(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

**(Ph.D/URS–EE–2015)**

Sr. No. 10145 **Subject : LIFE SCIENCE** **Code A**

**Time : 1¼ Hours** **Max. Marks : 100** **Total Questions : 100**

Roll No. _____ (in figure) _____ (in words)

Name : _____ Father's Name : _____

Mother's Name _____ Date of Examination _____

(Signature of the candidate) (Signature of the Invigilator)

**CANDIDATES MUST READ THE FOLLOWING INFORMATION/ INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.**

1. All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
2. The candidates must return the Question book-let as well as OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such candidate will not be evaluated.
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4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question book-let itself. Answers **MUST NOT** be ticked in the Question book-let.
5. **Use only Black or Blue BALL POINT PEN of good quality in the OMR Answer-Sheet.**
6. **There will be NEGATIVE marking. Each correct answer will be awarded one full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
7. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

| Question No. | Questions |
|---|---|
| 1. | High solubility of amino acid in water is due to<br>(1) Presence of side chain<br>(2) Dipolar ion structure<br>(3) Unipolarity<br>(4) Hydrophilic nature of amino acid |
| 2. | DNA polymerase contains a Glutamate residue that is important for binding to DNA Mutations was found that converted this glutamate residue to either lysine, glycine, valine or arginine. Which mutations would be predicted to be the most and least harmful to the ability of the enzyme to bind DNA ?<br>Most Least<br>(1) Glycine Arginine<br>(2) Arginine Glycine<br>(3) Lysine Valine<br>(4) Lysine Aspartic acid |
| 3. | Choose the correct statement<br>(a) Phenylisothyocynate - hydrolysis of peptide bonds on the carboxyl side of amino acid residue<br>(b) Dansyl chloride - identification of amino terminal residue of a peptide<br>(c) Chymotrypsin - hydrolysis of peptide bonds on the carboxyl side of aromatic residue<br>(d) CnBr - cleavage of peptide bonds on the carboxyl side of methionines<br>(1) Both a and d statements are correct<br>(2) b, c and d are correct<br>(3) Only b and c are correct<br>(4) All the above |

| Question No. | Questions |
|---|---|
| 4. | Initiation codon for protein synthesis in eukaryotes is<br>(1) AUG (2) AAA (3) GCA (4) CCG |
| 5. | Melting temperature of DNA, Tm of a DNA duplex is defined as the temperature at which half the molecules have dissociated in to single strand. Tm will be maximal at<br>(1) Low ionic strength and high DNA concentration<br>(2) High ionic strength and high DNA concentration<br>(3) High ionic strength and low DNA concentration<br>(4) Low ionic strength and low DNA concentration |
| 6. | Which of the following enzyme transfers a phosphate group from ATP to another molecule ?<br>(1) Phosphatase (2) Phosphodiesterase<br>(3) Kinase (4) Esterase |
| 7. | Correct equation for reduction of $NADP^+$ is<br>(1) $NADP^+ + 2H^+ \rightarrow NADPH^+ + H^+$<br>(2) $NADP^+ + H^+ + e^- \rightarrow NADPH$<br>(3) $NADP^+ + H^+ + 2e^- \rightarrow NADPH$<br>(4) $NADP^+ + 2H^+ + 2e^- \rightarrow NADPH_2$ |
| 8. | Which of the following statements is not true for fatty acids found in most mammalian cells ?<br>(1) They usually contain 12-20 carbons<br>(2) Polyunsaturated fatty acids contain conjugated double bonds<br>(3) All double bond are in *cis* configuration<br>(4) Free fatty acids are ionized at physiological pH |

| Question No. | Questions |
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| 9. | You have homogenized plant tissue and would like to separate chloroplasts from nuclei. Which of the following methods would be most suitable ?<br>(1) Polyacrylamide gel electrophoresis<br>(2) Differential centrifugation using sucrose gradient<br>(3) Equilibrium density gradient centrifugation on cscl gradient<br>(4) Gel filteration |
| 10. | A protein which spans the lipid bilayer<br>(1) Cannot diffuse in the plane of the membrane<br>(2) Cannot have any attachment to cytoplasmic components<br>(3) Cannot have bound carbohydrate<br>(4) Usually has both hydrophobic and hydrophilic regions |
| 11. | In plasma membrane, carbohydrates present on the<br>(1) Both layers of lipid<br>(2) Only on cytoplasmic side of lipid bilayer<br>(3) Only on non-cytoplasmic side of lipid bilayer<br>(4) None |
| 12. | Which antibody is responsible for allergic reactions ?<br>(1) IgG (2) IgM<br>(3) IgE 4) IgD |

| Question No. | Questions |
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| 13. | A Contractile vacuole is an organelle that pumps excess water out of many freshwater protozoan cells. A freshwater protozoan was placed in solution A and observed to form contractile vacuoles at a rate of 11 per minute. The same protozoan was then placed in solution B and observed to form contractile vacuoles at a rate of 4 per minute. Based on this information, which of the following statements is correct ?<br>(1) Solution A is hyperosmotic to solution B<br>(2) Solutions A and B are isomotic<br>(3) Solution B is hyperosmotic to solution A<br>(4) Solutions A and B are iso-osmotic to the protozoan cell |
| 14. | Which of the following is likely to be expressed ?<br>(1) Euchromatin without methylation<br>(2) Heterochromatin with methylation<br>(3) Euchromatin either methylated or not, equally expressed<br>(4) DNA with many methyl groups |
| 15. | What roles in regulating the intrinsic pathway of apoptosis are played by the Bcl-2 protein family members Bax and Bcl-2 ?<br>(1) Bax inhibits apoptosis while Bcl-2 stimulates apoptosis<br>(2) Bax stimulates apoptosis while Bcl-2 inhibits apoptosis<br>(3) Both Bax and Bcl-2 inhibit apoptosis<br>(4) Both Bax and Bcl-2 stimulates apoptosis |
| 16. | What is the term used for small molecules that bind to different regions of a binding site ?<br>(1) Epitopes (2) Epimers<br>(3) Isotopes (4) Isomers |

| Question No. | Questions |
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| 17. | In what way does the *ras* oncogene contribute to cancers ?<br>(1) *Ras* codes for an anti-apoptotic protein, which is produced in abnormally large amounts<br>(2) *Ras* codes for a gtpase switch protein, which in its mutated form cannot be switched off<br>(3) *Ras* codes for a transcription factor, which is produced in abnormally large amounts<br>(4) *Ras* codes for a truncated form of a growth factor receptor, which is continually active |
| 18. | What provides the energy for DNA polymerization?<br>(1) The hydrolysis of ATP (releasing $P_i$)<br>(2) The hydrolysis of GTP (releasing $P_i$)<br>(3) The hydrolysis of incoming nucleoside triphosphates (releasing $pp_i$)<br>(4) None of the above |
| 19. | If the genome of the bacterium *E. coli* requires about 20 minutes to replicate itself, how can the genome of the fruit fly Drosophila be replicated in only 3 minutes ?<br>(1) The Drosophila genome is smaller than *E. coli* genome<br>(2) Eukaryotic DNA polymerase synthesizes DNA at a much faster rate than prokaryotic DNA polymerase<br>(3) Nuclear membrane keep the Drosophila DNA concentrated in one place in the cell, which increase the rate of polymerization<br>(4) Drosophila DNA contains more origins of replication than *E Coli* |

| Question No. | Questions |
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| 20. | Telomeres serves as caps at the end of linear chromosomes. Which of the following is not true regarding the replication of telomeric sequences ?<br>(1) The lagging strand telomeres are not completely replicated by DNA polymerase<br>(2) Telomeres are made up of repeated sequences<br>(3) Additional repeated sequences are added to the template strand<br>(4) The leading strand doubles back on itself to form a primer for lagging strand |
| 21. | Order the following events observed during muscle contraction<br>1. The sarcomere shortens 2. ATP is hydrolysed<br>3. $Ca^{+2}$ binds to troponin 4. ATP binds to myosin<br>5. Myosin contract F-actin 6. F-actin moves<br>7. Topomyosin moves 8. $Ca^{+2}$ is released from the sarcoplasmic reticulum<br>(1) 8-4-3-7-2-5-1-6 (2) 4-8-7-2-3-5-6-1<br>(3) 4-8-3-7-5-6-2-1 (4) 4-8-3-7-2-5-6-1 |
| 22. | The most important difference between gap junctions between animal cells and plasmodesmata in plant is that in plasmodesmata<br>(1) Ionic coupling occurs<br>(2) Two adjacent plasma membranes are fused<br>(3) Metabolic cooperation occurs<br>(4) Pore diameter is 1 mm |

