DAYANAND SCIENCE COLLEGE, LATUR. Department of Biotechnology M.Sc. Biotechnology (Revised) First-Year

SEM-IISUB- Molecular Genetics- (BT –VI)Teacher- Mr. Gangavane S.C.MCQ-100 MARKS

- 1) Who is known as the Father of Genetics?
 - a)Erich Tschemark
 - b) Carl Correns
 - c) Gregor Johann Mendel
 - d) Hugo de Vries
- 2) Mendel discovered factors which remain its identity in a hybrid, these factors are _____
 - a) Genes
 - b) Alleles
 - c) DNA
 - d) Chromosomes
- 3) Which of the following specimen was chosen by Mendel for his experiment?
 - a) Drosophila
 - b) Fly
 - c) Rat
 - d) Pisum sativum
- 4) Mark the INCORRECT statement about Pisum sativum?
 - a) Long life cycle
 - b) Easy hybridization
 - c) Bisexual flower
 - d) Well-defined discrete characters

- 5) What is an allele?
 - a) Characteristics of an organism
 - b) Alternate forms of genes
 - c) Homologous chromosomes
 - d) Pair of centrioles
- 6) Reverse genetics is the evaluation of phenotype by studying the genotype.
 - a) True
 - b) False
- 7) Which of the following is NOT Mendel's law of inheritance?
 - a) Law of dominance
 - b) Law of segregation
 - c) Law of hetrozygous
 - d) Law of independent assortment
- 8) Out of the following, which law is also known as the law of purity of gametes?
 - a) Law of co-dominance
 - b) Law of independent assortment
 - c) Law of segregation
 - d) Law of dominance
- 9) Name the cross by which law of independent assortment inferred.
 - a) Dihybrid cross
 - b) Monohybrid cross
 - c) Test cross
 - d) Back cross

- 10) Which of the following is an example of incomplete dominance?
 - a) AB blood group
 - b) Mirabilis jalapa
 - c) Shape of crown in poultry
 - d) Mouse coat colour
- 11) Which of the following relationship was not studies by Mendel?
 - a) Flower colour and seed colour
 - b) Height and seed colour
 - c) Flower colour and shape of pollen grain
 - d) Height and seed coat colour
- 12) Choose the odd one out Green pod, Yellow seed, Purple flower, Terminal flower.
 - a) Green pod
 - b) Yellow seed
 - c) Purple flower
 - d) Terminal flower
- 13) Which of the following two traits is characteristic of a single gene?
 - a) Seed colour and shape
 - b) Flower colour and position
 - c) Colour of flower and seed coat
 - d) Height and colour of seed
- 14) Which of Mendel's laws will be violated by linkage?a) Panspermia

- b) Diminance
- c) Segregation
- d) Independent assortment
- 15) Which of Mendel's law is against the theory of Blending inheritance?
 - a) Law of segregation
 - b) Law of dominance
 - c) Law of recessive
 - d) Law of independent assortment
- 16) Considering the concept of Multiple alleles, one organism can have _____ alleles.
 - a) One
 - b) Two
 - c) Three
 - d) Four
- 17) It is confirmed that phenotype of short pea plant height will be expressed only when_____
 - a) Both the parents are tall
 - b) One parent is tall and other short
 - c) The seeds are generated by selling
 - d) Both parents are short
- 18) Which of the following was not a cause for Mendel's lack of instant popularity?
 - a) Darwin's theory of Natural selection
 - b) His experimental model being rare
 - c) His ideas of using statistics being beyond his time
 - d) His article was published in less known journal

- 19) Mendel did not give _____
 - a) Concept of genes
 - b) Concept of inheritance
 - c) Concept of dominance
 - d) Concept of chromosomes
- 20) In the beads on a string model, the bead is made up of
 - a) 6 histone proteins
 - b) 8 histone proteins
 - c) 6 histone proteins and DNA
 - d) 8 histone proteins and DNA
- 21) The unpacked stretches of DNA are the extra chromosomal load found in the eukaryotic genome.
 - a) True
 - b) False
- 22) How many types of histone molecules are found in nature?
 - a) 3
 - b) 4
 - c) 5
 - d) 6
- 23) Nucleosome is made up of _____
 - a) DNA, histone core protein
 - b) DNA, histone core protein, linker H1
 - c) RNA, histone core protein
 - d) RNA, histone core protein, linker H1

