BIOLOGY

NEET

CRASH COURSE

MOLECULAR BASIS OF INHERITANCE

SMART ACHIEVERS

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MOLECULAR BASIS OF INHERITANCE

1. Nucleotide monomers constitutes a polymer called nucleic acid. It is of two types RNA and DNA.
2. While DNA is store house of information, RNA helps in transfer and expression of information .
3. As DNA is structurally and chemically more stable, it is better genetic material. Although both DNA and DNA serves as genetic material.
4. RNA was first to evolve, and DNA was derived from it.
5. Bases in two DNA strands show hydrogen bonding (A = T, G ≡ C) and follow Chargaff's rule, so that both the strands are complementary and its replication is semi-conservative.
6. Segment of DNA that codes for an RNA is known as gene. During transcription, one DNA strand acts as template which directs the synthesis of complementary RNA.
7. In prokaryotes, transcription and translation is a continuous process. In eukaryotes, the genes are split exons are interupted by introns. Introns are removed and exons are joined, to produce functional RNA.
8. The mRNA contains genetic code In combination of three (triplet code) to code for an amino acid. This genetic code is read by t-RNA which act as an adapter molecule.
9. There is specific t-RNA for each amino acid. Each t-RNA binds to amino acid at one end and with codons by H-bonding at another end.
10. Translation occurs at ribosome, here ribozyme (rRNA enzyme) acts as catalyst which helps in peptide bond formation. Process of translation has evolved around RNA, which shows that life began around RNA.
11. Since transcription and translation are energetically very expensive; they are tightly regulated, e.g., lac operon which is regulated by amount of lactose in medium, i.e., regulation of enzyme synthesis by its substrate.
12. Human genome project is aimed for sequencing every base in human genome. DNA finger printing is used for this which is based upon principle of polymorphism in DNA sequence.

EXERCISE

Q.1 If genetic code is tetraplet then what is the possible number of codons wich code 20 types of amino acids :-
(1) 261 (2) 64 (3) 256 (4) 43

Q.2 Nucleic acids are made up of -
(1) Amino acids (2) Pentose sugars (3) Nucleosides (4) Nucleotides

Q.3 Mitochondrial DNA is-
(1) Naked (2) Circular (3) Double stranded (4) All the above

Q.4 Which of the following is called adaptor molecule-
(1) DNA (2) m-RNA (3) t-RNA (4) RNA

Q.5 Which may be attached with Adenine base in RNA -
(1) Guanine (2) Cytosine (3) Uracil (4) Thymine

Q.6 Nucleotide is -
(1) N_2 - base, pentose sugar and phosphoric acid
(2) Nitrogen, Hexose sugar and phosphoric acid
(3) Nitrogen base, pentose sugar
(4) Nitrogen base, trioses and phosphoric acid

Q.7 Unit of nucleic acids are -
(1) Phosphoric acid (2) Nitrogenous bases (3) Pentose Sugar (4) Nucleotides

Q.8 Nucleic acids are found in
(1) Nucleus (2) Cytoplasm
(3) Both nucleus & Cytoplasm (4) Nucleus & ribosomes

Q.9 Nucleic acid (DNA) is not found in-
(1) Nucleus & nucleolus (2) Peroxysome & ribosome
(3) Mitochondria & plastid (4) Chloroplast & nucleosome

Q.10 In which of the following, the DNA is the principal constituent -
(1) Nucleus (2) Chromatin (3) Ribosomes (4) Chloroplast

Q.11 Prokaryotic genetic system contains -
(1) DNA & histones (2) RNA & histones
(3) Either DNA or histones (4) DNA but no histones

Q.12 Genetic information is carried by the long chain molecules which are made up of -
(1) Amino acids (2) Nucleotides (3) Chromosomes (4) Enzymes

Q.13 One of the characteristics of DNA is -
(1) Uracil (2) Deoxyribose sugar
(3) Single strandedness (4) Ability of protein synthesis

Q.14 Purine bases of DNA are -
(1) U & G (2) A & G (3) A & C (4) None

Q.15 Which of the following N_2 bases are pyrimidines -
(1) T & C (2) T & A (3) A & C (4) G & T

Q.16 The purine & pyrimidine pairs of complementry strands of DNA are held together by –
(1) H - bonds (2) O - bonds (3) C - bonds (4) N - bonds

