Chapter 02 Molecular Basis of Inheritance

RANKER'S STUFF

Q.1 Male XX and female XY sometime occur due to:
(1) Deletion
(2) Transfer of segments in X and Y chromosomes
(3) Aneuploidy
(4) Hormonal imbalance

Q.2 In recent years, DNA sequences (nucleotide sequence) of mt-DNA and Y chromosomes were considered for the study of human evolution, because :
(1) They are small, and therefore, easy to study
(2) They are uniparental in origin and do not take part in recombination
(3) Their structure is known in great detail
(4) They can be studied from the samples of fossil remains

Q.3 A completely radioactive double stranded DNA molecule undergoes two round of replication in a non radioactive medium. What will be the radioactive status of the four daughter molecules:
(1) All four still contain radioactivity
(2) Radioactivity is lost from all four
(3) Out of four, three contain radioacitivity
(4) Half of the number contain no radioacitivity

Q.4 Consider the following sequence on m-RNA CUCAUGGCAGUGCCAUAG. This m-RNA regulates synthesis of a polypeptide chain. Find out the no. of amino acids in this polypeptide chain?
(1) 5 (2) 4 (3) 3 (4) 6

Q.5 A normal DNA molecule is continuously replicate in N^{15} medium then what is the % of lighter DNA in 4^{th} generation:
(1) 12.5% (2) 25% (3) 0% (4) 6.25%

Q.6 Find out the sequence of binding of the following amino acyl- t-RNA complexes during translation to an m-RNA transcribed by a DNA segment having the base sequence. 3' ATACCCATGGGG 5'. Choose the answer showing the correct order of alphabets :

(a) Amino acid — Anticodon: C C C
(b) Amino acid — Anticodon: A U G
(c) Amino acid — Anticodon: G G G
(d) Amino acid — Anticodon: A U A

(1) a, b, c, d (2) d, a, b, c
(3) a, b, d, c (4) b, a, c, d

Q.7 If the length of DNA fragment is 68 nm and it contains 40% adenine then find out the total no. of hydrogen bonds in this DNA
(1) 460 (2) 560 (3) 430 (4) 440

Q.8 Which of the following m-RNA is translated completely:
(A) 5' AUG UGA UUA AAG AAA 3'
(B) 5' AUG AUA UUG CCC UGA 3'
(C) 5' AGU UCC AGA CUC UAA 3'
(D) 5' AUG UAC AGU AAC UAG 3'
(1) (A) and (B) (2) (B) and (D)
(3) (C) and (D) (4) (A) and (D)

Q.9 In a m-RNA sequence of N2-base is 5' AUG GUG CUC AAA' 3'. What is the correct sequence of anticodons which recognizes codons of m-RNA:

(a) UUU (b) GAG (c) UAC (d) CAC

(1) a, b, c, d (2) d, a, b, c
(3) c, d, b, a (4) b, a, c, d

Q.10 Suppose evolution on earth has occurred in such a way that there are 96 amino acids instead of 20. DNA has 12 different types of bases and DNA synthesis occur in the same way as today. The

minimum number of bases per DNA codon would be:
(1) 12 (2) 8 (3) 2 (4) 3

Q.11 Assume that there are 6 types of nitrogen bases available and 40 types of amino acid are available for protein synthesis, then in genetic code each codon made up by minimum how many nitrogen bases ?
(1) 3 (2) 4 (3) 5 (4) 2

Q.12 In a segment of DNA 3.2 kelobases are present. If DNA segment has 820 adenine molecules, then what will be number of cytosine ?
(1) 1560 (2) 1480
(3) 780 (4) 740

Q.13 Which statement is correct?
(a) Degeneracy of code is related to, third member of codon
(b) Single codon, codes for more than one amino acid
(c) In codon first two bases are more specific
(d) In codons, third base is wobble
(e) Code is nearly universal
(1) a, b, c, d, e (2) a, b, d
(3) a, c, d (4) a, c, d, e

Q.14 Both the strand of DNA are not copied during transcription because :
(1) If both strands act as a template, they would code for RNA with different sequence
(2) The two RNA molecules, if produced Simultaneously would be complementary to each other, hence would form a double stranded RNA
(3) They would code, for RNA molecules with same sequences
(4) Both (1) and (2) are correct

