



Molecular Basis of Inheritance Important Questions With Answers

NEET Biology 2023

1. Assertion: Synthesis of daughter or new strand occurs continuously along the parent 3'→5' strand.

Reason: DNA polymerase can polymerise nucleotides in 3'→5' direction on 5'→3' strand.

- a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false

Solution : -

DNA-polymerase can polymerise nucleotides only in 5'→3' direction on 3'→5' strand because it adds them at the 3' end.

2. Arrange the various steps of DNA fingerprinting technique in the correct order.

- (i) Separation of DNA fragments by electrophoresis.
(ii) Digestion of DNA by restriction endonucleases.
(iii) Hybridisation using labelled VNTR probe.
(iv) Isolation of DNA.
(v) Detection of hybridised DNA fragments by autoradiography.
(vi) Transferring the separated DNA fragments to nitrocellulose membrane.
a) (iv) → (ii) → (i) → (vi) → (iii) → (v) b) (iv) → (i) → (ii) → (iii) → (vi) → (v)
c) (ii) → (i) → (iv) → (vi) → (iii) → (v) d) (iii) → (v) → (iv) → (ii) → (i) → (vi)

3. 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.**

Solution : -

Sickle cell anaemia is an autosomal hereditary disorder in which the erythrocytes become sickle shaped under oxygen deficiency as during strenuous exercise and at high altitudes. The disorder or disease is caused by the formation of an abnormal haemoglobin called haemoglobin-S. Sickle cell trait protect against malaria. Several studies have suggested that, sickle haemoglobin might get in the way of Plasmodium parasite infecting RBC's, reducing the number of parasites that actually infect the host cell and thus confer some protection against the disease.

4. When a heterozygous tall pea plant of F_1 generation upon self fertilization produces tall and dwarf phenotypes it proves the principle of

- a) Dominance **b) Segregation** c) Independent assortment d) Inheritance & purity of gametes

5. **Assertion:** Polycistronic mRNA, found in prokaryotes, specify a number of polypeptides.

Reason: Monocistronic mRNA, found in eukaryotes, both specify only a single polypeptide.

- a) If both assertion and reason are true and reason is the correct explanation of assertion.
b) If both assertion and reason are true but reason is not the correct explanation of assertion.
c) If assertion is true but reason is false. d) If both assertion and reason are false

6. Linkage is a tendency of alleles of different genes to assort together in :

- a) Meiosis b) Mitosis c) X-Y linkage d) Inversion

7. Biological name of wheat is:

- a) **Triticum aestivum** b) Triticum tritcale c) Triticum sativum d) Triticum tuberosum

8. Refer to the given sequence of steps and select the correct option.

$DNA \xrightarrow{(i)} hnRNA \xrightarrow{(ii)} mRNA \xrightarrow{(iii)} proteins$

a)

(i)	(ii)	(iii)
Replication	Transcription	Translation

b)

(i)	(ii)	(iii)
Replication	Processing	Translation

c)

(i)	(ii)	(iii)
Transcription	Splicing	Translation

d)

(i)	(ii)	(iii)
Transcription	Replication	Translation

Solution : -

DNA contains genetic information which is transcribed via mRNA. mRNA is not made directly in eukaryotic cell. It is transcribed in the nucleus as hnRNA which contains introns and exons. The introns are removed by RNA splicing leaving behind exons which contain the information. The exonic regions of RNA are joined together to produce a single chain RNA required for functioning as translational template. This information is then translated into polypeptide chains.

9. Which one of the following is the most suitable medium for culture of *Drosophila melanogaster*?

- a) **Ripe banana** b) Cow dung c) Moist bread d) Agar-agar

10. Read the following four statement (A-D):

- (A) In transcription, adenosine pairs with uracil.
 (B) Regulation of lac operon by repressor is referred to as positive regulation.
 (C) The human genome has approximately 50000 genes.
 (D) Haemophilia is a sex-linked recessive disease.

How many of the above statements are right?