Q.17 What is the nature of the 2 strands of a DNA duplex :
(1) Identical & Complimentary (2) Antiparallel & complimentary
(3) Dissimilar & non complimentary (4) Antiparallel & non complimentary

Q.18 DNA polymerase is needed for -
(1) Replication of DNA (2) Synthesis of DNA
(3) Elongation of DNA (4) All of above

Q.19 DNA duplication occurs at
(1) Meiosis - II (2) Mitotic interphase (3) Mitosis only (4) Meiosis and mitosis both

Q.20 Duplication of DNA is called -
(1) Replication (2) Transduction (3) Transcription (4) Translation

Q.21 DNA polymerase enzyme is required for the synthesis of -
(1) DNA From DNA (2)DNA from RNA (3) Both the above (4) DNA from nucleosides

Q.22 Ligase enzyme is used for -
(1) Denaturation of DNA (2) Splitting DNA into small bits
(3) Joining bits of DNA (4) Digestion of lipids

Q.23 DNA directed synthesis of m-RNA is called -
(1) Transcription (2) Translocation (3) Ttansduction (4) Replication

Q.24 A DNA strand is directly involved in the synthesis of all the following except -
(1) Another DNA (2) t-RNA & m-RNA (3) r-RNA (4) Protein

Q.25 64 Codons constitute genetic code because -
(1) There was 64 types of amino acid (2) 64 types of t-RNA
(3) Genetic code is triplet (4) There are 64 enzymes

Q.26 Genetic code determines -
(1) Structural pattern of an organism (2) Sequence of amino acid in protein chain
(3) Variation in offsprings (4) constancy of morphological trait

Q.27 Chargaaf's rule is given as -
(1) Purines Pyrimidines (2) A + G = T+ C (3) A+ U = G + C (4) A + T / G + C = Const.

Q.28 DNA of *E.coli* -
(1) ds circular (2) ss circular (3) ds linear (4) ss linear

Q.29 Transcription means synthesis of -
(1) DNA (2) Protein (3) m - RNA (4) Enzyme

Q.30 DNA fingerprinting method is very useful for -
(1) DNA tests for identity & relation ships (2) Forensic studies
(3) Polymorphism (4) All of the above

Q.31 A sequence of three consecutive bases in a t - RNA molecule which specifically binds to a complementary codon sequence in m RNA is known as -
(1) Triplet (2) Non - sense codon (3) Anti codon (4) Termination codon

Q.32 DNA which is composed of dinucleotide unit is -
(1) A - DNA (2) B - DNA (3) C - DNA (4) Z - DNA

Q.33 In bacteria the codon AUG stands for -
(1) Glycine (2) Methionine
(3) N- formyl methionine (4) Alanine

Q.34 Gene composed of :
(1) Amino acids (2) Polynucleotide (3) Fatty acid (4) Nitrogen bases

Q.35 Similarity in DNA and RNA -
(1) Both are polymer of nucleotides (2) Both have similar pyrimidine
(3) Both have similar sugar (4) Both are genetic material

Q.36 ATP is -
(1) Nucleotide (2) Nucleoside (3) Nucleic acid (4) Vitamin

Q.37 Which of the following is initiation codon:-
(1) UAG (2) AUC (3) AUG (4) CCU

Q.38 Extranuclear DNA is found in :
(1) Lysosome and chloroplast (2) Chloroplast and mitochondria
(3) Mitochondria and lysosome (4) Golgi and E.R.

Q.39 During translation initiation in prokaryotes, a GTP molecule is needed in :
(1) Formation of formyl-met-tRNA
(2) Binding of 30S subunit of ribosome with mRNA
(3) Association of 30 S-mRNA with formyl-met tRNA
(4) Association of 50 S subunit of ribosome with initiation complex

Q.40 Degeneration of a genetic code is attributed to the :
(1) First member of a codon (2) Second member of a codon
(3) Entire codon (4) Third member of a codon

Q.41 During transcription, the DNA site at which RNA polymerase binds is called :
(1) Promoter (2) Regulator (3) Receptor (4) Enhancer

Q.42 Which one of the following is a chain growth polymer ?
(1) Starch (2) Nucleic acid (3) Polystyrene (4) Protein

Q.43 Chemically hormones are
(1) Biogenic amines only (2) Proteins, steroids and biogenic amines
(3) Proteins only (4) Steroids only

Q.44 Which one of the following hormones is a modified amino acid ?
(1) Epinephrine (2) Progesterone (3) Prostaglandin (4) Estrogen

Q.45 Which form of RNA has a structure resembling clover leaf ?
(1) rRNA (2) hnRNA (3) mRNA (4) tRNA

Q.46 DNA is present in.
(1) Chromosomes and dictyosomes (2) Chloroplast and lysosomes
(3) Mitochondria and chloroplasts. (4) Mitochondria and endoplasmic reticulum.

