Molecular Basis of Inheritance MCQ

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

   Ans b. phosphodiester bonds

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

   a. base

   b. sugar

   c. phosphate group

   d. hydroxyl group

   Ans b. sugar

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

   a. trioses

   b. hexoses

   c. pentoses

   d. polysaccharides

   Ans c. pentoses

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

   a. the antiparallel nature

   b. the semiconservative nature

   c. uniform width throughout DNA

   d. uniform length in all DNA

   Ans c. uniform width throughout DNA

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

a. both positive

b. both negative

c. negative and positive, respectively

d. zero

Ans c. negative and positive, respectively

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

Ans b. 5′ (upstream) end and 3′ (downstream) end, respectively of the transcription unit

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

Ans d. All of the above

8. Which of the following is true with respect to AUG?

a. It codes for methionine only

b. It is an initiation codon

c. It codes for methionine in both prokaryotes and eukaryotes

d. All of the above

Ans d. All of the above

9. The first genetic material could be:

a. protein

b. carbohydrates

c. DNA

d. RNA

Ans d. RNA

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

Ans b. exons appear but introns do not appear in the mature RNA

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

a. Chromosome 21 and Y

b. Chromosome 1 and X

c. Chromosome 1 and Y

d. Chromosome X and Y

Ans c. Chromosome 1 and Y

12.Who amongst the following scientists had no contribution to 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

Ans d. Meselson and Stahl

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 deoxyribose

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

d. Both 'b' and 'c'

Ans b. Remove/Replace 3′ OH group in deoxyribose

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 joins the short stretches of DNA

Ans b. DNA dependent DNA polymerase catalyses polymerisation only in one direction (5' → 3')

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

a. Initiation

b. Elongation

c. Termination

d. All of the above

Ans b. Elongation

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

a. DNA-replication

b. Transcription

c. Translation

d. None of the above

Ans b. Transcription

17. Which of the following statements is correct about the role of regulatory proteins in transcription in prokaryotes?

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

Ans d. They can act both as activators and as repressors

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

a. Chromosome 1

b. Chromosome 11

c. Chromosome 21

d. Chromosome X

Ans a. Chromosome 1

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

a. It is a carrier of genetic information from DNA to ribosomes synthesising polypeptides.

b. It carries amino acids to ribosomes.

c. It is a constituent component of ribosomes.

d. All of the above.

Ans d. All of the above.

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

Ans b. It is single-stranded DNA

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

a. A-DNA

b. B-DNA

c. cDNA

d. rDNA

Ans c. cDNA

22. If Meselson and Stahl's experiment is continued for four generations in bacteria, the ratio of N15/N15: N15/N14: N14/N14 containing DNA in the fourth generation would be:

a. 1:1:0

b. 1:4:0

c. 0:1:3

d. 0:1:7

Ans d. 0:1:7

23.If the sequence of nitrogen bases of the coding strand of DNA in a transcription unit is: 5′ – A T G A A T G – 3′, the sequence of bases in its RNA transcript would be;

a. 5′ – A U G A A U G – 3′

b. 5′ – U A C U U A C – 3′

c. 5′ – C A U U C A U – 3′

d. 5′ – G U A A G U A – 3′

Ans a. 5′ – A U G A A U G – 3′

24.The RNA polymerase holoenzyme transcribes:

a. the promoter, structural gene and the terminator region

b. the promoter and the terminator region

c. the structural gene and the terminator region

d. the structural gene only

Ans d. the structural gene only

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′

Ans b. 5′ – CAU – 3′

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

a. 5′ – end

b. 3′ – end

c. Anticodon site

d. DHU loop

Ans b. 3′ – end

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.

Ans a. The smaller ribosomal sub-unit,

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

Ans a. lactose is present and it binds to the repressor

Very Short Answer Type Questions

1. What is the function of histones in DNA packaging?

DNA wraps itself around a protein called histone. Histones pack into structural units called nucleosomes.

2. Distinguish between heterochromatin and euchromatin. Which of the two is transcriptionally active?

Heterochromatin is a highly packed form of DNA in the chromosomes and stains dark.

Euchromatin is a loosely packed form of DNA in the chromosomes and stains lightly.