- a) Four b) One **c) Two** d) Three

11. Given below are the steps of protein synthesis. Arrange them in correct sequence and select the correct option.

- (i) Codon-anticodon reaction between mRNA and aminoacyl tRNA complex.
 (ii) Attachment of mRNA and smaller sub-unit of ribosome.
 (iii) Charging or aminoacylation of tRNA.
 (iv) Attachment of larger sub-unit of ribosome to the mRNA-tRNA_{Met} complex.
 (v) Linking of adjacent amino acids.
 (vi) Formation of polypeptide chain

- a) (ii) → (i) → (iii) → (v) → (iv) → (vi) b) (v) → (ii) → (i) → (iii) → (iv) → (vi)
 c) (iii) → (ii) → (iv) → (i) → (v) → (vi) **d) (iii) → (ii) → (i) → (iv) → (v) → (vi)**

12. A colour blind man marries a woman with normal sight who has no history of colour blindness in her family. What is the probability of their grandson (son's son) being colour blind?

- a) **0.25** b) 0.5 c) 1 d) Nil

13. Probes are constructed from short segment of

- a) ss DNA attached with radioactive marker b) ds DNA attached with radioactive marker
c) Hn RNA attached with fluorescent marker d) ds RNA attached with fluorescent marker

14. The net electric charge on DNA and histones is

- a) both positive b) both negative **c) negative and positive, respectively** d) zero

Solution : -

DNA is much more organised in eukaryotic chromatin and is associated with a variety of proteins most prominent of which are histones. Histones are rich in the basic amino acid residues lysines and arginines. Both the amino acid residues carry positive charges in their side chains. Histones are organised to form a unit of eight molecules called as histone octamer. The negatively charged DNA is wrapped around the positively charged histone octamer to form a structure called nucleosome.

15. DNA fingerprinting refers to
- Techniques used for identification of fingerprints of individuals
 - Molecular analysis of profiles of DNA samples**
 - Analysis of DNA samples using imprinting devices
 - Techniques used for molecular analysis of different specimens of DNA
16. t-RNA attach to larger subunit of ribosome with the help of which loop
- DHU-loop
 - TΨC loop**
 - Anticodon loop
 - Minor loop
17. During translation initiation in prokaryotes, a GTP molecule is needed in_____ .
- association of 50 S subunit of ribosome with initiation complex
 - formation of formyl-met-tRNA
 - binding of 30 S subunit of ribosome with mRNA
 - association of 30 S-mRNA with formyl-met-tRNA**

Solution : -

During translation of mRNA for the formation of initiation complex GTP is must required. The initiator AUG codes for the formylmethionine in prokaryotes.

18. Telomerase is an enzyme which is a_____
- simpleprotein
 - RNA
 - ribonucleoprotein**
 - repetitive DNA

Solution : -

Telomerase was discovered by Carol W. Greider in 1984. It is a ribonucleoprotein which synthesise the rich strand of telomers in DNA the telomeres contain condensed DNA material, giving stability to the chromosomes.

19. **Assertion:** tRNA recognises its corresponding codon in mRNA.

Reason: For each codon, there is an individual tRNA.

- If both assertion and reason are true and reason is the correct explanation of assertion.
- If both assertion and reason are true but reason is not the correct explanation of assertion.
- If assertion is true but reason is false.**
- If both assertion and reason are false.

Solution : -

tRNA has an anticodon loop which has 7 bases, out of which three bases form anticodon for recognising and attaching to the codon of mRNA. Since there are 61 codons specifying amino acids, the cell should contain 61 different tRNA molecules, each with a different anticodon. Actually, however, the number of tRNA molecule types discovered is much less than 61. This implies that the anticodons of some tRNAs read more than one codon on mRNA.