- 24) Histones have a high content of negatively charged amino acids.
 - a) True
 - b) False
- 25) With respect to assembly of every core histone which of the following is wrong?
 - a) A conserved region
 - b) Histone fold domain
 - c) Disc shaped structure
 - d) 2 α helices and an unstructured loop
- 26) Which of the following histone pairs forms tetramers in solution?
 - a) H1, H2A
 - b) H2A, H2B
 - c) H2B, H3
 - d) H3, H4
- 27) With respect to the "tails" of the histone molecules which of the following is not true?
 - a) N terminal extension
 - b) Lacks defined structure
 - c) Required for the association of nucleosome
 - d) Sites for extensive modifications
- 28) How many contacts are observed between the DNA and the histone core protein?
 - a) 14
 - b) 21
 - c) 54
 - d) 17

- 29) Association of DNA and histone is mediated by _____
 - a) Covalent bonding
 - b) Hydrogen bonding
 - c) Hydrophobic bonding
 - d) Vander Waals interactions
- 30) The DNA threads which appear inside the nucleus at the time of cell division?
 - a) Spindle fibers
 - b) Centrioles
 - c) Asters
 - d) Chromosomes
- 31) Which of the following is not a major class of chromatin proteins?
 - a) Histones
 - b) Topoisomerases
 - c) SMC proteins
 - d) Cohesins
- 32) Which of the following plays a substantial role in linking together sister chromatids immediately after replication?
 - a) Cohesins
 - b) Condensins
 - c) Histones
 - d) Topoisomerases

- 33) Which of the following are essential to the condensation of chromosomes as cells enter mitosis?
 - a) Cohesins
 - b) Condensins
 - c) Histones
 - d) Topoisomerases

34) Chromatin is composed of _____

- a) DNA
- b) DNA and proteins
- c) DNA, RNA and proteins
- d) None

35) Which of the following histones bind to linker DNA?

- a) H1
- b) H2A
- c) H2B
- d) H3
- 36) Which of the following has beads on a string structure?
 - a) Chromosomes
 - b) Chromatin
 - c) Nucleosomes
 - d) Heterochromatin
- 37) Which of the following histones shows more sequence similarity among eukaryotic species?
 - a) H1
 - b) H2A
 - c) H2B
 - d) H3

- 38) The sister chromatids separate at _____
 - a) Prophase
 - b) Metaphase
 - c) Telophase
 - d) Anaphase
- 39) Cellular DNA is uncondensed throughout _____
 - a) Prophase
 - b) Interphase
 - c) Telophase
 - d) Anaphase
- 40) What is DNA replication?
 - a) Conservative
 - b) Non-conservative
 - c) Semi-conservative
 - d) None of the mentioned
- 41) Semi-conservative DNA replication was first demonstrated in _____
 - a) Drosophila melanogaster
 - b) Escherichia coli
 - c) Streptococcus pneumonae
 - d) Drosophila melanogaster
- 42) Eukaryotes differ from prokaryote in mechanism of DNA replication due to _____
 - a) Use of DNA primer rather than RNA primer
 - b) Different enzyme for synthesis of lagging and leading strand

c) Discontinuous rather than semi-discontinuous replication

d) Unidirectional rather than semi-discontinuous replication

- 43) Which of the following is true about DNA polymerase?
 - a) It can synthesize DNA in the 5' to 3' direction
 - b) It can synthesize DNA in the 3' to 5' direction
 - c) It can synthesize mRNA in the 3' to 5' direction
 - d) It can synthesize mRNA in the 5' to 3' direction
- 44) What is the reaction in DNA replication catalyzed by DNA ligase?
 - a) Addition of new nucleotides to the leading strand
 - b) Addition of new nucleotide to the lagging strand

c) Formation of a phosphodiester bond between the 3'-OH of one Okazaki fragment and the 5'-phosphate of the next on the lagging strand

d) Base pairing of the template and the newly formed DNA strand

- 45) Which of the following reactions is required for proofreading during DNA replication by DNA polymerase III?
 - a) 5' to 3' exonuclease activity
 - b) 3' to 5' exonuclease activity
 - c) 3' to 5' endonuclease activity
 - d) 5' to 3' endonuclease activity
- 46) Which of the following enzymes remove supercoiling in replicating DNA ahead of the replication fork?
 - a) DNA polymerases
 - b) Helicases
 - c) Primases
 - d) Topoisomerases