Q.15 The salient feature of DNA are :
(i) It is made of two polynucleotide chain
(ii) Back bone is constituted by sugar and nitrogen base
(iii) Two chains have parallel polarity
(iv) Bases in two strands are paired through H-bonds
(v) The two chain are coiled in a left handed fashion
(1) i, iv, v (2) i, iv
(3) i, ii, v (4) i, ii, iii, iv, v

Q.16 Which is incorrect for genetic code :
(i) The codon is triplet
(ii) 64 codons code for amino acids
(iii) Genetic code is unambiguous
(iv) Genetic code is nearly universal
(v) AUG has dual functions
(1) only ii (2) ii & iii
(3) iii, iv & v (4) All are correct

Q.17 Which is correct :
(i) t-RNA has an anticodon loop that has bases complementary to the code
(ii) t-RNA has an amino acid acceptor end
(iii) t-RNA are specific for each amino acid
(iv) For initiation, there is specific t-RNA that is referred to as initiator t-RNA
(v) For termination there is specific t-RNA that is referred to as terminator t-RNA
(1) i, ii (2) i, ii, iii
(3) i, ii, iii, iv (4) i, ii, iii, iv, v

Q.18 *E. coli* cells with a mutated z gene of the lac operon cannot grow in medium containing only lactose as the source of energy because :
(1) They cannot synthesize functional beta galactosidase
(2) They cannot transport lactose from the medium into the cell
(3) The lac operon is constitutively active in these cells
(4) In the presence of glucose, *E. coli* cells do not utilize lactose

Q.19 DNA fingerprinting refers to :
(1) Techniques used for identification of fingerprints of individuals
(2) Molecular analysis of profiles of DNA samples
(3) Analysis of DNA samples using imprinting devices
(4) Techniques used for molecular analysis of different specimens of DNA

Q.20 Select the incorrect statement :
(1) DNA from single cell is enough to perform DNA fingerprinting analysis
(2) DNA fingerprinting has much wider applications in determining population & genetic diversities.
(3) The VNTR belongs to a class of satellite DNA referred as microsatellite.

(4) DNA fingerprint differs from individual to individual in a population except in the case of monozygotic twins.

Q.21 The number of base pairs in DNA of λ-bacteriophage is

(1) 5386 (2) 4.6×10^6

(3) 48502 (4) 3.3×10^9

Q.22 Match the following-

Column-I	Column-II
I. Splicing	(A) Lac operon
II. Okazaki fragments	(B) Lagging strands
III. Jacob and Monod	(C) Lactose
IV. Inducer	(D) Removal of introns

(1) I – D, II – B, III – A, IV – C

(2) I – B, II – A, III – D, IV – C

(3) I – D, II – C, III – A, IV – B

(4) I – B, II – C, III – A, IV – D

Q.23 Match the following-

Column-I	Column-II
I. mRNA	(A) tRNA
II. Anticodon	(B) Codon
III. Semiconservative	(C) Transformation mode of DNA Replication
IV. Griffith	(D) Meselson and Stahl

(1) I – D, II – B, III – A, IV – C

(2) I – B, II – A, III – D, IV – C

(3) I – D, II – C, III – A, IV – B

(4) I – B, II – C, III – A, IV – D

Q.24 Match the following-

Column-I	Column-II
I. Genome of ϕ × 174 bacteriophage	(A) Ribozyme, RNase
II. Purine	(B) 5386 nucleotides
III. Catalytic RNA	(C) Adenine and Guanine
IV. Any chemical change in DNA	(D) Mutation

(1) I – D, II – B, III – A, IV – C

(2) I – B, II – A, III – D, IV – C

(3) I – D, II – C, III – A, IV – B

(4) I – B, II – C, III – A, IV – D

Q.25 Match the following-

Column-I	Column-II
I. Operator site	(A) Binding site for RNA polymerase
II. Promoter site	(B) Binding site for repressor molecule
III. Structural gene	(C) Codes for enzyme protein
IV. Regulator gene	(D) Codes for repressor molecules

(1) I – D, II – B, III – A, IV – C

(2) I – B, II – A, III – C, IV – D

(3) I – D, II – C, III – A, IV – B

(4) I – B, II – C, III – A, IV – D

Q.26 Match the following-

Column-I	Column-II
I. Helicase	(A) Joining of nucleotides
II. SSB	(B) Opening of DNA
III. Primase	(C) Prevention of recoiling of DNA strands
IV. DNA polymerase III	(D) RNA priming