Euchromatin has transcriptionally active regions of DNA. Heterochromatin has transcriptionally inactive regions of DNA.

3. The enzyme DNA polymerase in E. coli is a DNA dependent polymerase and also has the ability to proof-read the DNA strand being synthesized. Explain. Discuss the dual polymerase.

There are three types of DNA polymerase present in the bacteria which add nucleotides in 5'-3' direction.

DNA polymerases III can proof read the newly formed strand and can sense the wrong base insertions.

4. What is the cause of discontinuous synthesis of DNA on one of the parental strands of DNA? What happens to these short stretches of synthesized DNA?

The DNA-dependent DNA polymerases catalyse polymerisation only in one direction, that is 3'→5' direction.

The leading strand which is elongating from the template in 3'→5' direction will grow continuously.

The lagging strand which is growing from template having polarity 5'→3' will grow discontinuously.

Because RNA primer will be formed at 5' end only so discontinuous strand will require many RNA primers and strand will be synthesised in small segments or Okazaki segments.

Later it is joined by the enzyme DNA ligase.

5. Given below is the sequence of the coding strand of DNA in a transcription unit 3 'A A T G C A G C T A T T A G G – 5' write the sequence of a) its complementary strand b) the mRNA.

a) Complementary strand: 5'-T T A C G T C G A T A A T C C-3'

b) the mRNA: 5' A A U G C A G C U A U U G G-3'

6. What is DNA polymorphism? Why is it important to study?

The difference in the nucleotide sequence between the individuals is called as DNA polymorphism.

It is important for genetic variation and very useful for criminal cases to find the culprit.

7. Based on your understanding of genetic code, explain the formation of any abnormal haemoglobin molecule. What are the known consequences of such a change?

This abnormal haemoglobin molecule formation occurs because one codon GAG gets replaced by GUG, which means in the codon GAG adenosine gets replaced by uracil. This change leads to the incorporation of valine in the beta haemoglobin chain instead of Glutamic acid at the 6th position

8. Sometimes cattle or even human beings give birth to their young ones that are having extremely different sets of organs like limbs/position of the eye(s) etc. Comment.

It happens due to uncoordinated regulation of gene expression in the gene sets associated with organ development.

9. In a nucleus, the number of ribonucleoside triphosphates is 10 times the number of deoxy x10 ribonucleoside triphosphates, but only deoxyribonucleotides are added during the DNA replication. Suggest a mechanism.

The number of ribonucleoside triphosphates is 10 times the number of deoxyribonucleoside triphosphates, but only deoxyribonucleotides are added during the DNA replication.

The DNA polymerase is highly specific to recognize only deoxyribonucleoside triphosphates.

10.Name a few enzymes involved in DNA replication other than DNA polymerase and ligase. Name the key functions for each of them.

Helicases, DNA clamp and Single-stranded binding proteins.

Helicases separate the two DNA strands at the replication fork using energy.

DNA Clamp is used to promote the replication of the DNA. It binds the DNA polymerase enzyme to the template strand and prevents it from disassociating.

Single-Strand Binding Proteins prevent the single strand of DNA to get digested by the nucleases.

It also prevents the formation of secondary structure.

11. Name any three viruses which have RNA as the genetic material.

1. Tobacco Mosaic Virus

2. Human- Immuno Deficiency Virus

3. Influenza Virus

Short Answer Type Questions

1. Define transformation in Griffith's experiment. Discuss how it helps in the identification of DNA as the genetic material.

In 1928 Frederick Griffith experimented with two strains of bacteria Streptococcus Pneumoniae.

These were the S-strain (smooth strain) and the R-strain (rough strain) and they were injected into two different mice. He found that only mice injected with S-strain had the disease and was virulent.

This was because the S-strain has a polysaccharide covering which protected the strain from mice's immune system.

The R–strain mice did not have the disease and were non-virulent.

The disease is shown by mice which is a transformation that takes place.

This genetic change was permanent which further showed that DNA was the genetic material.

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

Oswald Avery, Colin McLeod and Maclyn McCarty in 1933-34 experimented to find this genetic material.

They purified the biochemicals (DNA, RNA, & Protein) from the heat-killed S-strain cells.