Q.47 If base order in one chain of DNA is "ATCGA" then how many no. of H–bond found in DNA duplex :–
(1) 20 (2) 12 (3) 10 (4) 11

Q.48 Which of the following is the simplest amino acid
(1) Alanine (2) Asparagine (3) Glycine (4) Tyrosine

Q.49 Protein synthesis in an animal cell occurs
(1) On ribosomes present in cytoplasm as well as in mitochondria
(2) On ribosomes present in the nucleolus as well as in cytoplasm
(3) Only on ribosomes attached to the nuclear envelope and endoplasmic reticulum
(4) Only on the ribosomes present in cytosol

Q.50 Carbohydrates, the most abundant biomolecules on earth, are produced by –
(1) Some bacteria, algae and green plant cells (2) All bacteria, fungi and algae
(3) Fungi, algae and green plants cells (4) Viruses, fungi and bacteria

Q.51 In DNA purine nitrogen bases are :
(1) Uracil and Guanine (2) Guanine and Adenine
(3) Adenine and cytosine (4) None

Q.52 Specificity of protein is due to :
(1) Types of amino acid (2) Sequence of amino acid
(3) Number of amino acid (4) Quantity of amino acid

Q.53 Ribosomes are composed of :
(1) DNA + Protein (2) DNA (3) RNA + Protein (4) RNA + DNA

Q.54 Which of the following biomolecule is insoluble in water :
(1) α-Keratin (2) Haemoglobin (3) Ribonuclease (4) Adenine

Q.55 Thymine is –
(1) 5–Methyl uracil (2) 4–Methyl uracil (3) 3–Methyl uracil (4) 1–Methyl uracil

Q.56 The Okazaki fragments in DNA chain growth :
(1) Result in transcription
(2) Polymerize in the 3'-to-5' direction and forms replication fork
(3) Prove semi-conservative nature of DNA replication
(4) Polymerize in the 5'-to-3' direction and explain 3'-to-5' DNA replication

Q.57 A plant requires magnesium for :
(1) Holding cells together (2) Protein synthesis
(3) Chlorophyll synthesis (4) Cell wall development

Q.58 In the DNA molecule :
(1) the proportion of Adenine in relation to thymine varies with the organism
(2) there are two strands which run antiparallel one in 5' $\rightarrow$ 3' direction and other in 3' $\rightarrow$ 5'
(3) the total amount of purine nucleotides and pyrimidine nucleotides is not always equal
(4) there are two strands which run parallel in the 5' $\rightarrow$ 3' direction

Q.59 What is antisense technology ?
(1) When a piece of RNA that is complementary in sequence is used to stop expression of a specific gene
(2) RNA polymerase producing DNA
(3) A cell displaying a foreign antigen used for synthesis of antigens
(4) Production of somaclonal variants in tissue cultures

Q.60 What is not true for genetic code :-
(1) It is unambiguous
(2) A codon in mRNA is read in a non-contiguous fashion
(3) It is nearly universal
(4) It is degenerate

Q.61 Semiconservative replication of DNA was first demonstrated in :
(1) *Salmonella typhimurium* (2) *Drosophila melanogaster*
(3) *Escherichia coli* (4) *Streptococcus pneumoniae*

Q.62 The one aspect which is not a salient feature of genetic code, is its being :
(1) Universal (2) Specific (3) Degenerate (4) Ambiguous

AIIMS Special

Instructions for following questions (Q.63 to Q.80).

(1) If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1).
(2) If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2).
(3) If Assertion is true statement but Reason is false, then mark (3).
(4) If both Assertion and Reason are false statements, then mark (4).

Q.63 **Assertion :** RNA polymerase is of three types in eukaryotes for the synthesis of all types of RNAs.
Reason : RNA polymerase consists of six types of polypeptides alongwith rho factor which is involved in termination of RNA synthesis.