(1) I – B, II – A, III – C, IV – D

(2) I – B, II – A, III – D, IV – C

(3) I – D, II – C, III – A, IV – B

(4) I – B, II – C, III – D, IV – A

Q.27 Match the following-

Column-I	Column-II
I. AUG	(A) Polynucleotide phosphorylase
II. UAA	(B) Bacteria
III. Severe-Ochoa enzyme	(C) Chain terminating codon
IV. Polycistronic m-RNA	(D) Methionine

(1) I – B, II – A, III – C, IV – D

(2) I – B, II – A, III – D, IV – C

(3) I – D, II – C, III – A, IV – B

(4) I – B, II – C, III – A, IV – D

Q.28 Match the following-

Column-I	Column-II
I. Termination	(A) Aminoacyl tRNA synthetase
II. Translation	(B) Okazaki fragments
III. Transcription	(C) GTP dependent release factor
IV. DNA replication	(D) RNA polymerase

(1) I – B, II – A, III – C, IV – D

(2) I – C, II – A, III – D, IV – B

(3) I – D, II – C, III – A, IV – B

(4) I – B, II – C, III – A, IV – D

Q.29 Match the following-

Column-I	Column-II

I. Exon	(A) Intervening sequence
II. Intron	(B) Nirenberg, Khorana and Mathaei
III. Genetic code	(C) Nucleosome
IV. DNA packaging	(D) Coding sequence

(1) I – B, II – A, III – C, IV – D
(2) I – B, II – A, III – D, IV – C
(3) I – D, II – A, III – B, IV – C
(4) I – B, II – C, III – A, IV – D

Q.30 Match the following-

Column-I	**Column-II**
I. Griffith	(A) Nucleoid
II. Hershey and Chase	(B) Active chromatin
III. Prokaryotic DNA	(C) Transduction
IV. Euchromatin	(D) Transformation

(1) I – B, II – A, III – C, IV – D
(2) I – C, II – A, III – D, IV – B
(3) I – D, II – C, III – A, IV – B
(4) I – B, II – C, III – A, IV – D

Q.31 In 1953 J. Watson and F. Crick proposed Double helix model of DNA and got Nobel Prize. Their Model of DNA was based on-

A. X-ray diffraction of DNA produced by M. Wilkins and R. Franklin
B. Griffith's experiment
C. Hershey-Chase experiment
D. Chargaff's rule of base equivalence (A + G / T + C = 1)

(1) A, D (2) A, C, C, D
(3) B, C, D (4) A, B, C

Q.32 Antiparallel relationship of the two strands of DNA refers to the-

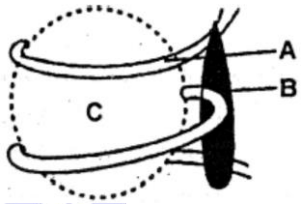
(1) Strands being the opposite of parallel-they are twisted
(2) Strands providing alternate branching
(3) One strand runs in 5′ → 3′ and other in 3′ → 5′ direction
(4) Both strands run in 5' → 3'direction

Q.33 Which of the following is/are correct matching(s)

Codon	**Amino acid**
A. AGU	Serine
B. UAC	Tyrosine
C. AUG	Methionine
D. GUG	Valine

(1) A, C (2) A, B, C, D
(3) B, C, D (4) A, B, C

Q.34 Go through the following diagram of Nucleosome (structural unit of chromatin). Identify its componental parts indicated by A, B and C-



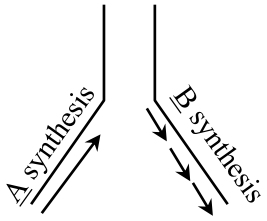
A	**B**	**C**
(1) RNA	Non histone	Histone
(2) DNA	H_1 histone	Histone Octamer
(3) RNA	Histone Octamer	H_1 histone
(4) DNA	Non histone	Histone

Q.35 Certain molecular processes are given in column A. Provide the terms given to these processes in column B after selecting them from terms : transport, gene regulation, transcription, replication, gene transfer, DNA finger printing.

Column A	**Column B**
(i) DNA → DNA	.....
(ii) DNA → hnRNA	.....
(iii) mRNA → Protein	.....
(iv) Repressor protein + Operator → No transcription	.....