| Question No. | Questions |
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| 23. | Which of the following statement is false ?<br>(1) Dnase I hypersensitive sites are regions where the DNA free of nucleosomes<br>(2) When gene is active, promoter is generally free of nucleosomes<br>(3) H1 phosphorylation occurs mainly before mitosis<br>(4) DNA sequences called matrix or scaffold associated regions are generally GC rich |
| 24. | Diacylglycerol activate<br>(1) Protein kinase A (2) Protein kinase C<br>(3) MAP kinase (4) Tyrosin kinase |
| 25. | Rhodopsin is a transmembrane protein belonging to a large family of G protein coupled receptor. It is found in the disc of rod cells of human retina. Activation of rhodopsin is due to<br>(1) Phosphorylation of its extracellular tyrosin residues<br>(2) Binding of external ligand to its extracellular loop<br>(3) Photoisomerization of its prosthetic group<br>(4) Binding of calcium ion to its transmembrane aspartic groups |
| 26. | In the Meselson and Stahl experiment, E. coli cells grown on heavy nitrogen were transferred to light nitrogen. What % of DNA can be expected to be constituted of light nitrogen after 3 generation of multiplication ?<br>(1) 25 (2) 50 (3) 70 (4) 100 |
| 27. | During DNA synthesis lagging strand is synthesized by<br>(1) DNA polymerase (2) Telomerase<br>(3) DNA polymerase (4) Helicase |

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| 28. | Wild type of *E. coli* was plated on a Rifampicin medium and incubated at 37°C. Majority of cella died; however some colonies are appeared after a few days. What is the most likely explaination for this observation?<br>(1) Degradation of rifampicin<br>(2) Mutation in DNA pol III<br>(3) Efflux of rifampicin<br>(4) Mutation in the beta subunit of RNA polymerase |
| 29. | Alternative splicing<br>(a) Uses a completely different mechanism than constitutive splicing<br>(b) Allows generation of protein isoforms from a single gene<br>(c) Involve the use of different 3' and 5' sites<br>(d) It used to make different proteins in different tissues and at different developmental stages<br>(1) a and b (2) a and c (3) a and d (4) b, c and d |
| 30. | Which of the following partial diploids will express β-galactosidase constitutively ?<br>(1) F' $laco^c$ $lacz^+$/$laco^+$ $lacz^+$ (2) F' lac $I^-$ $lacz^+$/$laci^+$ $lacz^+$<br>(3) F' lac $I^+$ $lacz^+$/$laci^-$ $lacz^+$ (4) F' lac $O^c$ $lacz^-$/$laco^+$ $lacz^+$ |
| 31. | Which of the following post translational modification of proteins does not occur in the lumen of the endoplasmic reticulum ?<br>(1) Glycosylation<br>(2) Formation of disulphide bond<br>(3) Folding and formation of quaternary structure<br>(4) Ubiquitination |

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| 32. | Which of the following chemical mutagen is likely to cause GC → AT transition<br>(1) 5-bromouracil (2) 2-aminipurine<br>(3) Acridine orange (4) Hydroxylamine |
| 33. | The oxidation of 1 mol of Glucose by anaerobic glycolysis yields a net of<br>(1) 2 mol of lactate, 2 mol of NADH and 2 mol of ATP<br>(2) 2 mol of lactate and 2 mol of ATP<br>(3) 2 mol of lactate, 2 mol of $NAD^+$ and 6 mol of ATP<br>(4) 2 mol of Acetyl co-A and 2 mol of ATP |
| 34. | A $C_3$ mustard plant was grown at 300 ppm of $CO_2$ in 14 hr light/10 hr dark cycles, it was transferred to 1000 ppm $CO_2$, this will lead to (other environmental parameters remaining identical)<br>(1) Increase in photosynthetic rate<br>(2) Decrease in photosynthetic rate<br>(3) Increase in respiration rate<br>(4) No change |
| 35. | Which of the following is correct about nitrate reductase ?<br>(1) FAD, Mo and heme act as prosthetic groups<br>(2) Catalyzed the conversion of $NO_3^-$ to $NH_4^+$<br>(3) $FADH_2$ act as electron donor<br>(4) A plant growing naturally on calcareous soil |

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| 36. | Which of the following plant hormone is icorrectly paired with its function?<br>(1) Auxin–responsible for apical dominance<br>(2) Abscisic acid–regulates the rate of transpiration<br>(3) Cytokinins–delays senescence<br>(4) Gibberellins–promotes bud and seed dormancy |
| 37. | Which of the following organs are incorrectly paired with their respective organism<br>(1) Insects (grasshoppers)-Malpighian tubules<br>(2) Earthworms-Nephridia<br>(3) Freshwater Protista-Flame Cells<br>(4) Platyhelminthes (planaria)-Flame Cells |
| 38. | Which of the following statements relating to the menstrual cycle are correct ?<br>(a) The period before ovulation is called the follicular phase<br>(b) The luteal phase is associated with a large increase in progesterone secretion<br>(c) Ovulation gives rise to a surge in the secretion of luteinising hormone (LH)<br>(d) Ovulation marks the completion of one menstrual cycle<br>(e) The cervical mucus is at its most viscous around ovulation<br>(f) Typically the luteal phase lasts for around 2 days in the absence of pregnancy<br>(1) a and b only (2) a, c and d<br>(3) d and e (4) All the above |

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| **39.** | TCR recognition of peptide-MHC class II depends on<br>(1) Covlent binding<br>(2) The presence of beta$_2$ microglobulin<br>(3) CDR-mediated binding<br>(4) A minimum of 2 peptides occupying the binding groove of each MHC molecule |
| **40.** | Most isolated congenital anomalies exhibit<br>(1) Mendelian inheritance (2) Chromosomal inheritance<br>(3) Multifactorial inheritance (4) Maternal inheritance |
| **41.** | Somatic mutations of immunoglobin accounts for<br>(1) Allelic mutation<br>(2) Affinity maturation<br>(3) V (D) J recombination<br>(4) Class switching from igm to igg |
| **42.** | Which of the following cytokine is released by both Th1 and Th2 type of cells<br>(1) IL-2 (2) IL-3 (3) IL-4 (4) IFN-$\gamma$ |
| **43.** | Junctional diversity mainly affects amino acids sequence in<br>(1) All CDR equally (2) CDR1<br>(3) CDR2 (4) CDR3 |
| **44.** | Vagus nerve is<br>(1) Sensory nerve<br>(2) Sensory motor mix nerve<br>(3) Motor nerve<br>(4) Lumbar nerve |

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| 45. | In Parkinson disease, there is a predominant loss of dopaminergic neurons primarily in<br>(1) Substantia nigra (2) Cerebellar corte<br>(3) Cerebral cortex (4) Locus cerulous |
| 46. | Which of the following is not a function of gilia<br>(1) Providing support to neural tissue<br>(2) Conduction and processing of neural signal<br>(3) Myelination of neuron<br>(4) Help in neuronal growth |
| 47. | Which of the following amino acid is coded by maximum number of codons<br>(1) Leucine (2) Tryptophan<br>(3) Valine (4) Alanine |
| 48. | Two proteins have the same molecular mass as well as the same isoelectric point. The best way to separate them would be to use<br>(1) Reverse phase chromatography<br>(2) Gel filtration chromatography<br>(3) Ion-exchange chromatography<br>(4) Chromatofocusing |
| 49. | A set of two or more overlapping DNA fragments that form a contigous stretch of DNA is called<br>(1) Contigs (2) BAC clones<br>(3) YAC clones (4) Map |

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| 50. | Sickle-cell anemia is an example of Single Nucleotide Polymorphism (SNP) of<br>(1) A to T mutation (2) T to A mutation<br>(3) G to C mutation (4) C to G mutation |
| 51. | Hybrid dysgenesis is asymmetrical. It is induced by<br>(1) X male PM crosses<br>(2) P male × M female crosses<br>(3) M male × P female crosses<br>(4) It is a random event, can occur in all the three |
| 52. | Typical nucleosomal organization of a gene is not found in<br>(1) Human liver nuclei (2) Malarial parasite<br>(3) Human sperm (4) Neuron |
| 53. | In the urine of Burkitt's lymphoma patient abnormal quantities of the following is detected<br>(1) Bence-Jones Proteins<br>(2) Human Chorionic Gonadotrophin (hcg)<br>(3) Carcinoembryonic antigen (CEA)<br>(4) Alpha-fetoprotein (AFP) |
| 54. | Which of the following is an example of GURT ?<br>(1) Hybridoma technology (2) PCR technology<br>(3) Terminator technology (4) Transgenic technology |