They noticed that the RNA digesting enzyme (RNases), Protein digesting enzymes (Proteases) did not affect the transformation of the non-virulent R-strain to the virulent S-strain.

3. Discuss the significance of heavy isotope of nitrogen in the Meselson and Stahl's experiment.

A heavy isotope of nitrogen in the Meselson and Stahl's experiment showed that the DNA is of intermediate density between N14 and N15. This showed that the hybrid DNA has one strand of N14 and one strand of N15 showing DNA was semi-conservative.

4. Define a cistron. Giving examples differentiate between monocistronic and polycistronic transcription unit.

Cistron is the part of the DNA which has the information for an entire polypeptide chain.

Monocistron is a type of messenger RNA which codes for a single protein and it is single codon of the cistron.

It is found in prokaryotes. Polycistron is a type of messenger RNA which codes for several proteins and it is several codons of the cistron.

Found mainly in eukaryotes.

5. Give any six features of the human genome.

1. The genome has around 3164.7 million nucleotide bases.

2. 99.9 % of the nucleotide bases are same in all humans.

3. The largest gene is Dystrophin having 2.4 million bases.

4. Chromosome 1 has most genes (2968) and Y has the least genes (231).

5. Less than 2% of the genome has the coding sequence for proteins.

6. Only 50% of the total discovered genes have known functions.

6. During DNA replication, why is it that the entire molecule does not open in one go? Explain the replication fork. What are the two functions that the monomers (d NTPs) play?

This is because the opening or unwinding of the DNA creates tension in the molecule. Uncoiled parts start forming supercoils due to the interaction of the exposed nucleotides.

The replication occurs within a small opening of the DNA helix for long DNA molecules.

It is called the replication fork. Monomers provide energy for polymerisation reaction and provide deoxyribonucleotides for DNA replication.

7. Retroviruses do not follow central Dogma. Comment.

Retroviruses do not follow central Dogma because their genetic material is RNA instead of DNA.

This RNA is then converted to DNA by the process called Reverse Transcription with the help of enzyme reverse transcriptase.

Hence central dogma is not followed.

8. In an experiment, DNA is treated with a compound which tends to place itself amongst the stacks of nitrogenous base pairs. As a result of this, the distance between two consecutive base increases from 0.34nm to 0.44 nm calculate the length of DNA double helix (which has 2×109 bp) in the presence of saturating amount of this compound.

Distance between two consecutive base pairs: 0.44 nm or 0.44 x 10-9.

Length of the DNA: 2 x 10 9 x 0.44 x 10-9

Length of DNA = 0.88m

9. What would happen if histones were to be mutated and made rich in acidic amino acids such as aspartic acid and glutamic acid in place of basic amino acids such as lysine and arginine?

This mutation would make the histones acidic and negatively charged and histones would not be able to bind to DNA because both would be negatively charged.

Hence, the DNA would not be packed and chromatin would not be formed.

10. Recall the experiments done by Frederick Griffith, Avery, MacLeod and McCarty, where DNA was speculated to be the genetic material. If RNA, instead of DNA was the genetic material, would the heat-killed strain of Pneumococcus have transformed the R-strain into virulent strain? Explain.

The heat-killed strain of Pneumococcus would not have transformed the R-strain into the virulent strain. This is because RNA is not thermostable.

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

    32P is radioactive and 15N is non-radioactive. So, its presence won't be detected.

    If hypothetically 15N would be radioactive, then its presence would be seen both inside the cell as it gets incorporated in the DNA as a nitrogenous base and also as a supernatant as it gets incorporated in the amino group of amino acids.

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

    Some amino acids are coded by more than one codon. This phenomenon is called as the degeneracy of codon.

    Hence, from such amino acids, multiple nucleotide sequence would be obtained.

13. **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.**

    Yes. The statement is correct because if mutation takes place at the third base pair, it does not lead to a phenotypic change. These mutations are known as silent mutations.

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

    Lactose present in the external medium can only enter the bacterium when the bacterium has permease within it. Low level of expression of the lac operon is required for permease to form within the bacteria.

15. **How has the sequencing of the human genome opened new windows for the treatment of various genetic disorders? Discuss amongst your classmates.**

    The sequencing of the human genome opened new windows for the treatment of various genetic disorders because it led to a better knowledge of genetic disorders. A better understanding on Diagnosis, treatment and prevention of genetic disorders is possible.