(1) (i) - Replication, (ii) – Transcription, (iii) – Translation, (iv) – Gene regulation
(2) (i) - Replication, (ii) – Gene transport, (iii) – Translation, (iv) – Gene regulation
(3) (i) - Replication, (ii) – Transcription, (iii) – Gene regulation, (iv) – Translation
(4) (i) - Replication, (ii) – DNA finger printing, (iii) – Translation, (iv) – Gene regulation

Q.36 Name the types of synthesis A and B coding in the replication fork of DNA as shown below-

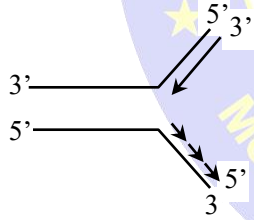


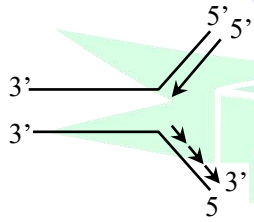
(1) A-Continuous synthesis (synthesis of leading strand); B-Discontinuous synthesis (Synthesis of lagging strand).
(2) A-Continuous synthesis (Synthesis of leading strand); B-Continuous synthesis (Synthesis of lagging strand).
(3) A-Continuous synthesis (synthesis of lagging strand); B-Discontinuous synthesis (Synthesis of leading strand)
(4) A-Discontinuous synthesis (synthesis of lagging strand); B-Continuous synthesis (Synthesis of leading strand).

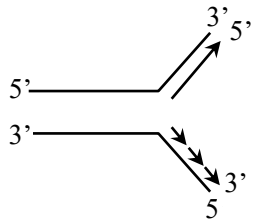
Q.37 The following events occur in the replication of DNA
1. Bonds between complementary bases break.
2. Bonds between complementary bases form.
3. DNA molecule uncoils.
4. Opposite strands separate.
5. Sugar-phosphate bonds form.
6. Free nucleotides align with complementary nucleotides on each strand.

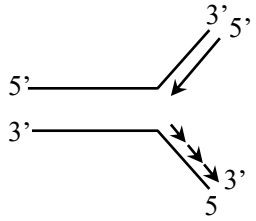
(1) 1 3 6 4 2 5
(2) 1 3 4 6 2 5
(3) 3 6 1 4 5 2
(4) 4 3 1 6 5 2

Q.38 Which one of the following correctly represents the manner of replication of DNA?

(1)


(2)


(3)


(4)


Q.39 Which of the following statement(s) about Griffith's experiment are correct?
(i) S-strain has mucus (polysaccharide) coat.
(ii) S-strain is virulent and causes pneumonia infection, while R-strain does not.
(iii) Transforming principle is associated with genetic material of R-strain.
(iv) Transformation of R-strain into S-strain can take place in a test tube.
(1) i and iii only (2) iii and iv only
(3) i, ii and iv only (4) ii, iii and iv only

Q.40 Consider the following statements.
(i) The presence of a promoter in a transcription unit defines the template and coding strands.
(ii) DNA- dependent RNA polymerase catalyse the polymerization in only one direction that is $5' \rightarrow 3'$.
(iii) Regulatory sequences are loosely defined as regulatory genes and these sequences do not code for any RNA or protein.
Choose the correct statements
(1) i only (2) i and ii only
(3) ii and iii only (4) i, ii and iii

Q.41 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.
Which of the statements given above are correct?
(1) i and iii only (2) i and ii only
(3) i, ii and iii only (4) ii and iii only

Q.42 Tandem Repeat DNA
(i) Is classified as microsatellites and minisatellites.
(ii) Normally does not code for any protein.
(iii) Shows polymorphism.
(iv) Is used in fingerprinting.

Choose the correct option to complete the statement.

(1) i, iii and iv only (2) i, ii and iv only
(3) i, iii and iv only (4) i, ii, iii and iv

Direction (Q.43-Q.51): In the light of the above statements, choose the correct answer from the options given below:

(A) Both Statement-I and Statement-II are incorrect.
(B) Both Statement-I and Statement-II are correct.
(C) Statement-I is incorrect but Statement-II is correct.
(D) Statement-I is correct but statement-II is incorrect

Q.43 Given below are two statements:

Statement-I: Positively charged histone proteins are essential for packaging negatively charged DNA.

Statement-II: Without histone protein DNA can not fold due to negative charge.

(1) A (2) B (3) C (4) D

Q.44 Given below are two statements:

Statement-I: The presence of introns is reminiscent of antiquity and the process of splicing represents the dominance of RNA world.

Statement-II: The split gene arrangement represents an advanced feature of the genome.

(1) A (2) B (3) C (4) D

Q.45 Given below are two statements:

Statement-I: Genetic codes are unambiguous and specific.

