SHIKSHA CLASSES

Subject : Biology **BOARD ANSWER PAPER** **Total Marks : 20**
Class : XII **Ch.: 4. Molecular Basis of Inheritance**

Q.1 : Select & write the most appropriate answer from the given alternatives for each sub-question. **[3]**

(i) Which of the following is a STOP codon?

Ans : b) UAA

(ii) Okazaki fragments are formed during…….

Ans. : d) Replication

(iii) The gene is a segment of …….

Ans. : c) DNA

Q. 2. A) Write the answer in ONE sentence: **[6]**

1) How many bases codes for one amino acid?

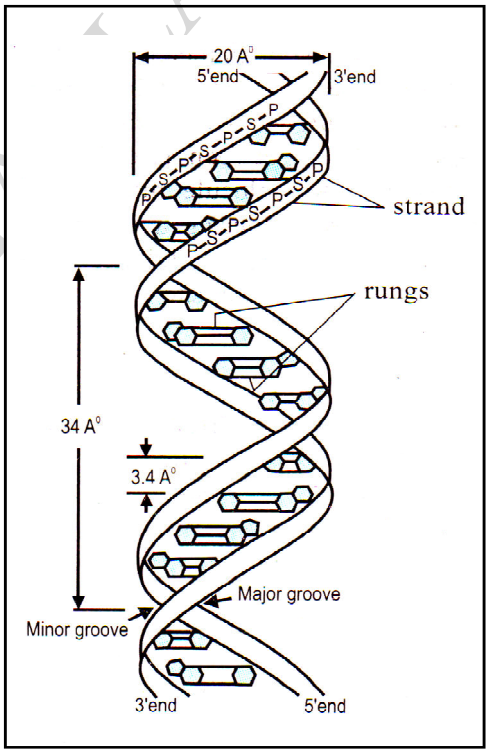
Ans. : There are 3 base codes for one amino acid.

2) Name the two purines of DNA.

Ans. : Name of two purines of DNA is : a) Adenine b) Guanine

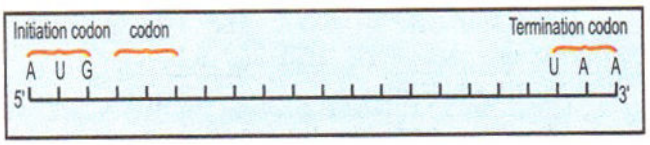
(B) Draw well labelled diagram of structure of DNA.

Ans. :



(C) Draw well labelled diagram of m-RNA

Ans : Draw well labelled diagram of m-RNA



Q.3 : A) Attempt any ONE of the following : **[6]**

1) Explain the terms introduced by Seymour Benzer.

Ans : According to Seymour Benzer, gene is made up by 3 units.

1) **Cistron -** It is unit of function. It is responsible for expression of a trait. It carry genetic information for protein synthesis It can be long up to 100 bp.
2) **Muton -** It is unit of mutation. It is the smallest unit of DNA. It undergo mutation. It consist of Nucleotide.
3) **Recon -** It is unit of Recombination. It is segment of DNA that participate in recombination through crossing over maximum during meiosis. It helps in Transmission.

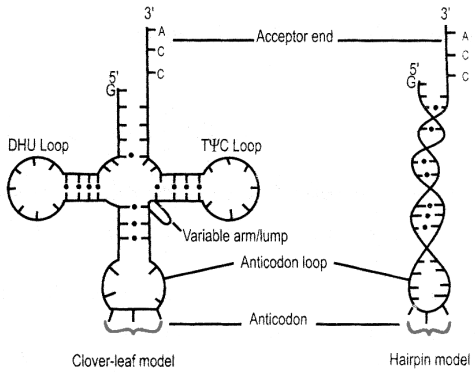
2) Distinguish between DNA & RNA.

Ans. :

DNA	RNA
1. DNA is deoxyribonucleic Acid	1. RNA is ribonucleic Acid.
2. DNA is double stranded	2. RNA is single stranded
3. In DNA, there is deoxyribose sugar	3. In RNA, there is ribose sugar.
4. DNA is genetic material in all type of organism	4. RNA is genetic material in few viruses only
5. Pyrimidine nitorgen bases are cytosine & thymine	5. Pyrimidine nitorgen bases are cytosine & uracil.
6. In eukaryotic cells, DNA is present.	6. In eukaryotic cells. RNA is present in nucleus as well as cytoplasm.
7. DNA sends codon for the synthesis of protein, but otherwise it does not take part in protein synthesis.	7. RNA takes part in protein synthesis through transcription & translation.

B) Sketch and label diagram of t-RNA.

Ans : Diagram of t-RNA



Q.4. What is DNA? Describe the double helical structure of DNA. **[5]**

Ans. : 1. **DNA -** DNA strands for Deoxyribonucleic acid. It has acidic properties & is present in the nucleus. Since it contain deoxyribose sugar, it is called Deoxyribonucleic acid.

2. Structure of eukaryotic DNA.

1. **Double helix -** DNA is double helical molecule consisting of two long strands which are coiled around a common, imaginary central axis. This forms double helix. This double helical structure of DNA was described by Watson & Crick.

2. **Structure of a strand -** Each strand is made up of polynucleotide chains. Each polynucleotide chain is composed of many, nucleotide. Each nucleotide is formed by pentose, deoxyribose sugar, phosphatic group which is phosphoric acid & one N_2 base.

3. **Complementary pairing -** Nitrogen bases are double ring purines or single ring pyrimidines Adenine & thymine are pyrimidines. There is complementary pairing between purines & pyrimidines, Adenine pair with thymine similarly cytosine & guanine pair with each other with triple hydrogen bond.