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| 55. | Anticancer vitamin is<br>(1) Retinol (2) Phylloquinone<br>(3) Thiamine (4) Pyridoxine |
| 56. | DNA has deoxy position of deoxyribose at<br>(1) 1st position (2) 2nd position<br>(3) 3rd position (4) 4th position |
| 57. | Which one of the following organism is used in Ames test ?<br>(1) *E. coli* (2) *Saccharomyces cerevisae*<br>(3) *Salmonella typhimurium* (4) *Pseudomonas aeruginosa* |
| 58. | In a population of 200 individuals which is in equilibrium, the frequency of one allele is 0.11. What is the expected frequency of heterozygous individuals ?<br>(1) 0.1958 (2) 0.89 (3) 0.0979 (4) 0.862 |
| 59. | Si RNA (s) interfere at<br>(1) DNA replication level (2) Transcription level<br>(3) Translational level (4) Post translational level |
| 60. | Highest capacity vector is<br>(1) M13 (2) YAC<br>(3) Cosmid (4) Lambda phage vector |
| 61. | Cdc mutants are useful in study of<br>(1) Replication (2) Recombination<br>(3) Cell cycle stages (4) Apoptopsis |

| Question No. | Questions |
|---|---|
| 62. | In the cell cycle the level of cyclin protein abruptly falls during<br>(1) S phase (2) M phase (3) G1 phase (4) G2 phase |
| 63. | Which of the following obeyed the Mendelian inheritance ?<br>(1) Transposons<br>(2) Quantitative traits<br>(3) Gene for vertical transfer of disease<br>(4) Transition |
| 64. | Which of the following chromosomal alterations would you expect to have the most drastic consequences ?<br>(1) Deletion (2) Duplication<br>(3) Translocation (4) Inversion |
| 65. | The X-ray diffraction studies conducted by ___ were key to the discovery of the structure of DNA<br>(1) Chargaff (2) Watson and Crick<br>(3) Franklin (4) McClintock |
| 66. | An individual with Down syndrome contains ____ chromosomes<br>(1) 1.45 (2) 22 (3) 24 (4) 47 |
| 67. | Which of the following statements about the digestion of proteins is correct<br>(1) Protein digestion begins in the stomach<br>(2) Protein digestion begins when the hydrochloric acid first hydrolyses the peptide bonds<br>(3) Protein digestion begins in the stomach<br>(4) Protein digestion begins when trypsinogen has been activated to trypsin by hydrochloric acid |

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| 68. | Which of the following statements about microtubules is correct ?<br>(1) Microtubules are polymers of β tubulin homodimers<br>(2) β tubulin has latent ATPase activity, which regulates microtubule stability<br>(3) Microtubules are stable structures in the cell<br>(4) Microtubules are hollow tubes consisting of 13 protofilaments |
| 69. | Which vitamin deficiency manifests itself as impaired wound healing, gastrointestinal bleeding, oral tissues ?<br>(1) Vitamin C (2) Vitamin D<br>(3) Vitamin A (4) Vitamin B |
| 70. | Which one of the following pairs of structures distinguishes a nerve cell from other types of cell ?<br>(1) Nucleus and Mitochondria<br>(2) Flagellum and medullary sheath<br>(3) Vacuoles and fibres<br>(4) Perikaryons and dendrites |
| 71. | The fluid that fills the posterior chamber of the eye is<br>(1) Choroid humor (2) Vitreous humor<br>(3) Aqueous humor (4) Lacrimal fluid |
| 72. | Creatinine the waste product closely regulated by the brain and kidneys is the end product of the metabolism of ____<br>(1) Anaerobic (2) Ammonia<br>(3) Muscle (4) Nucleotide |

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|---|---|
| 73. | Diabetes insipidus is caused by a lack of _____<br>(1) ADH hormone (2) FSH hormone<br>(3) TSH hormone (4) Insulin |
| 74. | Which technique is used to locate the specific genes in chromosomes ?<br>(1) Western blotting (2) Northern blotting<br>(3) In situ hybridisation (4) Colony hybridisation |
| 75. | PCR is used in<br>(1) Site specific translocation<br>(2) Site directed mutagenesis<br>(3) Site specific recombination<br>(4) All of the above |
| 76. | The variation in the restriction fragment length between individuals of a species is called<br>(1) RAPD (2) AFLP (3) RFLP (4) SSR |
| 77. | Which of the following is an example of a neutral mutation ?<br>(1) A codon that normally codes for valine is mutated. The mutated codon now codes for isoleucine<br>(2) A codon that normally codes for valine is mutated. The mutated codon still codes for valine<br>(3) A codon that normally codes for valine is disrupted when an extra base is inserted into the codon<br>(4) A codon that normally codes for valine is mutated. The mutated codon is now a "stop" codon |

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| 78. | In the lytic cycle the bacterial cell is ruptured by the action of<br>(1) Bacterial enzyme (2) Polymerase<br>(3) Transposon enzyme (4) Lysozyme |
| 79. | Which of the following statements about Nuclear Magnetic Resonance (NMR) is correct ?<br>(1) NMR is used to determine the amino acid sequence of proteins<br>(2) A disadvantage of NMR analysis is that it requires a large amount of protein<br>(3) The majority of known protein structures have been determined using NMR<br>(4) NMR requires crystallisation of proteins |
| 80. | Which correlation is the strongest ?<br>(1) +.10 (2) –.95 (3) +.90 (4) –1.00 |
| 81. | Which of the following techniques is the most suitable for detecting a metabolite labelled with $^{14}C$ ?<br>(1) Mass spectrometry<br>(2) Infra red spectroscopy<br>(3) Scintillation counting (detection of radioactivity)<br>(4) Nuclear magnetic resonance spectroscopy |
| 82. | Which of the following microscopy techniques relies on the specimen interfering with the wavelength of light to produce a high contrast image without the need for dyes or any damage to the sample ?<br>(1) Phase contrast microscopy<br>(2) Conventional bright field light microscopy<br>(3) Fluorescence microscopy<br>(4) Electron microscopy |

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|---|---|
| 83. | Which of the following statements about the ECG are true ?<br>(1) The P-Q interval is normally about 0.1 s<br>(2) The P wave of the ECG reflects artrial contraction<br>(3) The peak amplitude of the R wave recorded by limb leads is about 10 mV<br>(4) All the above are true |
| 84. | Which one of the following is a primary protein database ?<br>(1) NCBI (2) SWISS-PROT<br>(3) EMBL (4) DDBJ |
| 85. | Gene duplication results in __<br>(1) Xenologs (2) Zoologs<br>(3) Paralogs (4) Orthologs |
| 86. | Introduction of DNA into cells by exposing to high voltage electric pulse is<br>(1) Electroporation (2) Electrofusion<br>(3) Electrolysis (4) Electrofission |
| 87. | Which of the following drug was not isolated from natural source ?<br>(1) Artemisin (2) Isoniazid<br>(3) Quinine (4) Morphine |
| 88. | Pollination is the process by which plants transfer male sex cells from one plant to another. How does the nucleus of the male cell reach the female cell ?<br>(1) It blows in the wind<br>(2) It travels on the legs of bees and sticks to the egg cell<br>(3) The pollen grain grows a pollen tube and the nucleus travels down the pollen tube to reach the egg cell<br>(4) None of the above |

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| 89. | The use of double haploid in plant breeding helps to :<br>(1) Develop somatic hybrid<br>(2) Introgressing transgenic traits<br>(3) Reduce generation time while introgressing dominant traits<br>(4) Reduce generation time while introgressing recessive traits |
| 90. | Respiratory enzymes are located in :<br>(1) Mitochondrial matrix (2) Cristae<br>(3) Outer membrane (4) Perimitochondrial space |
| 91. | When oxygen is released as a result of photosynthesis, it is a by product of which of the following :<br>(1) Splitting the water molecules<br>(2) Reducing NADP+<br>(3) Chemiosmosis<br>(4) None of these |
| 92. | Which one of the following is not used for *ex situ* plant conservation ?<br>(1) Seed bank (2) Shifting cultivation<br>(3) Botanical Gardens (4) Field gene banks |
| 93. | The botanical name of Senna herbal plant is :<br>(1) *Cassia angustifolia* (2) *Cassia tora*<br>(3) *Solanum nigrum* (4) *Cappris aphylla* |