20. A bacterium with completely radioactive DNA was allowed to replicate in a non-radioactive medium for two generation what % of the bacteria should contain radioactive DNA
- 100%
 - 50%**
 - 25%
 - 12.5%
21. With regard to mature mRNA in eukaryotes
- exons and introns do not appear in the mature RNA
 - exons appear but introns do not appear in the mature RNA**
 - introns appear but exons do not appear in the mature RNA
 - both exons and introns appear in the mature RNA

Solution : -

Eukaryotic transcripts possess extra segments called introns or intervening sequences or noncoding sequences. They do not appear in mature or processed RNA. The functional coding sequences are called exons. Splicing is removal of introns and fusion of exons to form functional RNAs.

22. ABO blood groups in humans are controlled by the gene I. It has three alleles- I^A , I^B and i. Since there are three different alleles, six different genotype are possible. How many phenotypes can occur?

- a) **Four** b) Two c) Three d) One

23. Read the following statements

- (i) One codon codes for only one amino acid.
 (ii) Some amino acids are coded by more than one codon.
 (iii) The sequence of triplet nitrogenous bases in DNA or mRNA corresponds to the amino acid sequence in the polypeptide chain

Give suitable terms for the characteristics of 'genetic code' as per the above statements.

a)

Degeneracy	Colinearity	Unambiguous
(i)	(iii)	(iii)

b)

Degeneracy	Colinearity	Unambiguous
(iii)	(ii)	(i)

c)

Degeneracy	Colinearity	Unambiguous
(ii)	(iii)	(i)

d)

Degeneracy	Colinearity	Unambiguous
(i)	(ii)	(iii)

24. A man whose father was colour blind marries a woman who had a colour blind mother and normal father. What percentage of male children of this couple will be colour blind?

- a) 25% b) 0% c) **50%** d) 75%

25. DNA elements, which can switch their position, are called _____.

- a) exons b) introns c) cistrons d) **transposons**

Solution : -

Transposons are genetic elements varying from 750 base pairs to 40 kilo base pairs in length and can move from a site in one genome to another site in the same or in a different genome.

26. Repressible operon system is usually found in ___(i)___ pathways. The pathway's end product serves as a ___(ii)___ to activate the repressor, turn off enzyme synthesis and prevent overproduction of the end product of the pathway. Genes for this operon are usually switched ___(iii)___ and the repressor is synthesised in an ___(iv)___ form.

a)

(i)	(ii)	(iii)(iv)
anabolic	corepressor	on inactive

b)

(i)	(ii)	(iii)(iv)
anabolic	inducer	off active

c)

(i)	(ii)	(iii)(iv)
catabolic	inducer	off active

d)

(i)	(ii)	(iii)(iv)
catabolic	corepressor	on inactive

27. Match the following genes of the Lac operon with their respective products:

- (a) i gene - (i) $\beta\beta$ - galactosidase
 (b) z gene - (ii) Permease
 (c) a gene - (iii) Repressor
 (d) y gene - (iv) Transacetylase

Select the correct option.

- a) (iii) (i) (ii) (iv) b) **(iii) (i) (iv) (ii)** c) (iii) (iv) (i) (ii) d) (i) (iii) (ii) (iv)

Solution : -

- In lac operon
- i gene - Repressor
- z gene - β -galactosidase
- y gene - Permease
- a gene - Transacetylase

28. Regulatory proteins are the accessory proteins that interact with RNA polymerase and affect its role in transcription. Which of the following statements is correct about regulatory protein?
- 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.

Solution : -

In a transcription unit, the activity of RNA polymerase at a given promoter is regulated by interaction with accessory proteins, which affect its ability to recognise start sites. These regulatory proteins can act both positively (activators) and negatively (repressors).

29. Semi-conservative replication of DNA was first demonstrated in _____
- a) **Escherichia coli** b) Streptococcus pneumoniae c) Salmonella typhimurium
 d) Drosophila melanogaster

Solution : -

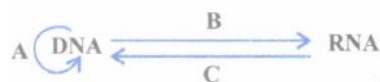
Meselson and Stahl cultured E. coli in a ^{15}N medium to get the DNA of heavy density. Then bacteria were shifted to a ^{14}N medium, DNA of replication cycles 0, 1, and 2 was isolated. The DNA was all of intermediate density after one replication cycle and ruled out the conservative replication model, which predicts that both heavy density DNA and light density DNA will be present. This result proved the semi-conservative replication model, according to which all DNA molecules will consist of one ^{15}N -labeled DNA strand and one ^{14}N -labeled DNA strand. The result of second replication cycle were also in consistent with semi-conservative replication model. So, the correct answer is 'Escherichia coli.'