16. **The total number of genes in humans is far less (< 25,000) than the previous estimate (up to 1,40,000 gene). Comment.**

    This is because of the presence of large portions of repetitive sequencing regions in the human genome.

    If the repetitive portions are not added the non-repetitive gene count will be less if the stretched of DNA sequence that is repeated numerous times.

17. Now, the sequencing of total genomes is getting less expensive day by the day. Soon it may be affordable for a common man to get his genome sequenced. What is your opinion could be the advantage and disadvantage of this development?

Advantages

1. It would lead to better diagnosis, treatment and prevention of genetic disorders.
2. A better understanding of the DNA gene sequence would lead to a better understanding of biological systems.

Disadvantages

1. Patenting of the genetic test results can be done. In a turn of which gene patenting can also be done.
2. Genetic disorders which can't be treated might be discovered.

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

DNA fingerprinting is not an option as it does not have repetitive sequencing portions for bacteriophage like in VNTR'S so a pattern of bands would not be formed. Bacteriophage has a small genome that has all the coding sequences.

19. During in vitro synthesis of DNA, a researcher used 2', 3' – dideoxy cytidine triphosphate as raw nucleotide in place of 2'-deoxycytidine. What would be the consequence?

Polymerisation would not take place as the 3'OH group on the sugar is not present to add a nucleotide for forming ester bonds.

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

1. Chargaffs law showed Adenosine forms bond with Thymine (A&T) and Guanine bonds with Cytosine (G & C).
2. Wilkin's and Franklin's state DNA has a diameter of 20 Å, a regular helix structure with 34Å distance and 10 base pairs of nucleotides in each turn of the spiral.

   They discovered DNA was a double helix structure. They also discovered the complementary base pairing by hydrogen bonds.

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

(i) Methylated guanosine cap: Methylated guanosine cap helps to bind mRNA to smaller ribosomal subunit when a translation is initiated

(ii) poly-A "tail": It prolongs mRNA's life.

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

The alternate splicing of exons could be either gender-specific, developmental stage-specific etc. This can lead to encoding of various proteins from a single gene. In the absence of such splicing, there is a requirement of a new gene for every protein or protein.

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

Tandems are a region in a chromosome which the sequence of DNA stretch is repeated for several times.

It forms a pattern of bands which is unique for each individual and is used in DNA fingerprinting in the forensic department.

Long Answer Type Questions

1. Give an account of the Hershey and Chase experiment. What did it conclusively prove? If both DNA and proteins contained phosphorus and sulphur do you think the result would have been the same?

Alfred Hershey and Martha Chase experimented in 1952 which detects the presence of genetic material with the virus bacteriophages.

They took the virus and allowed to grow in the two separate medium which consists of radioactive phosphorus in one medium and other medium consisted of radioactive Sulphur (S35).

Medium containing radioactive Phosphorous had radioactive DNA because DNA is a phosphorus-based structure. Medium containing radioactive sulphur had radioactive protein.

The virus has been injected into E. Coli bacterial and viral coats were removed by blending them.

E. coli infected with the virus had radioactive DNA and no radioactive proteins were present.

This showed that 'DNA' was the genetic material that got transferred from virus to E. coli and not protein.

Conclusion:

a. DNA is the genetic material that transfers from one cell to another and not protein.

b. Radioactive 35 S and 32 p labelled protein capsule would show no radioactivity in the cell, but radioactivity would be detected in the supernatant.

2. During evolution why DNA was chosen over RNA as genetic material? Give reasons by first discussing the desired criteria in a molecule that can act as genetic material and in the light of biochemical differences between DNA and RNA.

The desired criteria in a molecule that can act as genetic material are

1. It should be chemically and structurally stable.
2. It should be able to replicate so that replication should take place.
3. Mutation or gradual and slow changes should take place.
4. It should be able to express itself in Mendelian.
5. For further evolution, it should transfer from parent to progeny.