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| 94. | Phytoremediation can clean up polluted soil by using<br>(1) Plants to take up and accumulate the pollutant so that it can be removed when the plant is harvested<br>(2) Anaerobic bacteria to degrade toxic compounds<br>(3) Plants covers up to prevent surface soil heating<br>(4) All of the above |
| 95. | Which of the following is an example of carbon-dioxide sequestration ?<br>(1) The reversal of global warming<br>(2) The injection of carbon dioxide into subsurface geologic reservoirs<br>(3) Smoke-stack emissions<br>(4) Emissions trading |
| 96. | Which one of the following areas in India, is a hotspot of biodiversity ?<br>(1) Sunderbans (2) Gangetic Plain<br>(3) Eastern Ghats (4) Western Ghats |
| 97. | The gap in Darwin's theory of evolution was his inability to ____<br>(1) Explain the basis of evolution<br>(2) Observe variation<br>(3) Observe large populations<br>(4) Explain migration |
| 98. | An example of convergent evolution is<br>(1) Australian marsupials and placental mammals<br>(2) The flippers in fish, penguins, and dolphins<br>(3) The wings in birds, bats, and insects<br>(4) All of these |

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| **99.** | The functions of secondary plant metabolites is<br>(1) Make the plant susceptible to unfavourable conditions<br>(2) Provide defence mechanisms against microbial attack<br>(3) Help to increase the growth rate of plant<br>(4) Help in plant reproduction processes |
| **100.** | Secondary immune response is generated due to<br>(1) Memory Cells<br>(2) NK Cells<br>(3) Naive T Cells<br>(4) Naive B Cells |
| | |

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Mother's Name _____ Date of Examination _____

(Signature of the candidate) (Signature of the Invigilator)

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| Question No. | Questions |
|---|---|
| 1. | When oxygen is released as a result of photosynthesis, it is a by product of which of the following :<br>(1) Splitting the water molecules<br>(2) Reducing NADP+<br>(3) Chemiosmosis<br>(4) None of these |
| 2. | Which one of the following is not used for *ex situ* plant conservation ?<br>(1) Seed bank (2) Shifting cultivation<br>(3) Botanical Gardens (4) Field gene banks |
| 3. | The botanical name of Senna herbal plant is :<br>(1) *Cassia angustifolia* (2) *Cassia tora*<br>(3) *Solanum nigrum* (4) *Cappris aphylla* |
| 4. | Phytoremediation can clean up polluted soil by using<br>(1) Plants to take up and accumulate the pollutant so that it can be removed when the plant is harvested<br>(2) Anaerobic bacteria to degrade toxic compounds<br>(3) Plants covers up to prevent surface soil heating<br>(4) All of the above |
| 5. | Which of the following is an example of carbon-dioxide sequestration ?<br>(1) The reversal of global warming<br>(2) The injection of carbon dioxide into subsurface geologic reservoirs<br>(3) Smoke-stack emissions<br>(4) Emissions trading |

| Question No. | Questions |
|---|---|
| 6. | Which one of the following areas in India, is a hotspot of biodiversity ?<br>(1) Sunderbans (2) Gangetic Plain<br>(3) Eastern Ghats (4) Western Ghats |
| 7. | The gap in Darwin's theory of evolution was his inability to ____<br>(1) Explain the basis of evolution<br>(2) Observe variation<br>(3) Observe large populations<br>(4) Explain migration |
| 8. | An example of convergent evolution is<br>(1) Australian marsupials and placental mammals<br>(2) The flippers in fish, penguins, and dolphins<br>(3) The wings in birds, bats, and insects<br>(4) All of these |
| 9. | The functions of secondary plant metabolites is<br>(1) Make the plant susceptible to unfavourable conditions<br>(2) Provide defence mechanisms against microbial attack<br>(3) Help to increase the growth rate of plant<br>(4) Help in plant reproduction processes |
| 10. | Secondary immune response is generated due to<br>(1) Memory Cells<br>(2) NK Cells<br>(3) Naive T Cells<br>(4) Naive B Cells |

| Question No. | Questions |
|---|---|
| 11. | The fluid that fills the posterior chamber of the eye is<br>(1) Choroid humor (2) Vitreous humor<br>(3) Aqueous humor (4) Lacrimal fluid |
| 12. | Creatinine the waste product closely regulated by the brain and kidneys is the end product of the metabolism of ____<br>(1) Anaerobic (2) Ammonia<br>(3) Muscle (4) Nucleotide |
| 13. | Diabetes insipidus is caused by a lack of _____<br>(1) ADH hormone (2) FSH hormone<br>(3) TSH hormone (4) Insulin |
| 14. | Which technique is used to locate the specific genes in chromosomes ?<br>(1) Western blotting (2) Northern blotting<br>(3) In situ hybridisation (4) Colony hybridisation |
| 15. | PCR is used in<br>(1) Site specific translocation<br>(2) Site directed mutagenesis<br>(3) Site specific recombination<br>(4) All of the above |
| 16. | The variation in the restriction fragment length between individuals of a species is called<br>(1) RAPD (2) AFLP (3) RFLP (4) SSR |

| Question No. | Questions |
|---|---|
| 17. | Which of the following is an example of a neutral mutation ?<br>(1) A codon that normally codes for valine is mutated. The mutated codon now codes for isoleucine<br>(2) A codon that normally codes for valine is mutated. The mutated codon still codes for valine<br>(3) A codon that normally codes for valine is disrupted when an extra base is inserted into the codon<br>(4) A codon that normally codes for valine is mutated. The mutated codon is now a "stop" codon |
| 18. | In the lytic cycle the bacterial cell is ruptured by the action of<br>(1) Bacterial enzyme (2) Polymerase<br>(3) Transposon enzyme (4) Lysozyme |
| 19. | Which of the following statements about Nuclear Magnetic Resonance (NMR) is correct ?<br>(1) NMR is used to determine the amino acid sequence of proteins<br>(2) A disadvantage of NMR analysis is that it requires a large amount of protein<br>(3) The majority of known protein structures have been determined using NMR<br>(4) NMR requires crystallisation of proteins |
| 20. | Which correlation is the strongest ?<br>(1) +.10 (2) –.95 (3) +.90 (4) –1.00 |

| Question No. | Questions |
|---|---|
| 21. | Hybrid dysgenesis is asymmetrical. It is induced by<br>(1) X male PM crosses<br>(2) P male × M female crosses<br>(3) M male × P female crosses<br>(4) It is a random event, can occur in all the three |
| 22. | Typical nucleosomal organization of a gene is not found in<br>(1) Human liver nuclei (2) Malarial parasite<br>(3) Human sperm (4) Neuron |
| 23. | In the urine of Burkitt's lymphoma patient abnormal quantities of the following is detected<br>(1) Bence-Jones Proteins<br>(2) Human Chorionic Gonadotrophin (hcg)<br>(3) Carcinoembryonic antigen (CEA)<br>(4) Alpha-fetoprotein (AFP) |
| 24. | Which of the following is an example of GURT ?<br>(1) Hybridoma technology (2) PCR technology<br>(3) Terminator technology (4) Transgenic technology |
| 25. | Anticancer vitamin is<br>(1) Retinol (2) Phylloquinone<br>(3) Thiamine (4) Pyridoxine |

| Question No. | Questions |
|---|---|
| 26. | DNA has deoxy position of deoxyribose at<br>(1) 1st position (2) 2nd position<br>(3) 3rd position (4) 4th position |
| 27. | Which one of the following organism is used in Ames test ?<br>(1) *E. coli* (2) *Saccharomyces cerevisae*<br>(3) *Salmonella typhimurium* (4) *Pseudomonas aeruginosa* |
| 28. | In a population of 200 individuals which is in equilibrium, the frequency of one allele is 0.11. What is the expected frequency of heterozygous individuals ?<br>(1) 0.1958 (2) 0.89 (3) 0.0979 (4) 0.862 |
| 29. | Si RNA (s) interfere at<br>(1) DNA replication level (2) Transcription level<br>(3) Translational level (4) Post translational level |
| 30. | Highest capacity vector is<br>(1) M13 (2) YAC<br>(3) Cosmid (4) Lambda phage vector |
| 31. | Order the following events observed during muscle contraction<br>1. The sarcomere shortens 2. ATP is hydrolysed<br>3. $Ca^{+2}$ binds to troponin 4. ATP binds to myosin<br>5. Myosin contract F-actin 6. F-actin moves<br>7. Topomyosin moves 8. $Ca^{+2}$ is released from the sarcoplasmic reticulum<br>(1) 8-4-3-7-2-5-1-6 (2) 4-8-7-2-3-5-6-1<br>(3) 4-8-3-7-5-6-2-1 (4) 4-8-3-7-2-5-6-1 |