30. Linkage discovered in Drosophila by
- a) Bateson **b) Morgan** c) Muller d) Correns
31. Control of gene expression takes place at the level of
- a) DNA-replication **b) transcription** c) translation d) none of the above.

Solution : -

Regulation of gene expression refers to a very broad term that may occur at various levels. In eukaryotes the gene expression can be regulated at transcriptional level, processing level, transport of mRNA from nucleus to the cytoplasm, and translational level whereas in prokaryotes, control of the rate of transcriptional initiation is the predominant site for control of gene expression.

32. The given flow chart shows central dogma reverse.



Enzymes used in processes A, B and C are respectively

a)

A	B	C
RNA dependent	DNA dependent	RNA dependent
DNA polymerase	RNA polymerase	RNA polymerase

b)

A	B	C
DNA dependent	RNA dependent	DNA dependent
DNA polymerase	DNA polymerase	RNA polymerase

c)

A	B	C
DNA dependent	DNA dependent	RNA dependent
DNA polymerase	RNA polymerase	DNA polymerase

d)

A	B	C
DNA dependent	DNA dependent	RNA dependent
RNA polymerase	DNA polymerase	DNA polymerase

33. Antiparallel strand in DNA is due to
 a) Disulphide linkage b) Hydrogen bond **c) Phosphodiester bond** d) Ionic bond
34. Rate of polymerisation by DNA polymerase III per second is
 a) 1000 bp b) 200 bp **c) 2000 bp** d) 4000 bp
35. If two persons with 'AB' blood group marry and have sufficiently large number of children, these children could be classified as 'A' blood group: 'AB' blood group: 'B' blood group in 1:2:1 ratio. Modern technique of protein electrophoresis reveals presence of both 'A' and 'B' type proteins in 'AB' blood group individuals. This is an example of:
 a) Complete dominance **b) Codominance** c) Incomplete dominance d) Partial dominance
36. Which one of the following is a case of wrong matching?
 a) Micropropagation-In vitro production of plants in large numbers
 b) Callus - Unorganised mass of cells produced in tissue culture
 c) Somatic hybridization - Fusion of two diverse cells **d) Vector DNA - Site for t-RNA synthesis**
37. In which direction m-RNA is synthesised on DNA template?
a) 5'→3' b) 3'→5' c) Both (a) and (b) d) Any

Solution : -

Formation of mRNA on DNA template is called Transcription. During transcription the synthesizing mRNA grows in 5' → 3' direction on non coding strand, which is synonymous to the template strand. Non coding strand refers to the DNA strand which has similar base sequences like that of the mRNA strand, with the thymine only replaced with uracil. The synthesis of new DNA and RNA is always unidirectional, i.e., in the direction of 5' → 3'.

38. Which are the commonly used vectors for human genome sequencing?
a) BAC and YAC b) Expression vectors c) T-DNA d) T/Acloning vectors

Solution : -

The commonly used hosts were bacteria and yeast, and the vectors were called as BAC (bacterial artificial chromosomes), and YAC (yeast artificial chromosomes).

39. Basis of DNA fingerprinting is:
 a) Relative proportion of purines and pyrimidines
 b) Relative difference in DNA occurrence in blood skin and saliva
 c) Relative amounts of DNA in ridges and grooves of fingerprints
d) Satellite DNA occurring as highly repeated short DNA segments

Solution : -

DNA fingerprinting involves identifying differences in some specific regions in DNA sequence called as repetitive DNA because, in these sequences, a small stretch of DNA is repeated many times. These repetitive DNA are separated from bulk genomic DNA as different peaks during density gradient centrifugation. The bulk DNA forms a major peak and the other small peaks are referred to as satellite DNA.