The biochemical difference between DNA and RNA are

i. DNA is less reactive and more stable chemically and structurally whereas RNA is more reactive and less stable chemically and structurally.

ii. Thymine in the place of Uracil also makes stability in DNA whereas the Uracil in the place of Thymine will decrease the stability of RNA

iii. Slow mutation takes place in DNA whereas, in RNA, rapid mutations take place

iv. DNA is double-stranded and RNA is single-stranded

These biochemical differences between the DNA and RNA make DNA a desired genetic material.

3. Give an account of post-transcriptional modifications of a eukaryotic mRNA.

Post-transcriptional modifications are the chemical alterations done to the primary transcript of RNA.

These modifications convert a gene into functional RNA.

In prokaryotes, the primary transcript (hn-RNA) has both the non-coding introns inside the gene and the coding exons but they are non-functional.

Hence, Splicing takes place. In which introns are removed and exons are joined in a definite order.

In Eukaryotes (in-RNA) or primary transcript is absent so, slicing is not needed.

In this capping of Methyl Guanosine Triphosphate nucleotide is added to the 5’ end of hn-RNA known as cap structure and in tailing addition of Adenylate residues at the 3’ end of the RNA takes place.

hn-RNA is processed to form mRNA or messenger RNA after all this process and thus transported out of the nucleus for translation.

4. Discuss the process of translation in detail.

The translation is the decoding of mRNA to form an amino acid chain with the help of ribosome in the cytosol of the cell.

Amino acids, m-RNA, t-RNA and Ribosomes are involved in this process.

Initiation:

1. At the 5' end of the mRNA, the smaller 40S subunit of the ribosome with methionyl-tRNA scans the mRNA to find the start codon (5'AUG) and specific to methionine.
2. The larger 60S subunit of the ribosome binds to the mRNA.This 60S ribosomal subunit has two t-RNA binding sites.

   Site P: This site can hold the peptide chain.

   Site A: This site can hold t-RNA.

Elongation:

1. As the Met-tRNA binds to the P site of the 60S subunit of the RNA. Another aminoacyl- tRNA which has an anticodon complementary to the next codon occupies the site A within the 60S subunit of the ribosome.
2. In between Methionyl-tRNA and Aminoacyl-tRNA peptidyl transferase forms a peptide bond.
3. t-RNA molecule at the P site become uncharged and it leaves the ribosome. Thus it moves along the mRNA molecule to the next codon which opens the Site A for next aminoacyl-tRNA.
4. The polypeptide chain is built in the direction of N to C terminal.

Termination:

1. The stop codon enters the site as the A site is vacant. None of the t-RNA molecules binds to this codon.
2. The peptide bond of Methionyl-tRNA and Aminoacyl-tRNA become hydrolysed releasing the polypeptide into the cytoplasm. The dissociation of ribosomal subunit takes place.

5. Define an operon. Giving an example, explain an Inducible operon.

The operon is a cluster of a gene which has related functions and is involved in the catabolism or degradation of lactose which was given by François Jacob and Jacques Monad in 1961.

Inducer operon also called Lac Operon (lactose) and Trp Operon also called Repressor operon (Tryptophan operon) are the two types of the operon.

Inducible operon system:

1. It is also known as Lac Operon found in bacteria E. coli. When E. coli feeds on something it prefers Glucose over lactose.
2. When Glucose is fully taken up by the E. coli, it starts using Lactose.
3. When the intake of lactose is started by E. coli, Lac operon gets activated which proves that lactose is an inducer for the Lac Operon.

Lac Operon

1. In the operon gene 'i' undergo transcription and forms a messenger RNA or mRNA. This undergoes translation to form repressor protein.
2. A repressor tetramer is formed by combing the repressor protein and the promoter site or gene 'p' is the binding site for enzyme RNA polymerase.
3. As the repressor tetramer moves towards the operator site to bind to it, lactose present in the E. coli breaks down the tetramer. The operator gets unblocked and makes it able for enzyme RNA polymerase to move forward from the promoter site.
4. This enables the enzyme RNA polymerase to start transcribing structural gene z,y and a. Gene 'z' coding for enzyme p-galactosidase breaks down into glucose and lactose. Gene 'y' coding for enzyme permease provides the entry of more lactose in the bacteria E.coli.
5. Gene 'a' coding for transacetylase adds the acetyl group to beta-galactosidase to activate beta-galactosidase.