| Question No. | Questions |
|---|---|
| 32. | The most important difference between gap junctions between animal cells and plasmodesmata in plant is that in plasmodesmata<br>(1) Ionic coupling occurs<br>(2) Two adjacent plasma membranes are fused<br>(3) Metabolic cooperation occurs<br>(4) Pore diameter is 1 mm |
| 33. | Which of the following statement is false ?<br>(1) Dnase I hypersensitive sites are regions where the DNA free of nucleosomes<br>(2) When gene is active, promoter is generally free of nucleosomes<br>(3) H1 phosphorylation occurs mainly before mitosis<br>(4) DNA sequences called matrix or scaffold associated regions are generally GC rich |
| 34. | Diacylglycerol activate<br>(1) Protein kinase A (2) Protein kinase C<br>(3) MAP kinase (4) Tyrosin kinase |
| 35. | Rhodopsin is a transmembrane protein belonging to a large family of G protein coupled receptor. It is found in the disc of rod cells of human retina. Activation of rhodopsin is due to<br>(1) Phosphorylation of its extracellular tyrosin residues<br>(2) Binding of external ligand to its extracellular loop<br>(3) Photoisomerization of its prosthetic group<br>(4) Binding of calcium ion to its transmembrane aspartic groups |

| Question No. | Questions |
|---|---|
| 36. | In the Meselson and Stahl experiment, E. coli cells grown on heavy nitrogen were transferred to light nitrogen. What % of DNA can be expected to be constituted of light nitrogen after 3 generation of multiplication ?<br>(1) 25 (2) 50 (3) 70 (4) 100 |
| 37. | During DNA synthesis lagging strand is synthesized by<br>(1) DNA polymerase (2) Telomerase<br>(3) DNA polymerase (4) Helicase |
| 38. | Wild type of *E. coli* was plated on a Rifampicin medium and incubated at 37°C. Majority of cella died; however some colonies are appeared after a few days. What is the most likely explaination for this observation?<br>(1) Degradation of rifampicin<br>(2) Mutation in DNA pol III<br>(3) Efflux of rifampicin<br>(4) Mutation in the beta subunit of RNA polymerase |
| 39. | Alternative splicing<br>(a) Uses a completely different mechanism than constitutive splicing<br>(b) Allows generation of protein isoforms from a single gene<br>(c) Involve the use of different 3' and 5' sites<br>(d) It used to make different proteins in different tissues and at different developmental stages<br>(1) a and b (2) a and c (3) a and d (4) b, c and d |
| 40. | Which of the following partial diploids will express β-galactosidase constitutively ?<br>(1) F' $laco^c$ $lacz^+$/$laco^+$ $lacz^+$ (2) F' lac $I^-$ $lacz^+$/$laci^+$ $lacz^+$<br>(3) F' lac $I^+$ $lacz^+$/$laci^-$ $lacz^+$ (4) F' lac $O^c$ $lacz^-$/$laco^+$ $lacz^+$ |

| Question No. | Questions |
|---|---|
| 41. | High solubility of amino acid in water is due to<br>(1) Presence of side chain<br>(2) Dipolar ion structure<br>(3) Unipolarity<br>(4) Hydrophilic nature of amino acid |
| 42. | DNA polymerase contains a Glutamate residue that is important for binding to DNA Mutations was found that converted this glutamate residue to either lysine, glycine, valine or arginine. Which mutations would be predicted to be the most and least harmful to the ability of the enzyme to bind DNA ?<br>Most / Least<br>(1) Glycine / Arginine<br>(2) Arginine / Glycine<br>(3) Lysine / Valine<br>(4) Lysine / Aspartic acid |
| 43. | Choose the correct statement<br>(a) Phenylisothyocynate - hydrolysis of peptide bonds on the carboxyl side of amino acid residue<br>(b) Dansyl chloride - identification of amino terminal residue of a peptide<br>(c) Chymotrypsin - hydrolysis of peptide bonds on the carboxyl side of aromatic residue<br>(d) CnBr - cleavage of peptide bonds on the carboxyl side of methionines<br>(1) Both a and d statements are correct<br>(2) b, c and d are correct<br>(3) Only b and c are correct<br>(4) All the above |

| Question No. | Questions |
|---|---|
| 44. | Initiation codon for protein synthesis in eukaryotes is<br>(1) AUG (2) AAA (3) GCA (4) CCG |
| 45. | Melting temperature of DNA, Tm of a DNA duplex is defined as the temperature at which half the molecules have dissociated in to single strand. Tm will be maximal at<br>(1) Low ionic strength and high DNA concentration<br>(2) High ionic strength and high DNA concentration<br>(3) High ionic strength and low DNA concentration<br>(4) Low ionic strength and low DNA concentration |
| 46. | Which of the following enzyme transfers a phosphate group from ATP to another molecule ?<br>(1) Phosphatase (2) Phosphodiesterase<br>(3) Kinase (4) Esterase |
| 47. | Correct equation for reduction of $NADP^+$ is<br>(1) $NADP^+ + 2H^+ \rightarrow NADPH^+ + H^+$<br>(2) $NADP^+ + H^+ + e^- \rightarrow NADPH$<br>(3) $NADP^+ + H^+ + 2e^- \rightarrow NADPH$<br>(4) $NADP^+ + 2H^+ + 2e^- \rightarrow NADPH_2$ |
| 48. | Which of the following statements is not true for fatty acids found in most mammalian cells ?<br>(1) They usually contain 12-20 carbons<br>(2) Polyunsaturated fatty acids contain conjugated double bonds<br>(3) All double bond are in *cis* configuration<br>(4) Free fatty acids are ionized at physiological pH |

| Question No. | Questions |
|---|---|
| 49. | You have homogenized plant tissue and would like to separate chloroplasts from nuclei. Which of the following methods would be most suitable ?<br>(1) Polyacrylamide gel electrophoresis<br>(2) Differential centrifugation using sucrose gradient<br>(3) Equilibrium density gradient centrifugation on cscl gradient<br>(4) Gel filteration |
| 50. | A protein which spans the lipid bilayer<br>(1) Cannot diffuse in the plane of the membrane<br>(2) Cannot have any attachment to cytoplasmic components<br>(3) Cannot have bound carbohydrate<br>(4) Usually has both hydrophobic and hydrophilic regions |
| 51. | Which of the following techniques is the most suitable for detecting a metabolite labelled with $^{14}C$ ?<br>(1) Mass spectrometry<br>(2) Infra red spectroscopy<br>(3) Scintillation counting (detection of radioactivity)<br>(4) Nuclear magnetic resonance spectroscopy |
| 52. | Which of the following microscopy techniques relies on the specimen interfering with the wavelength of light to produce a high contrast image without the need for dyes or any damage to the sample ?<br>(1) Phase contrast microscopy<br>(2) Conventional bright field light microscopy<br>(3) Fluorescence microscopy<br>(4) Electron microscopy |

| Question No. | Questions |
|---|---|
| 53. | Which of the following statements about the ECG are true ?<br>(1) The P-Q interval is normally about 0.1 s<br>(2) The P wave of the ECG reflects artrial contraction<br>(3) The peak amplitude of the R wave recorded by limb leads is about 10 mV<br>(4) All the above are true |
| 54. | Which one of the following is a primary protein database ?<br>(1) NCBI (2) SWISS-PROT<br>(3) EMBL (4) DDBJ |
| 55. | Gene duplication results in ___<br>(1) Xenologs (2) Zoologs<br>(3) Paralogs (4) Orthologs |
| 56. | Introduction of DNA into cells by exposing to high voltage electric pulse is<br>(1) Electroporation (2) Electrofusion<br>(3) Electrolysis (4) Electrofission |
| 57. | Which of the following drug was not isolated from natural source ?<br>(1) Artemisin (2) Isoniazid<br>(3) Quinine (4) Morphine |
| 58. | Pollination is the process by which plants transfer male sex cells from one plant to another. How does the nucleus of the male cell reach the female cell ?<br>(1) It blows in the wind<br>(2) It travels on the legs of bees and sticks to the egg cell<br>(3) The pollen grain grows a pollen tube and the nucleus travels down the pollen tube to reach the egg cell<br>(4) None of the above |