40. Which is incorrect for genetic code-
 (a) (i) The codon is triplet
 (b) (ii) 64 codons code for amino acids
 (c) (iii) Genetic code is unambiguous
 (iv) Genetic code is nearly universal
 (d) (v) AUG has dual functions
a) only ii b) ii & iii c) iii, iv + v d) All are correct
41. Protein helping in opening of DNA double helix in front of replications fork is _____
a) DNA gyrase b) DNA polymerase-I c) DNA ligase d) topoisomeras

Solution : -

DNA gyrase helps in opening of DNA double helix in front of replication fork.

42. If the DNA of a virus is labelled with ^{32}P and the protein of the virus is labelled with ^{35}S , after transduction which molecule(s) would be present inside the bacterial cells?

a) ^{32}P only b) ^{35}S only c) Both (a) and (b) d) None of these

Solution : -

Bacteria which were infected with viruses that had radioactive DNA (incorporated with ^{32}P) were radioactive, indicating that DNA was the material that passed from the virus to the bacteria. Bacteria that were infected with viruses that had radioactive proteins (incorporated with ^{35}S) were not radioactive. DNA is therefore, the genetic material that is passed from virus to bacteria.

43. Match column I with column II and select the correct option from the given codes.

Column I	Column II
A. Translation	(i) Aminoacyl tRNA synthetase
B. Transcription	(ii) Okazaki fragments
C. DNA replication	(iii) RNA polymerase

a) A-(ii), B-(i), C-(iii) **b) A-(i), B-(iii), C-(ii)** c) A-(iii), B-(i), C-(ii) d) A-(ii), B-(iii), C-(i)

44. One gene-one enzyme relationship was established for the first time in _____

a) *Salmonella typhimurium* b) *Escherichia coli* c) *Diplococcus pneumoniae* **d) *Neurospora crassa***

Solution : -

Beadle and Tatum did classical experiments on *Neurospora crassa* to prove that in a multistep biochemical pathway, each step is controlled by different enzymes and each of these enzymes are encoded by specific gene. This is called as one gene one enzyme hypothesis.

45. Haemophilic gene does not transfer from:

a) **Haemophilic father to son** b) Haemophilic mother to son c) Haemophilic father to daughter
d) Haemophilic mother to son & daughter

46. If distance between gene on chromosome is then gene shows:

a) **Weak linkage** b) Strong linkage c) Less crossing d) 1 & 3 both

47. Inheritance of skin colour in humans is an example of

a) chromosomal aberration b) point mutation **c) polygenic inheritance** d) codominance

48. Read the following statements and select the correct option.

(i) Loosely packed and lightly stained region of chromatin are called as heterochromatin.

(ii) Densely packed and dark stained region of chromatin are called as euchromatin.

(iii) A typical nucleosome contains 200 bp of DNA helix.

a) Statements (i) and (ii) are true, but statement (iii) is false.

b) Statements (i) and (ii) are false, but statement (iii) is true.

c) Statements (ii) and (iii) are true, but statement (i) is false. d) All the statements are true

Solution : -

A typical nucleosome contains 200 bp of DNA helix. Nucleosomes constitute the repeating unit of a structure in nucleus called chromatin. Chromatin is held over a scaffold of non-histone chromosomal (or NHC) proteins. At some places chromatin is densely packed to form darkly stained heterochromatin. At other places chromatin is loosely packed. It is called euchromatin. It is transcriptionally active chromatin whereas heterochromatin is transcriptionally inactive and late replicating or heteropycnotic.

49. Spliceosomes are not found in cells of _____

a) Fungi b) Animals **c) Bacteria** d) plants

Solution : -

Spliceosomes are the machinery used for splicing in Eukaryotic cells. Splicing refers to the removal of noncoding regions or Introns from the Heterogeneous RNA and joining of exons or the coding sequences to form the mature mRNA. It is absent in prokaryotes, i.e., Bacteria.

50. What replace thymine in RNA:

- a) Guanine b) Adenine **c) Uracil** d) Water