- 47) DNA unwinding is done by _____
 - a) Ligase
 - b) Helicase
 - c) Topoisomerase
 - d) Hexonuclease
- 48) Which of the following enzymes is the principal replication enzyme in E. coli?
 - a) DNA polymerase I
 - b) DNA polymerase II
 - c) DNA polymerase III
 - d) None of the mentioned
- 49) Which enzyme used to join bits of DNA?
 - a) DNA polymerase
 - b) DNA ligase
 - c) Endonuclease
 - d) Primase
- 50) If the mutation has a negligible effect on the function of a gene, it is known as a _____
 - a) Silent mutation
 - b) Frame shift mutation
 - c) Substitution mutation
 - d) Insertion mutation
- 51) Which of the following mechanisms will remove uracil and incorporate the correct base?
 - a) Direct repair
 - b) Base excision repair
 - c) Mismatch repair
 - d) Nucleotide excision repair

- 52) Which of the following has the self-repairing mechanisms? a) DNA and RNA
 - b) DNA, RNA and protein
 - c) Only DNA
 - d) DNA and proteins
- 53) What is the function of enzyme involved in base excision repair?
 - a) Addition of correct base
 - b) Addition of correct nucleotide
 - c) Removal of incorrect base
 - d) Removal of phosphodiester bond
- 54) The DNA polymerase involved in base excision repair is
 - a) DNA polymerase α
 - b) DNA polymerase β
 - c) DNA polymerase σ
 - d) DNA polymerase y
- 55) An alteration in a nucleotide sequence that changes a triplet coding for an amino acid into a termination codon is

a) Nonsense mutation

- b) Mutagenesis
- c) Mutation
- d) Mutagen

- 56) A point mutation that replaces a purine with another purine, or a pyrimidine with another pyramidine
 - a) Nonsense mutation
 - b) Silent mutation
 - c) Transition mutation
 - d) Transversion
- 57) The enzyme of E.coli is a nuclease that initiates the repair of double stranded DNA breaks by homologous recombination is?

a) DNA glycosylase

- b) DNA ligase
- c) DNA polymerase
- d) RNA polymerase
- 58) Recombinational repair is often due to _____
 - a) Incorporation of many incorrect nucleotides by DNA pol
 - b) Many cystidine dimer and associated large gaps in a strand

c) Many thymidine dimer formations and associated large gaps in a strand

d) All of the mentioned

- 59) The enzyme photolyase is used in what method of repair?
 - a) Base excision
 - b) Photo reactivation
 - c) Nucleotide excision
 - d) None of the mentioned

60) Which of the following statements regarding splicing in eukaryotes is correct?

a) Several reactions in the splicing process involve hydrolysis of ATP

b) Exons are spliced out and introns are retained in the mature mRNA transcript

c) Splicing takes place in the cytosol

d) Small nuclear RNAs are retained in the mature mRNA transcript

- 61) Which of the following is not involved in the post transcriptional processing of t-RNA?
 - a) Base modulation
 - b) Attachment of CCA arm
 - c) Splicing
 - d) Attachment of poly-A tail
- 62) Which of the following is an incorrect statement about m-RNA?
 - a) Cap is added to the 5' end
 - b) Introns are removed and exons are spliced together
 - c) Histone mRNAs lack 5' cap
 - d) Poly-A tail is added to the 3' end
- 63) Which is the first nucleic acid synthesizing enzyme discovered?
 - a) Polynucleotide phosphorylase
 - b) DNA polymerase
 - c) RNA polymerase
 - d) DNA ligase

- 64) 70S prokaryotic ribosome is the complex of _____
 - a) 30S + 50S
 - b) 30S + 40S
 - c) 20S + 60S
 - d) 20S + 30S
- 65) 80S eukaryotic ribosome is the complex of _____
 - a) 60S and 40S
 - b) 40S and 20S
 - c) 60S and 50S
 - d) 30S and 20S
- 66) What is the main function of t-RNA?
 - a) Proof reading
 - b) Inhibits protein synthesis
 - c) Identifies amino acids and transport them to ribosomes
 - d) None of the mentioned
- 67) Which one of the following best describes the cap modification of eukaryotic mRNA?

a) Modified guanine nucleotide added to the 3' end of the transcript

b) Modified guanine nucleotide added to the 5' end of the transcript

c) String of adenine nucleotides added to the 3' end of the transcript

d) String of adenine nucleotides added to the 5' end of the transcript

68) The largest class of introns which are found in nuclear mRNA primary transcript is?