| Question No. | Questions |
|---|---|
| 59. | The use of double haploid in plant breeding helps to :<br>(1) Develop somatic hybrid<br>(2) Introgressing transgenic traits<br>(3) Reduce generation time while introgressing dominant traits<br>(4) Reduce generation time while introgressing recessive traits |
| 60. | Respiratory enzymes are located in :<br>(1) Mitochondrial matrix (2) Cristae<br>(3) Outer membrane (4) Perimitochondrial space |
| 61. | Somatic mutations of immunoglobin accounts for<br>(1) Allelic mutation<br>(2) Affinity maturation<br>(3) V (D) J recombination<br>(4) Class switching from igm to igg |
| 62. | Which of the following cytokine is released by both Th1 and Th2 type of cells<br>(1) IL-2 (2) IL-3 (3) IL-4 (4) IFN-$\gamma$ |
| 63. | Junctional diversity mainly affects amino acids sequence in<br>(1) All CDR equally (2) CDR1<br>(3) CDR2 (4) CDR3 |
| 64. | Vagus nerve is<br>(1) Sensory nerve<br>(2) Sensory motor mix nerve<br>(3) Motor nerve<br>(4) Lumbar nerve |

| Question No. | Questions |
|---|---|
| 65. | In Parkinson disease, there is a predominant loss of dopaminergic neurons primarily in<br>(1) Substantia nigra (2) Cerebellar corte<br>(3) Cerebral cortex (4) Locus cerulous |
| 66. | Which of the following is not a function of gilia<br>(1) Providing support to neural tissue<br>(2) Conduction and processing of neural signal<br>(3) Myelination of neuron<br>(4) Help in neuronal growth |
| 67. | Which of the following amino acid is coded by maximum number of codons<br>(1) Leucine (2) Tryptophan<br>(3) Valine (4) Alanine |
| 68. | Two proteins have the same molecular mass as well as the same isoelectric point. The best way to separate them would be to use<br>(1) Reverse phase chromatography<br>(2) Gel filtration chromatography<br>(3) Ion-exchange chromatography<br>(4) Chromatofocusing |
| 69. | A set of two or more overlapping DNA fragments that form a contigous stretch of DNA is called<br>(1) Contigs (2) BAC clones<br>(3) YAC clones (4) Map |

| Question No. | Questions |
|---|---|
| 70. | Sickle-cell anemia is an example of Single Nucleotide Polymorphism (SNP) of<br>(1) A to T mutation (2) T to A mutation<br>(3) G to C mutation (4) C to G mutation |
| 71. | Which of the following post translational modification of proteins does not occur in the lumen of the endoplasmic reticulum ?<br>(1) Glycosylation<br>(2) Formation of disulphide bond<br>(3) Folding and formation of quaternary structure<br>(4) Ubiquitination |
| 72. | Which of the following chemical mutagen is likely to cause GC → AT transition<br>(1) 5-bromouracil (2) 2-aminipurine<br>(3) Acridine orange (4) Hydroxylamine |
| 73. | The oxidation of 1 mol of Glucose by anaerobic glycolysis yields a net of<br>(1) 2 mol of lactate, 2 mol of NADH and 2 mol of ATP<br>(2) 2 mol of lactate and 2 mol of ATP<br>(3) 2 mol of lactate, 2 mol of $NAD^+$ and 6 mol of ATP<br>(4) 2 mol of Acetyl co-A and 2 mol of ATP |

| Question No. | Questions |
|---|---|
| 74. | A $C_3$ mustard plant was grown at 300 ppm of $CO_2$ in14 hr light/10 hr dark cycles, it was transferred to 1000 ppm $CO_2$, this will lead to (other environmental parameters remaining identical)<br>(1) Increase in photosynthetic rate<br>(2) Decrease in photosynthetic rate<br>(3) Increase in respiration rate<br>(4) No change |
| 75. | Which of the following is correct about nitrate reductase ?<br>(1) FAD, Mo and heme act as prosthetic groups<br>(2) Catalyzed the conversion of $NO_3^-$ to $NH_4^+$<br>(3) $FADH_2$ act as electron donor<br>(4) A plant growing naturally on calcareous soil |
| 76. | Which of the following plant hormone is icorrectly paired with its function?<br>(1) Auxin–responsible for apical dominance<br>(2) Abscisic acid–regulates the rate of transpiration<br>(3) Cytokinins–delays senescence<br>(4) Gibberellins–promotes bud and seed dormancy |
| 77. | Which of the following organs are incorrectly paired with their respective organism<br>(1) Insects (grasshoppers)-Malpighian tubules<br>(2) Earthworms-Nephridia<br>(3) Freshwater Protista-Flame Cells<br>(4) Platyhelminthes (planaria)-Flame Cells |

| Question No. | Questions |
|---|---|
| 78. | Which of the following statements relating to the menstrual cycle are correct ?<br>(a) The period before ovulation is called the follicular phase<br>(b) The luteal phase is associated with a large increase in progesterone secretion<br>(c) Ovulation gives rise to a surge in the secretion of luteinising hormone (LH)<br>(d) Ovulation marks the completion of one menstrual cycle<br>(e) The cervical mucus is at its most viscous around ovulation<br>(f) Typically the luteal phase lasts for around 2 days in the absence of pregnancy<br>(1) a and b only (2) a, c and d<br>(3) d and e (4) All the above |
| 79. | TCR recognition of peptide-MHC class II depends on<br>(1) Covlent binding<br>(2) The presence of beta$_2$ microglobulin<br>(3) CDR-mediated binding<br>(4) A minimum of 2 peptides occupying the binding groove of each MHC molecule |
| 80. | Most isolated congenital anomalies exhibit<br>(1) Mendelian inheritance (2) Chromosomal inheritance<br>(3) Multifactorial inheritance (4) Maternal inheritance |

| Question No. | Questions |
|---|---|
| 81. | Cdc mutants are useful in study of<br>(1) Replication (2) Recombination<br>(3) Cell cycle stages (4) Apoptopsis |
| 82. | In the cell cycle the level of cyclin protein abruptly falls during<br>(1) S phase (2) M phase (3) G1 phase (4) G2 phase |
| 83. | Which of the following obeyed the Mendelian inheritance ?<br>(1) Transposons<br>(2) Quantitative traits<br>(3) Gene for vertical transfer of disease<br>(4) Transition |
| 84. | Which of the following chromosomal alterations would you expect to have the most drastic consequences ?<br>(1) Deletion (2) Duplication<br>(3) Translocation (4) Inversion |
| 85. | The X-ray diffraction studies conducted by ___ were key to the discovery of the structure of DNA<br>(1) Chargaff (2) Watson and Crick<br>(3) Franklin (4) McClintock |
| 86. | An individual with Down syndrome contains ____ chromosomes<br>(1) 1.45 (2) 22 (3) 24 (4) 47 |

| Question No. | Questions |
|---|---|
| 87. | Which of the following statements about the digestion of proteins is correct<br>(1) Protein digestion begins in the stomach<br>(2) Protein digestion begins when the hydrochloric acid first hydrolyses the peptide bonds<br>(3) Protein digestion begins in the stomach<br>(4) Protein digestion begins when trypsinogen has been activated to trypsin by hydrochloric acid |
| 88. | Which of the following statements about microtubules is correct ?<br>(1) Microtubules are polymers of β tubulin homodimers<br>(2) β tubulin has latent ATPase activity, which regulates microtubule stability<br>(3) Microtubules are stable structures in the cell<br>(4) Microtubules are hollow tubes consisting of 13 protofilaments |
| 89. | Which vitamin deficiency manifests itself as impaired wound healing, gastrointestinal bleeding, oral tissues ?<br>(1) Vitamin C (2) Vitamin D<br>(3) Vitamin A (4) Vitamin B |
| 90. | Which one of the following pairs of structures distinguishes a nerve cell from other types of cell ?<br>(1) Nucleus and Mitochondria<br>(2) Flagellum and medullary sheath<br>(3) Vacuoles and fibres<br>(4) Perikaryons and dendrites |