Q.64 **Assertion :** 5S rRNA and surrounding protein complex provides binding site of tRNA.
Reason : tRNA is soluble RNA with unusual bases.

Q.65 **Assertion :** Operator gene is functional when it is not blocked by repressor.
Reason : Regulator gene produces active protein only which acts on operon system in E.coli.

Q.66 **Assertion :** Peptidyl transfer site is contributed by larger sub-unit of ribosome.
Reason : The enzyme peptidyl transferase is contributed by both 23S and 16S ribosomal subunits.

Q.67 **Assertion :** Teminism is unidirectional flow of information.
Reason : It requires DNA dependent RNA polymerase enzyme.

Q.68 **Assertion :** In bacterial translation mechanism, two tRNA are required by methionine.
Reason : AUG codes for methionine and it shows nonambiguity also.

Q.69 **Assertion :** Nutritional mutant strain of pink mould is auxotroph.
Reason : It is not able to prepare its own metabolites from the raw materials obtained from outside.

Q.70 **Assertion :** In DNA fingerprinting, hybridization is done with molecular probe.
Reason : Molecular probe is small DNA segment synthesized in laboratory with known sequence that recognise complementary sequence in RNA.

Q.71 **Assertion :** c-DNA libraries are important to scientists in human genomics.
Reason : c-DNA is synthetic type of DNA generated from mRNA.

Q.72 **Assertion :** SNP-pronounced "snips" are common in human genome.
Reason : It is minute variations that occurs at a frequency of one in every 300 bases.

Q.73 **Assertion :** A single strand of m-RNA is capable of forming a number of polypeptide chains.
Reason : Tarmination codons occur in m-RNA.

Q.74 **Assertion :** Chromosomal aberrations are caused by a break in the chromosome or itschromatid.
Reason : Duplication, deficiency, transversion and trans locations are the cause of chromosomal aberrations.

Q.75 **Assertion :** 'Lac Operon Model' is applicable to E. coli.
Reason : E. coli. lacks a definite nucleus.

Q.76 **Assertion :** Amber codon is a termination codon.
Reason : If in m-RNA, a termination codon is present, the protein synthesis stops abruptly whether the protein synthesis is completed or not.

Q.77 **Assertion :** Watson and Crick provided experimental proof of semiconservative nature of DNA replication.
Reason : RNA polymerase binds nucleotides in replication.

Q.78 **Assertion :** The mRNA attaches itself to the ribosome via its 3' and.
Reason : The mRNA has nucleotide and bases of lagging sequence.

Q.79 **Assertion :** Replication and transcription occur in the nucleus but translation occurs in the cytoplasm.
Reason : mRNA is transferred from the nucleus into the cytoplasm where ribosomes and amino acids are available for protein synthesis.

Q.80 **Assertion :** Cancer cells are virtualy immortal untill the body in which they reside dies.
Reason : Cancer is caused by damage to genes regulating the cell division cycle.

ANSWER KEY

Q.1	3	Q.2	4	Q.3	4	Q.4	3	Q.5	3	Q.6	1	Q.7	4
Q.8	3	Q.9	2	Q.10	2	Q.11	4	Q.12	2	Q.13	2	Q.14	2
Q.15	1	Q.16	1	Q.17	2	Q.18	4	Q.19	4	Q.20	1	Q.21	3
Q.22	3	Q.23	1	Q.24	4	Q.25	3	Q.26	2	Q.27	2	Q.28	1
Q.29	3	Q.30	4	Q.31	3	Q.32	4	Q.33	3	Q.34	2	Q.35	1
Q.36	1	Q.37	3	Q.38	2	Q.39	3	Q.40	4	Q.41	1	Q.42	3
Q.43	2	Q.44	1	Q.45	4	Q.46	3	Q.47	2	Q.48	3	Q.49	1
Q.50	1	Q.51	2	Q.52	2	Q.53	3	Q.54	1	Q.55	1	Q.56	4
Q.57	3	Q.58	2	Q.59	1	Q.60	2	Q.61	3	Q.62	4	Q.63	3
Q.64	2	Q.65	3	Q.66	3	Q.67	4	Q.68	2	Q.69	1	Q.70	3
Q.71	2	Q.72	1	Q.73	2	Q.74	2	Q.75	2	Q.76	2	Q.77	4
Q.78	4	Q.79	1	Q.80	2								