Statement-II: Some amino acids are coded by more than one codon.

(1) A (2) B (3) C (4) D

Q.46 Given below are two statements:

Statement-I: In lac operon, a polycistronic structural gene is regulated by a common promoter and regulatory genes.

Statement-II: Such arrangement is very common in bacteria and is referred as operon.

(1) A (2) B (3) C (4) D

Q.47 Given below are two statements:

Statement-I: The gene-i codes for the repressor of the lac operon.

Statement-II: The y-gene codes for permease, which increases permeability of the cell to β-galactosidase.

(1) A (2) B (3) C (4) D

Q.48 Given below are two statements:

Statement-I: HGP was closely associated with the rapid development of a new area in biology called as Bioinformatics.

Statement-II: The enormous amount of data generated in HGP necessitated the use of high speed computational devices for data storage and analysis.

(1) A (2) B (3) C (4) D

Q.49 Given below are two statements:

Statement-I: The sequencing of chromosome-1 was completed at last in May-2006.

Statement-II: Chromosome-1 in the longest chromosome with maximum number of genes.

(1) A (2) B (3) C (4) D

Q.50 Given below are two statements:

Statement-I: DNA polymorphism arises due to mutations.

Statement-II: An inheritable mutation which is observed in a population at high frequency, is referred to as DNA polymorphism.

(1) A (2) B (3) C (4) D

Q.51 Given below are two statements:

Statement-I: Operon concept is applicable only in prokaryotes.

Statement-II: Gene expression in prokaryotes is influenced by environmental conditions.

(1) A (2) B
(3) C (4) D

Direction: In each of the following questions, a statement of Assertion (A) is given followed by corresponding statement of Reason (R). Of the statements, mark the correct answer as

(A) If both A and R are true and R is the correct explanation of A
(B) If both A and R are true, but R is not the correct explanation of A

(C) If A is true, but R is false

(D) If A is false, but R is true

Q.52 **Assertion:** Transcription occurs in the nucleus but translation occurs in the cytoplasm in eukaryotes.

Reason: *m*RNA is transferred from the nucleus into the cytoplasm where ribosomes and amino acids are available for protein synthesis.

(1) A (2) B (3) C (4) D

Q.53 **Assertion:** hn-RNA is larger than *m*RNA.

Reason: *hn*RNA has non- translating introns which are not required for -translation

(1) A (2) B

(3) C (4) D

Q.54 Assertion: Amber codon is a termination codon.

Reason: If in a mRNA, a termination codon is present, the protein synthesis stop abruptly whether the protein synthesis is complete or not.

(1) A (2) B

(3) C (4) D

Q.55 **Assertion:** Adenine cannot pair with cytosine

Reason: Adenine and cytosine do not have a perfect match between hydrogen donor and hydrogen acceptor sites. Hence, they cannot pair.

(1) A (2) B (3) C (4) D

Q.56 **Assertion:** DNA fingerprinting involves identifying differences in some specific regions in DNA called as repetitive DNA sequences.

Reason: These sequences show high degree of polymorphism and form the basis of DNA finger printing.

(1) A (2) B (3) C (4) D

Q.57 **Assertion:** The genetic code is degenerate

Reason: Most of the amino acids are coded by more than one codon.

(1) A (2) B (3) C (4) D

Q.58 **Assertion:** DNA fingerprinting is very well known for its application in paternity testing in case of disputes

Reason: It employs the principle of polymorphism in DNA sequences as the polymorphisms are inheritable from parent to children.

(1) A (2) B (3) C (4) D

Q.59 **Assertion:** The VNTR belongs to a class of satellite DNA referred to as mini-satellite.

Reason: The mini-satellite numbers remains same from chromosome to chromosome in an individual.

(1) A (2) B (3) C (4) D

Q.60 **Assertion:** Lac operator is present only in lac operon and it interact specifically with lac repressor only.

Reason: Each operon has its specific operator and specific repressor.

(1) A (2) B (3) C (4) D

ANSWER KEY

RANKER'S STUFF

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	2	2	4	2	3	2	4	2	3	3	1	3	4	4	2
Que.	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
Ans.	1	3	1	2	3	3	1	2	4	2	4	3	2	3	3
Que.	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**
Ans.	1	3	2	2	1	1	2	4	3	4	4	4	2	4	2
Que.	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
Ans.	2	4	2	2	2	2	1	1	1	1	1	1	1	3	**1**