| Question No. | Questions |
|---|---|
| 91. | In plasma membrane, carbohydrates present on the<br>(1) Both layers of lipid<br>(2) Only on cytoplasmic side of lipid bilayer<br>(3) Only on non-cytoplasmic side of lipid bilayer<br>(4) None |
| 92. | Which antibody is responsible for allergic reactions ?<br>(1) IgG (2) IgM<br>(3) IgE 4) IgD |
| 93. | A Contractile vacuole is an organelle that pumps excess water out of many freshwater protozoan cells. A freshwater protozoan was placed in solution A and observed to form contractile vacuoles at a rate of 11 per minute. The same protozoan was then placed in solution B and observed to form contractile vacuoles at a rate of 4 per minute. Based on this information, which of the following statements is correct ?<br>(1) Solution A is hyperosmotic to solution B<br>(2) Solutions A and B are isomotic<br>(3) Solution B is hyperosmotic to solution A<br>(4) Solutions A and B are iso-osmotic to the protozoan cell |
| 94. | Which of the following is likely to be expressed ?<br>(1) Euchromatin without methylation<br>(2) Heterochromatin with methylation<br>(3) Euchromatin either methylated or not, equally expressed<br>(4) DNA with many methyl groups |

| Question No. | Questions |
|---|---|
| 95. | What roles in regulating the intrinsic pathway of apoptosis are played by the Bcl-2 protein family members Bax and Bcl-2 ?<br>(1) Bax inhibits apoptosis while Bcl-2 stimulates apoptosis<br>(2) Bax stimulates apoptosis while Bcl-2 inhibits apoptosis<br>(3) Both Bax and Bcl-2 inhibit apoptosis<br>(4) Both Bax and Bcl-2 stimulates apoptosis |
| 96. | What is the term used for small molecules that bind to different regions of a binding site ?<br>(1) Epitopes (2) Epimers<br>(3) Isotopes (4) Isomers |
| 97. | In what way does the *ras* oncogene contribute to cancers ?<br>(1) *Ras* codes for an anti-apoptotic protein, which is produced in abnormally large amounts<br>(2) *Ras* codes for a gtpase switch protein, which in its mutated form cannot be switched off<br>(3) *Ras* codes for a transcription factor, which is produced in abnormally large amounts<br>(4) *Ras* codes for a truncated form of a growth factor receptor, which is continually active |
| 98. | What provides the energy for DNA polymerization?<br>(1) The hydrolysis of ATP (releasing $P_i$)<br>(2) The hydrolysis of GTP (releasing $P_i$)<br>(3) The hydrolysis of incoming nucleoside triphosphates (releasing $pp_i$)<br>(4) None of the above |

| Question No. | Questions |
|---|---|
| **99.** | If the genome of the bacterium *E. coli* requires about 20 minutes to replicate itself, how can the genome of the fruit fly Drosophila be replicated in only 3 minutes ?<br>(1) The Drosophila genome is smaller than *E. coli* genome<br>(2) Eukaryotic DNA polymerase synthesizes DNA at a much faster rate than prokaryotic DNA polymerase<br>(3) Nuclear membrane keep the Drosophila DNA concentrated in one place in the cell, which increase the rate of polymerization<br>(4) Drosophila DNA contains more origins of replication than *E Coli* |
| **100.** | Telomeres serves as caps at the end of linear chromosomes. Which of the following is not true regarding the replication of telomeric sequences ?<br>(1) The lagging strand telomeres are not completely replicated by DNA polymerase<br>(2) Telomeres are made up of repeated sequences<br>(3) Additional repeated sequences are added to the template strand<br>(4) The leading strand doubles back on itself to form a primer for lagging strand |

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

**(Ph.D/URS–EE–2015)**

Sr. No. 10151 **Subject : LIFE SCIENCE** **Code C**

**Time : 1¼ Hours** **Max. Marks : 100** **Total Questions : 100**

Roll No. _____ (in figure) _____ (in words)

Name : _____ Father's Name : _____

Mother's Name _____ Date of Examination _____

(Signature of the candidate) (Signature of the Invigilator)

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**CANDIDATES MUST READ THE FOLLOWING INFORMATION/ INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.**

1. All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
2. The candidates must return the Question book-let as well as OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such candidate will not be evaluated.
3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing **within two hours** after the test is over. No such complaint(s) will be entertained thereafter.
4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question book-let itself. Answers **MUST NOT** be ticked in the Question book-let.
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| Question No. | Questions |
|---|---|
| 1. | The fluid that fills the posterior chamber of the eye is<br>(1) Choroid humor (2) Vitreous humor<br>(3) Aqueous humor (4) Lacrimal fluid |
| 2. | Creatinine the waste product closely regulated by the brain and kidneys is the end product of the metabolism of ____<br>(1) Anaerobic (2) Ammonia<br>(3) Muscle (4) Nucleotide |
| 3. | Diabetes insipidus is caused by a lack of _____<br>(1) ADH hormone (2) FSH hormone<br>(3) TSH hormone (4) Insulin |
| 4. | Which technique is used to locate the specific genes in chromosomes ?<br>(1) Western blotting (2) Northern blotting<br>(3) In situ hybridisation (4) Colony hybridisation |
| 5. | PCR is used in<br>(1) Site specific translocation<br>(2) Site directed mutagenesis<br>(3) Site specific recombination<br>(4) All of the above |
| 6. | The variation in the restriction fragment length between individuals of a species is called<br>(1) RAPD (2) AFLP (3) RFLP (4) SSR |

| Question No. | Questions |
|---|---|
| 7. | Which of the following is an example of a neutral mutation ?<br>(1) A codon that normally codes for valine is mutated. The mutated codon now codes for isoleucine<br>(2) A codon that normally codes for valine is mutated. The mutated codon still codes for valine<br>(3) A codon that normally codes for valine is disrupted when an extra base is inserted into the codon<br>(4) A codon that normally codes for valine is mutated. The mutated codon is now a "stop" codon |
| 8. | In the lytic cycle the bacterial cell is ruptured by the action of<br>(1) Bacterial enzyme (2) Polymerase<br>(3) Transposon enzyme (4) Lysozyme |
| 9. | Which of the following statements about Nuclear Magnetic Resonance (NMR) is correct ?<br>(1) NMR is used to determine the amino acid sequence of proteins<br>(2) A disadvantage of NMR analysis is that it requires a large amount of protein<br>(3) The majority of known protein structures have been determined using NMR<br>(4) NMR requires crystallisation of proteins |
| 10. | Which correlation is the strongest ?<br>(1) +.10 (2) –.95 (3) +.90 (4) –1.00 |

| Question No. | Questions |
|---|---|
| 11. | Hybrid dysgenesis is asymmetrical. It is induced by<br>(1) X male PM crosses<br>(2) P male × M female crosses<br>(3) M male × P female crosses<br>(4) It is a random event, can occur in all the three |
| 12. | Typical nucleosomal organization of a gene is not found in<br>(1) Human liver nuclei (2) Malarial parasite<br>(3) Human sperm (4) Neuron |
| 13. | In the urine of Burkitt's lymphoma patient abnormal quantities of the following is detected<br>(1) Bence-Jones Proteins<br>(2) Human Chorionic Gonadotrophin (hcg)<br>(3) Carcinoembryonic antigen (CEA)<br>(4) Alpha-fetoprotein (AFP) |
| 14. | Which of the following is an example of GURT ?<br>(1) Hybridoma technology (2) PCR technology<br>(3) Terminator technology (4) Transgenic technology |
| 15. | Anticancer vitamin is<br>(1) Retinol (2) Phylloquinone<br>(3) Thiamine (4) Pyridoxine |
| 16. | DNA has deoxy position of deoxyribose at<br>(1) 1st position (2) 2nd position<br>(3) 3rd position (4) 4th position |

| Question No. | Questions |
|---|---|
| 17. | Which one of the following organism is used in Ames test ?<br>(1) *E. coli* (2) *Saccharomyces cerevisae*<br>(3) *Salmonella typhimurium* (4) *Pseudomonas aeruginosa* |
| 18. | In a population of 200 individuals which is in equilibrium, the frequency of one allele is 0.11. What is the expected frequency of heterozygous individuals ?<br>(1) 0.1958 (2) 0.89 (3) 0.0979 (4) 0.862 |
| 19. | Si RNA (s) interfere at<br>(1) DNA replication level (2) Transcription level<br>(3) Translational level (4) Post translational level |
| 20. | Highest capacity vector is<br>(1) M13 (2) YAC<br>(3) Cosmid (4) Lambda phage vector |
| 21. | Which of the following post translational modification of proteins does not occur in the lumen of the endoplasmic reticulum ?<br>(1) Glycosylation<br>(2) Formation of disulphide bond<br>(3) Folding and formation of quaternary structure<br>(4) Ubiquitination |
| 22. | Which of the following chemical mutagen is likely to cause GC → AT transition<br>(1) 5-bromouracil (2) 2-aminipurine<br>(3) Acridine orange (4) Hydroxylamine |