4. **Purine & Pyrimidine -** The total number of purines always equal to the total number of pyrimidine in a DNA molecule. So their ratio is i.e. 1 : 1

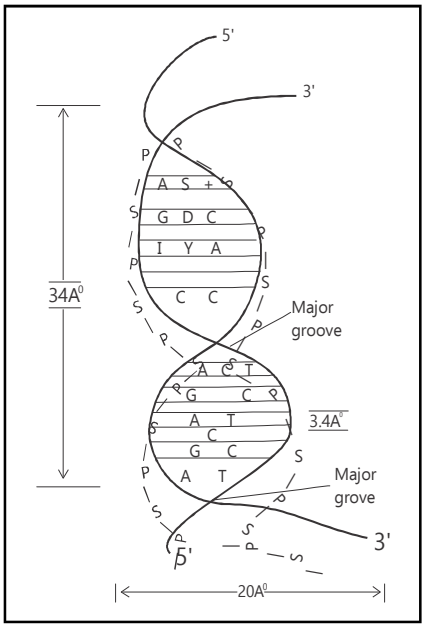
$$\frac{A+G}{A+C}=1$$

5. **Polarity strand -** One strand of DNA has polarity 3'- 5' while opposite strand has 5' -3', 3' - 5' are carbon atoms located in deoxyribose. Sugar free posphate group occurs at 5' & while at 3' end there is - OH group.

   Due to such arrangement one strands runs in 3' - 5' direction while the other runs in 5'-3' direction. Hence DNA strands are called antiparallel.

6. **Dimension & grooves -** The diameter of DNA molecule is 2nm. The spiral ladder like arrangement of DNA molecule is due to deflection of pitch of 36^0 between two rungs. There are 10 base pairs in one complete spiral. (lnm = $10A^0$) DNA undergo right handed coiling arround a central imaginary axis.

   The coiling of double helix results in formation of major or deep groves & the twisting of two strand one another forms the minor or shallow groves.

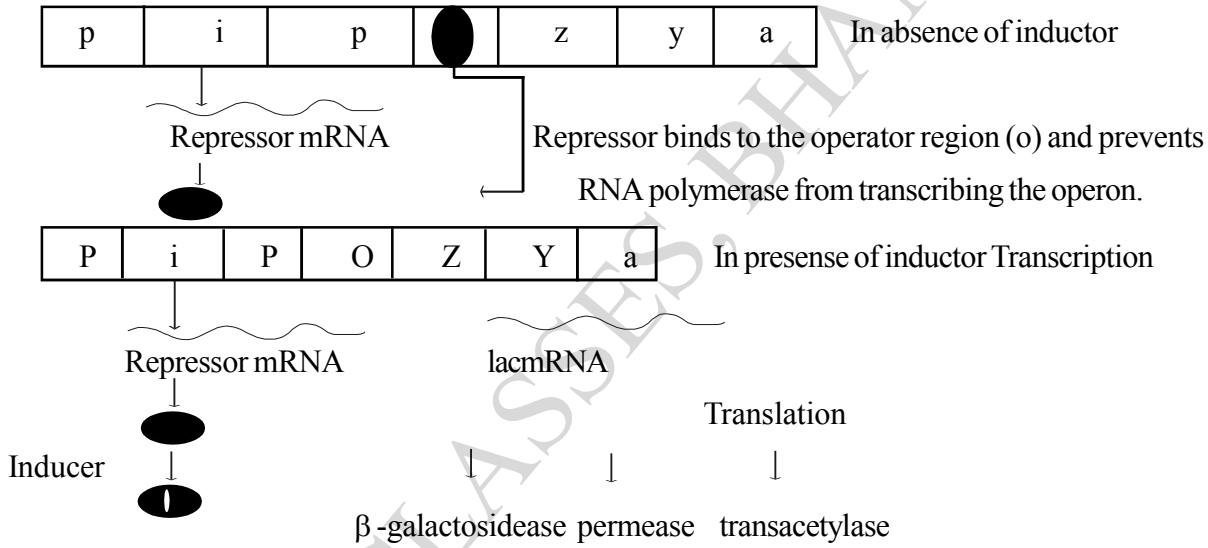


OR

: Describe the Lac Operon.

Ans : Lac Operon :

1) Lac Operon means lactose operon in which a polycistronic gene is regulated by common promotor & regulatory gene. Lac operon is used to explain the gene expression in ***E coli*** These genes are essential for the metabolism of lactose. Lactose metabolism require these enzyme.
2) Permease is needed for the entry of lactose in the cell.
3) B-galactosidase brings about hydrolysis of lactose into glucose & galactose.
4) There are 3 sites of lac operon i.e. promoter site (p), regulatory site. (i) & operatory site (0).
5) There are 3 structural gene viz, z, y & a.
6) The 'Z' gene codes for B - galactosidase. 'Y' gene codes for permease & 'a' gene code for transacetylase.
7) Jacob & Monad have explained the working of Lac operon.



8) When cell is using its normal energy source i.e. glucose, the 'i' gene transcribes a repressor M-RNA, After its translation a repressor protein is produced. Repressor protein binds the operator region of operon prevents the RNA polymerase from transcribing operon.
9) If glucose is absent in the medium, then lactose is used as source of energy. In such case, the lactose enters cell due to permease. This acts as an inducer & interacts with repressor causing the inactivation.
10) When repressor is inactivated, the RNA polymerase can bind it self to operator site, This starts the transcription causing operon to produce lac m - RNA.

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