Solution

CET25B5 MOLECULAR BASIS OF INHERITANCE

Class 12 - Biology

1. **(d)** SNP
Explanation: SNP

2. **(d)** Viral DNA
Explanation: Viral DNA

3. **(d)** 5 - AGCGCT - 3'
3' TCGCGA - 5'

Explanation: 5 - AGCGCT - 3'
3' TCGCGA - 5'

4. **(b)** DNA topoisomerase
Explanation: DNA topoisomerase

5. **(b)** Electrophoresis
Explanation: Electrophoresis

6. **(b)** Mesosome
Explanation: Mesosome

7. **(b)** 3' - end
Explanation: The amino acid attaches to the tRNA at its 3' - end.

8. **(d)** RNA polymerase
Explanation: RNA polymerase

9. **(c)** GCUAAUGUC
Explanation: GCUAAUGUC

10. **(d)** S^{35}
Explanation: S^{35}

11. **(c)** Free infectious RNA
Explanation: Free infectious RNA

12. **(b)** Two
Explanation: Two

13. **(a)** The smaller ribosomal sub-unit
Explanation: When the small subunit encounters an mRNA, the process of translation of the mRNA to protein begins.

14. **(a)** the structural gene only
Explanation: Holoenzyme will transcribe only structural gene. The promoter gene is necessary for initiation and the terminator gene is necessary for termination of transcription. Promoter and terminator genes are not transcribed during transcription.

15.

(c) DNA polymerase
Explanation: DNA polymerase

16.

(b) An enhancer
Explanation: An enhancer

17. **(a)** 23 SrRNA
Explanation: 23 SrRNA

18. **(a)** Shows high degree of polymorphism in population and also the same degree of polymorphism in an individual, which is heritable from parents to children.
Explanation: Shows high degree of polymorphism in population and also the same degree of polymorphism in an individual, which is heritable from parents to children.

19.

(b) RNA molecule without protein coat.
Explanation: RNA molecule without protein coat.

20. **(a)** Regulator gene
Explanation: Regulator gene

21.

(c) 5' - CAU - 3'
Explanation: Anticodon loop of tRNA has a complementary sequence to the codon present on mRNA.

22.

(d) *Escherichia coli*
Explanation: Semiconservative replication of DNA was first demonstrated in bacterium *Escherichia coli* as it contains a single chromosome within the cell without a nuclear membrane.

23.

(d) Satellite DNA (repetitive sequences of DNA) that show high degree of polymorphism
Explanation: Satellite DNA (repetitive sequences of DNA) that show high degree of polymorphism forms the basis for basic DNA fingerprinting.

24.

(c) make every individual unique in phenotypic appearance.
Explanation: Genome variations are differences in the sequence of DNA from one person to the next.
In human's 99.9% of the base sequences of DNA are same and are referred to as **Bulk genomic DNA.**
The difference lies in the remaining 0.1%. It is these differences which make every individual unique in their phenotypic appearance. This DNA has small stretches of **repetitive sequences**. They are referred as Repetitive DNA.

25.

(d) X-ray crystallography
Explanation: X-ray crystallography

26.

(b) Analyzing VNTR samples of DNA obtained from body fluid or cells.
Explanation: VNTR analysis (sometimes called DNA fingerprinting) can be used to identify and match cell samples.
In order to use VNTRs, we must have a source of DNA. The DNA can come from any nucleated cell, e.g., white blood cells, skin samples, semen samples, or hair follicles. Red blood cells cannot be used as they do not have a nucleus.
For a VNTR analysis, the DNA is extracted and cut using restriction endonucleases. A Southern Blot is then performed using various probes.

27.

(d) (b) and (c)
Explanation: (b) and (c)

28.

(c) tRNA
Explanation: tRNA

29.

(b) Francois Jacob and Jacques Monod - Lac Operon
Explanation: Francois Jacob and Jacques Monod - Lac Operon

30. **(a)** Transcription
Explanation: Transcription

31. **(a)** Chromosome 1
Explanation: The sequence of chromosome 1 was completed only in May 2006 (this was the last of the 24 human chromosomes – 22 autosomes and X and Y – to be sequenced).

32.

(b) Jumping genes
Explanation: Jumping genes

33.

(c) RNA
Explanation: RNA was the first genetic material. There is now enough evidence to suggest that essential life processes (such as metabolism, translation, splicing, etc.), evolved around RNA. RNA used to act as a genetic material as well as a catalyst (there are some important biochemical reactions in living systems that are catalyzed by RNA catalysts and not by protein enzymes). But, RNA being a catalyst is reactive and hence unstable. Therefore, DNA has evolved from RNA with chemical modifications that make it more stable.

34.

(b) $3.3 \times 10^9 \text{bp}$
Explanation: $3.3 \times 10^9 \text{bp}$

35.

(c) AUG
Explanation: AUG

36.

(b) Switching ON and OFF of the operon
Explanation: In lac operon, lactose is the substrate for enzyme beta-galactocidase and it regulates switching ON and OFF of the operon. Hence, lactose is called the inducer.

37.

(d) Chargaff's rule
Explanation: Chargaff's rule

38.