6. 'There is a paternity dispute for a child'. Which technique can solve the problem? Discuss the principle involved.

To solve the disputed DNA fingerprinting should be used.

In DNA fingerprinting a pattern of bands is formed due to small stretch of the DNA sequence which is repeated numerous times called as Variable Number of Tandem Repeats (VNTR'S), also known as Mini Satellites.

These VNTR's are specific for each individual.

The principle involved behind DNA fingerprinting is the Variable Number of Tandem Repeats (VNTR'S) also known as Mini Satellites.

These are a pattern of the band formed due to small stretch of the DNA sequence which is repeated numerous times. These VNTR's are specific for each individual.

7. Give an account of the methods used in sequencing the human genome.

DNA sequencing is the method used to detect the definite order of bases (Adenosine, Guanine, Thymine and Cytosine) with in the DNA.

A) Maxim Gilbert Method

B) Sanger Method

These are the two main methods.

Maxim Gilbert Method: In 1977 Maxim Gilbert devised for DNA sequencing

By increasing the temperature the DNA denatured into single-stranded DNA.

The 5' end is labelled radioactively by Kinase reaction using gamma P 32. Cleave the DNA strand at specific positions using chemical reactions.

For cleavage at specific positions, two chemicals are used followed by the addition of piperidine. Dimethyl Sulphate:

This chemical only attacks purines (Adenosine and Guanine). Hydrazine:

This chemical only attacks pyrimidine (Cytosine and Thymine) In Maxim and Gilbert experiment the chemicals cleaved G, A+G, C and C+T.

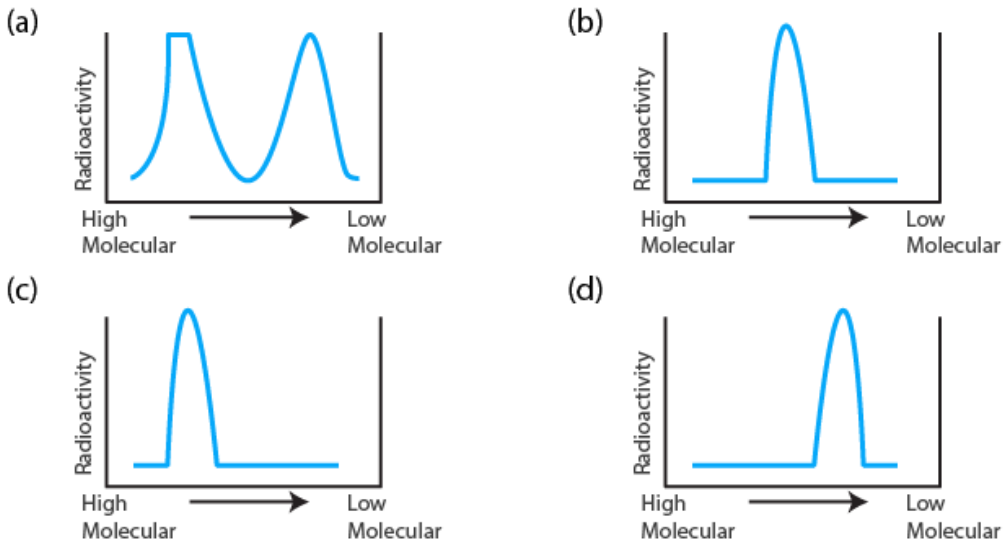
In four test tubes, four different sizes of DNA's are obtained. Now, these DNA's are separated based on size by gel electrophoresis technique.

After this separation, the sequence of DNA is obtained.

8. List the various markers that are used in DNA fingerprinting.

Restriction Fragment Length Polymorphisms (RFLPs), Random Amplified Polymorphic DNAs (RAPDs), Amplified Fragment Length Polymorphisms (AFLPs), Simple Sequence Repeats (SSRs) which also called as microsatellites, Single Nucleotide Polymorphisms (SNPs) and others have been developed.

9. Replication was allowed to take place in the presence of radioactive deoxynucleotides precursors in E. coli that was a mutant for DNA ligase. Newly synthesised radioactive DNA was purified and strands were separated by denaturation. These were centrifuged using density gradient centrifugation. Which of the following would be a correct result?



Option (d) is the correct.

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