a) Spliceosomal introns

- b) Group I introns
- c) Group II introns
- d) Group IV introns

- 69) Which type of splicing reaction requires a guanine nucleoside or nucleotide cofactor that is not used as a source of energy?
 - a) Spliceosomal
 - sb) Group I
 - c) Group II
 - d) Group IV
- 70) The process of modification of pre mRNA is known as_____
 - a) Replication
 - b) DNA repair
 - c) Translation
 - d) RNA processing
- 71. In a nucleotide, the nitrogen base is joined to the sugar molecule by
- a) Phosphodiester bond b) Glycosidic bond c) Hydrogen bond d) (a) &(b)
- 72. If a double stranded DNA has 20% Thymine, the percentage of Guanine in the DNA
- a) 30% b) 10% c) 90% d) 40%

73. If a DNA contains 1000 base pairs, what would be its length?

a) 3400 Å b) 34000 Å c) 6800 d) 1000 Å

74. What is not True for DNA in prokaryotes

- a) present in the form of a compact structure called nucleoid
- b) the coils are maintained by non-histone basic proteins
- c) found in cytoplasm in a supercoiled condition

d) packaged as nucleosomes along with histones

75. Pick the right difference between a DNA and RNA

- a) Sugar and phosphate b) sugar and purines
- c) purines and phosphate d) sugar and pyrimidines

- 76. In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R).
- (1) If both Assertion and Reason are true and the reason is the correct explanation of the assertion, then mark (a)
- (2) If both Assertion and Reason are true but the reason is not the correct explanation of the assertion, then mark (b)
- (3) If Assertion is true but Reason are false, then mark (c)
- (4) If both Assertion and Reason are false, then mark (d)
- Assertion: In Griffith's experiment mice were injected by a mixture of heat killed Smooth
- type bacteria and live Rough type bacteria. Some mice died of pneumonia and their
- blood contained both live Rough type bacteria and live Smooth type bacteria.
- **Reason:** The dead Smooth type bacteria became alive and caused pneumonia.
- Griffith named it as transforming principle.
- 77. Hershey and Chase experiment proving DNA as the genetic material was based on the principle
- a) **Transduction** b) transformation c) transcription d) translation
- 78. A bacterial colony containing DNA made up of 100% N15 nitrogen bases is allowed to

replicate in a medium containing N14 bases. After one round of replication the result

would be

- a) All individuals will be identical to parents
- b) All individuals will be hybrids
- c) Only 50% individuals would be hybrids
- d) All individuals would have DNA made up of 100% N14

79. Teminism is

a) a central dogma reverse

- b) a central dogma of molecular biology
- c) a circular flow of hereditary material
- d) an effect of cytoplasm on functioning of DNA

80. Cistron is

- a) The coding sequence of DNA
- b) The functional unit of DNA molecule that codes for a particular gene product
- c) Intervening non coding sequence of DNA
- d) The sequences which are removed during RNA splicing.
- 81. Read the statements given below and identify the incorrect statement.
- a) The human genome contains 3164.7 million nucleotide bases.
- b) The average gene consists of 30,000 bp
- c) The total number of genes is estimated at 30,000.
- d) Chromosome Y has 231 genes
- e) Less than 2% of the genome codes for proteins.

82. The coding sequences found in split genes are called

- a) Operons b) introns c) exons d) cistrons
- 83. The removal of which enzyme affects the synthesis of hnRNA in eukaryotes
- a) RNA polymerase II b) RNA primase c) RNA polymerase III d) RNA polymerase I

84. Sickle cell anemia is caused

- a) When valine is replaced by glutamic acid in beta polypeptide chain
- b) When glutamic acid is replaced by valine in beta polypeptide chain
- c) When glutamic acid is replaced by valine in alpha polypeptide chain
- d) When valine is replaced by glutamic acid in alpha polypeptide chain

85. Wobble position means

- a) Base paring b) altered base on code
- b) third altered base on codon d) none of the above

86. Peptidyl transferase

- a) Is a 23s rRNA b) forms peptide bonds
- c) component of ribosome d) all the three
- 87. Which mRNA will be translated to a polypeptide chain containing 8 amino acids?
- a) AUGUUAAUAGACGAG**UAG**CGACGAUGU
- b) AUGAGACGGACUGCAUUCCCAACCUGA
- c) AUGCCCAACCGUUAUUCAUGC**UAG**
- d) AUGUCGACAGUC**UAA**AACAGCGGG