(b) Blood group A, I^AI^O
Explanation: Blood group A, I^AI^O

39.

(d) Autoradiography
Explanation: Autoradiography

40.

(b) Zinc finger analysis
Explanation: Zinc finger analysis

41. **(a)** S-phase
Explanation: S-phase

42.

(d) Polymerase chain reaction (PCR) by amplification process
Explanation: Amplification is a mechanism leading to multiple copies of a chromosomal region within a chromosome arm. The DNA amplification technique of the polymerase chain reaction (PCR) is a laboratory method for creating multiple copies of small segments of DNA.

43. **(a)** UAG, UGA - stop
Explanation: UAG, UGA - stop

44. **(a)** 200 bp of DNA helix
Explanation: 200 bp of DNA helix

45. **(a)** RNA only
Explanation: RNA only

46. **(a)** Discontinuously
Explanation: Discontinuously

47. **(c)** Monozygotic twins or identical twins
Explanation: Autoradiogram of the VNTR probe gives many bands of different sizes. It differs from individual to individual except for monozygotic twins or identical twins Because MZ twins share the same genetic makeup (DNA) because they are formed from a single zygote (fertilized egg).

48. **(d)** 5'-GAATTC-3'
3'-CTTAAG-5'

Explanation: 5'-GAATTC-3'
3'-CTTAAG-5'

49. **(d)** Thymine
Explanation: Thymine

50. **(c)** RNA
Explanation: RNA

51. **(b)** When a piece of RNA that is complementary in sequence is used to stop expression of specific gene.
Explanation: When a piece of RNA that is complementary in sequence is used to stop expression of specific gene.

52. **(c)** A radioactively labelled single stranded DNA molecule.
Explanation: A radioactively labelled single stranded DNA molecule.

53. **(a)** WBCs, hair root cells, and body secretion
Explanation: DNA fingerprinting is a method used to identify an individual from a sample of DNA by looking at unique patterns in their DNA.
DNA is extracted from a biological sample. STR analysis is incredibly sensitive so it only needs a tiny amount of someone's DNA to produce an accurate result. As a result, the DNA can be extracted from a wider range of biological samples, including blood, saliva and hair and body secretion, etc.

54. **(a)** Transacetylase, repressor protein, permease, β-galactosidase
Explanation: Transacetylase, repressor protein, permease, β-galactosidase

55. **(a)** Neurospora crassa
Explanation: Neurospora crassa

56. **(a)** $\frac{0.34\,\text{nm}}{3.4\,\overset{o}{A}}$
Explanation: $\frac{0.34\,\text{nm}}{3.4\,\overset{o}{A}}$

57. **(c)** 5' - A U G A A U G - 3'
Explanation: The base sequence of a coding strand of DNA molecule in a transcription unit and mRNA molecule is always the same just thymine is replaced by uracil in mRNA.

58. **(d)** UAC
Explanation: The anticodon on the tRNA corresponding to the AUG initiator codon on mRNA is UAC as A bonds with U and G bonds with C in RNA. Thymine (T) is absent in RNA.

59.

(d) Meselson and Stahl
Explanation: Meselson and Stahl

60.

(c) Cistron
Explanation: Cistron

61.

(d) Dehydration
Explanation: Dehydration

62.

(d) One regulator gene and three structural genes.
Explanation: Lac Operon consists of one regulator gene I, and three structural genes Z, Y and A. I gene code for repression of the lac Operon. Z gene code for beta-galactosidase, Y code for permease, and a gene code for transacetylase.

63.

(b) Alec Jefferys
Explanation: Sir Alec John Jeffreys, CH FRS (born 9 January 1950 in Oxford, Oxfordshire, England) is a British geneticist, who developed techniques for DNA fingerprinting and DNA profiling which is now used worldwide in forensic science to assist police detective work and to resolve paternity and immigration disputes.
He is a professor of genetics at the University of Leicester, and he became an honorary freeman of the City of Leicester on 26 November 1992.
In 1994, he was knighted for services to genetics.

64. **(a)** Bacterium
Explanation: Bacterium

65.

(b) Avery
Explanation: Avery

66.

(d) Degenerate
Explanation: Degenerate

67.

(b) Thymine
Explanation: Thymine

68.

(d) It is single stranded DNA
Explanation: According to chargaff rule, the number of purines and pyrimidines is always equal in a double-stranded DNA molecule, but here it is not so. So we can conclude that it must be a single-stranded DNA molecule.

69.

(c) Negatively charged
Explanation: Negatively charged

70. **(a)** UCCAUAGCGUA
Explanation: UCCAUAGCGUA

71. **(a)** Cistron
Explanation: Cistron

72.

(b) Genetic code
Explanation: Genetic code

73.

(b) Regulator gene
Explanation: Regulator gene is a gene that regulates the expression of one or more structural genes by controlling the

production of a protein (such as a genetic repressor) which regulates their rate of transcription. Regulation of lac operon by a repressor is called negative regulation.

74. **(a)** Phenylalanine, Methionine
Explanation: Phenylalanine, Methionine

75. **(a)** The normal DNA from ^{15}N-DNA
Explanation: The normal DNA from ^{15}N-DNA