAGGCAUU-3'

B. 5'-UUACGGAATTCG-3'

C. 3'-UUACGGAAUUCG-5'

D. 3'-AAUGCCUUAUCG-5'

Answer: C

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55. In DNA of certain organisms, guanine constitutes 20% of the bases. What percentage of the bases would be adenine?

A. 0

B. 0.1

C. 0.2

D. 0.3

Answer: D

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56. The process of transformation was discovered by

A. Maurice H.F. Wilkins and Rosalind E. Franklin

B. M. Meselson and F.W. Stahl

C. James Watson and Francis Crick

D. Fredrick Griffith

Answer: D

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57. Which of the following codons has no tRNA?

A. UAA

B. UAU

C. UGU

D. UGC

Answer: A

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58. Which one of the following nitrogenous base is seen only in RNA?

A. a] Adenine

B. b] Thymine

C. c] Uracil

D. d] Cytosine

Answer: C

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59. Ti plasmids used in genetic engineering is obtained from

A. Bacillus thuringiensis

B. Agrobacterium rhizogenes

C. Agrobacterium tumefaciens

D. Pseudomonas syringae

Answer: C

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60. The enzyme used to join the DNA fragments is

A. topoisomerase

B. adenosine deaminase

C. DNA ligase

D. DNA polymerase

Answer: C

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61. Which of these is used as vector in gene therapy for SCID?

A. Arbovirus

B. Rotavirus

C. Enterovirus

D. Retrovirus

Answer: D

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62. Name the longest gene.

A. Dystrophin

B. Insulin gene

C. Beta globin gene of haemoglobin

D. Tumor suppressor gene

Answer: A

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63. In the Lac Operon system, β-galactosidase is coded by

A. a-gene

B. i-gene

C. l-gene

D. z-gene

Answer: D

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64. Match the codons with their respective amino acids and choose the correct answer.

i.	UUU	a.	Serine
ii.	GGG	b.	Methionine
iii.	UCU	c.	Phenylalanine
iv.	CCC	d.	Glycine
v.	AUG	e.	Proline

A. i - c, ii - d, iii - a, iv - e, v - b

B. i - c, ii - a, iii -d, iv - e, v - b

C. i - c, ii - d, iii - e, iv - a, v - b

D. i - b, ii - d, iii - a, iv - e, v-c

Answer: A

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65. In bacteria, the formation of peptide bond during translation is effected by

A. Lysozyme

B. Ribozyme

C. Nucleosome

D. Microsome

Answer: B

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66. Locations or sites in the human DNA where single base DNA differences occur are called

A. Repetitive DNA

B. VNTR

C. SNP

D. SSCP

Answer: C

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67. The technique of DNA fingerprinting was pioneered and perfected by

A. Ian Wilmut

B. Hargobind Khorana

C. Jacque Monod

D. Alec Jeffreys

Answer: D

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68. Histones are rich in

A. Alanine and glycine

B. Lysine and arginine

C. Histidine

D. Cysteine and tyrosine

Answer: B

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69. The process of copying genetic information from one strand of the DNA into RNA is termed as

A. a] Translation

B. b] Transamination

C. c] Replication

D. d] Transcription

Answer: D

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70. Consider the following statements

i. r-RNA provides the template for synthesis of proteins

ii. t-RNA brings amino acids and reads the genetic code

iii. RNA polymerase binds to promoter and initiates transcription

iv. A segment of DNA coding for polypeptide is called intron

A. i and iii are correct

B. i and ii are correct

C. i, ii and iii are correct

D. ii and iii are correct

Answer: D

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71. During Messelson and Stahl's experiments, heavy DNA was distinguished from normal DNA by centrifugation in

A. A. CsOH gradient

B. B. $^{14}NH_4Cl$

C. C. $^{15}NH_4Cl$

D. D. CsCl gradient

Answer: D

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72. The process of removal of introns and joining of exons is called

A. Capping

B. Tailing

C. Termination

D. Splicing

Answer: D

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