88. Arrange the following events in the order of synthesis of a protein

- i) A peptide bond forms
- ii) A tRNA matches its anticodon to the codon in the A- site
- iii) The movement of second tRNA complex from A-site to P-site
- iv) The large subunit attaches to the small subunit and the initiator tRNA fits in the P-site
- v) A small subunit binds to the mRNA
- vi) The activated amino acid tRNA complex attaches the initiation codon on mRNA
- a) iv, v, iii, ii, i, vi b) iv, vi, v, ii, I, iii
- c) v, iv, iii, ii, vi, l d) v, vi, iv, ii, i, iii

- 89. Select the incorrect statement out of the five given below about lac operon when Lactose is present in the medium.
- a) Gene A gets transcribed into mRNA which produces βgalactoside permease
- b) Inducer-Repressor complex is formed
- c) Lactose inactivates repressor protein
- d) RNA polymerase transcribe Z-gene, Y-gene and A-gene
- e) Allolactose is the inducer of lac operon
- 90. The percentage of human genome which encodes proteins is approximately
- a) Less than 2% b) 5% c) 25% d) 99%
- 91. Match the entries in column I with those of column II and choose the correct answer.

Column I Column II

- A) Alkali treatment M) separation of DNA fragments on gel slab
- B) Southern blotting N) split DNA fragments into single strands
- C) Electrophoresis O) DNA transferred to nitrocellulose sheet
- D) PCR P) X-ray photography
- E) Autoradiography Q) produce fragments of different sizes
- F) DNA treated with REN R) DNA amplification
- (1) A N, B- Q, C- P, D- R, E- M, F O
- (2) A P, B R, C M, D -O, E N, F Q
- (3) A Q, B O, C M, D R, E P, F N
- (4) A N, B O, C M, D R, E P, F Q

92. Enzyme which can break and seal the DNA strand

a) Topoisomease II (b) Helicase (c) Primase (d) Restriction endonuclease

93. Match the names of scientists in column I with their achievements in column II and choose the correct answer given below

Column I Column II

A) Watson and Crick P) DNA fingerprinting

B) R.W. Holley Q) Decipher genetic code

C) Marshal Nirenberg R) Double helix of DNA

D) Jacob and Monod S) Clover model of tRNA

E) Alec Jeffrey T) Lac operon concept

(A	٩)	(B)	(C)	(D)	(E)
a)	R	S	Ρ	Т	Q
b)	R	S	Q	Т	Ρ
c) l	R	Q	Ρ	Т	S
d)	R	Т	S	Ρ	Q

94. Which of the statements give below is correct with respect to frameshift mutation

- a) a single nucleotide base change, insertion, or deletion of the genetic material
- b) Glutamine is replaced by valine
- c) Sickle cell anemia is an example
- d) insertions or deletions of a number of nucleotides in a DNA sequence that is not divisible by three.

95. The transcription initiation factor associated with the RNA polymerase holoenzyme in prokaryotes is
(a) β (b) (c) σ (d) σ

(a) β (b) ω **(c) σ** (d) αl

96. The stretch of codons between AUG and a stop codon is called a) open reading frame b) TATA box c) colinearity d) degenerate

97. The structural genes of lac operon transcribe mRNA which is

a) polycistronic b) replicative c) monokaryotic d) monocistronic

98. If the sequence of bases in DNA is TACCGACCA, then the sequence of codons on the transcript will be

a) ATGGCTGGT b) ATCCGAACU c) AUGGCUGGU d) AUGGACUAA

99. Match the following Column I Column II

S

(A) Helicase (M) activation of amino acid

(B) Peptidyl transferase (N) joins DNA fragments

(C) DNA polymerase (O) unwinds DNA helix

(D) DNA ligase (P) peptide bonds between amino acids

(E) Aminoacyl synthetase enzyme (Q) DNA synthesis

(F) RNA primase (R) synthesis of RNA primer

a) A-O, B-P, C-Q, D-N, E-M, F-R

b) A-R, B-M, C-N, D-Q, E-P, F-O

c) A-M, B-R, C-P, D-Q, E-N, F-O

d) A-R, B- Q, C- A, D- M, E-P, F-N

100. Genes which are active all the time synthesizing substances needed by the cell are called

a) Cellular luxury genes b) metabolic genes

c) house keeping genes d) control genes