| uestion No. | Questions |
|---|---|
| 23. | The oxidation of 1 mol of Glucose by anaerobic glycolysis yields a net of<br>(1) 2 mol of lactate, 2 mol of NADH and 2 mol of ATP<br>(2) 2 mol of lactate and 2 mol of ATP<br>(3) 2 mol of lactate, 2 mol of $NAD^+$ and 6 mol of ATP<br>(4) 2 mol of Acetyl co-A and 2 mol of ATP |
| 24. | A $C_3$ mustard plant was grown at 300 ppm of $CO_2$ in14 hr light/10 hr dark cycles, it was transferred to 1000 ppm $CO_2$, this will lead to (other environmental parameters remaining identical)<br>(1) Increase in photosynthetic rate<br>(2) Decrease in photosynthetic rate<br>(3) Increase in respiration rate<br>(4) No change |
| 25. | Which of the following is correct about nitrate reductase ?<br>(1) FAD, Mo and heme act as prosthetic groups<br>(2) Catalyzed the conversion of $NO_3^-$ to $NH_4^+$<br>(3) $FADH_2$ act as electron donor<br>(4) A plant growing naturally on calcareous soil |
| 26. | Which of the following plant hormone is icorrectly paired with its function?<br>(1) Auxin–responsible for apical dominance<br>(2) Abscisic acid–regulates the rate of transpiration<br>(3) Cytokinins–delays senescence<br>(4) Gibberellins–promotes bud and seed dormancy |

| Question No. | Questions |
|---|---|
| 27. | Which of the following organs are incorrectly paired with their respective organism<br>(1) Insects (grasshoppers)-Malpighian tubules<br>(2) Earthworms-Nephridia<br>(3) Freshwater Protista-Flame Cells<br>(4) Platyhelminthes (planaria)-Flame Cells |
| 28. | Which of the following statements relating to the menstrual cycle are correct ?<br>(a) The period before ovulation is called the follicular phase<br>(b) The luteal phase is associated with a large increase in progesterone secretion<br>(c) Ovulation gives rise to a surge in the secretion of luteinising hormone (LH)<br>(d) Ovulation marks the completion of one menstrual cycle<br>(e) The cervical mucus is at its most viscous around ovulation<br>(f) Typically the luteal phase lasts for around 2 days in the absence of pregnancy<br>(1) a and b only (2) a, c and d<br>(3) d and e (4) All the above |
| 29. | TCR recognition of peptide-MHC class II depends on<br>(1) Covlent binding<br>(2) The presence of beta$_2$ microglobulin<br>(3) CDR-mediated binding<br>(4) A minimum of 2 peptides occupying the binding groove of each MHC molecule |
| 30. | Most isolated congenital anomalies exhibit<br>(1) Mendelian inheritance (2) Chromosomal inheritance<br>(3) Multifactorial inheritance (4) Maternal inheritance |

| Question No. | Questions |
|---|---|
| 31. | High solubility of amino acid in water is due to<br>(1) Presence of side chain<br>(2) Dipolar ion structure<br>(3) Unipolarity<br>(4) Hydrophilic nature of amino acid |
| 32. | DNA polymerase contains a Glutamate residue that is important for binding to DNA Mutations was found that converted this glutamate residue to either lysine, glycine, valine or arginine. Which mutations would be predicted to be the most and least harmful to the ability of the enzyme to bind DNA ?<br>Most / Least<br>(1) Glycine / Arginine<br>(2) Arginine / Glycine<br>(3) Lysine / Valine<br>(4) Lysine / Aspartic acid |
| 33. | Choose the correct statement<br>(a) Phenylisothyocynate - hydrolysis of peptide bonds on the carboxyl side of amino acid residue<br>(b) Dansyl chloride - identification of amino terminal residue of a peptide<br>(c) Chymotrypsin - hydrolysis of peptide bonds on the carboxyl side of aromatic residue<br>(d) CnBr - cleavage of peptide bonds on the carboxyl side of methionines<br>(1) Both a and d statements are correct<br>(2) b, c and d are correct<br>(3) Only b and c are correct<br>(4) All the above |

| Question No. | Questions |
|---|---|
| 34. | Initiation codon for protein synthesis in eukaryotes is<br>(1) AUG (2) AAA (3) GCA (4) CCG |
| 35. | Melting temperature of DNA, Tm of a DNA duplex is defined as the temperature at which half the molecules have dissociated in to single strand. Tm will be maximal at<br>(1) Low ionic strength and high DNA concentration<br>(2) High ionic strength and high DNA concentration<br>(3) High ionic strength and low DNA concentration<br>(4) Low ionic strength and low DNA concentration |
| 36. | Which of the following enzyme transfers a phosphate group from ATP to another molecule ?<br>(1) Phosphatase (2) Phosphodiesterase<br>(3) Kinase (4) Esterase |
| 37. | Correct equation for reduction of $NADP^+$ is<br>(1) $NADP^+ + 2H^+ \rightarrow NADPH^+ + H^+$<br>(2) $NADP^+ + H^+ + e^- \rightarrow NADPH$<br>(3) $NADP^+ + H^+ + 2e^- \rightarrow NADPH$<br>(4) $NADP^+ + 2H^+ + 2e^- \rightarrow NADPH_2$ |
| 38. | Which of the following statements is not true for fatty acids found in most mammalian cells ?<br>(1) They usually contain 12-20 carbons<br>(2) Polyunsaturated fatty acids contain conjugated double bonds<br>(3) All double bond are in *cis* configuration<br>(4) Free fatty acids are ionized at physiological pH |

| Question No. | Questions |
|---|---|
| 39. | You have homogenized plant tissue and would like to separate chloroplasts from nuclei. Which of the following methods would be most suitable ?<br>(1) Polyacrylamide gel electrophoresis<br>(2) Differential centrifugation using sucrose gradient<br>(3) Equilibrium density gradient centrifugation on cscl gradient<br>(4) Gel filteration |
| 40. | A protein which spans the lipid bilayer<br>(1) Cannot diffuse in the plane of the membrane<br>(2) Cannot have any attachment to cytoplasmic components<br>(3) Cannot have bound carbohydrate<br>(4) Usually has both hydrophobic and hydrophilic regions |
| 41. | When oxygen is released as a result of photosynthesis, it is a by product of which of the following :<br>(1) Splitting the water molecules<br>(2) Reducing NADP+<br>(3) Chemiosmosis<br>(4) None of these |
| 42. | Which one of the following is not used for *ex situ* plant conservation ?<br>(1) Seed bank (2) Shifting cultivation<br>(3) Botanical Gardens (4) Field gene banks |

| Question No. | Questions |
|---|---|
| 43. | The botanical name of Senna herbal plant is :<br>(1) *Cassia angustifolia* (2) *Cassia tora*<br>(3) *Solanum nigrum* (4) *Cappris aphylla* |
| 44. | Phytoremediation can clean up polluted soil by using<br>(1) Plants to take up and accumulate the pollutant so that it can be removed when the plant is harvested<br>(2) Anaerobic bacteria to degrade toxic compounds<br>(3) Plants covers up to prevent surface soil heating<br>(4) All of the above |
| 45. | Which of the following is an example of carbon-dioxide sequestration ?<br>(1) The reversal of global warming<br>(2) The injection of carbon dioxide into subsurface geologic reservoirs<br>(3) Smoke-stack emissions<br>(4) Emissions trading |
| 46. | Which one of the following areas in India, is a hotspot of biodiversity ?<br>(1) Sunderbans (2) Gangetic Plain<br>(3) Eastern Ghats (4) Western Ghats |
| 47. | The gap in Darwin's theory of evolution was his inability to ____<br>(1) Explain the basis of evolution<br>(2) Observe variation<br>(3) Observe large populations<br>(4) Explain migration |

| Question No. | Questions |
|---|---|
| 48. | An example of convergent evolution is<br>(1) Australian marsupials and placental mammals<br>(2) The flippers in fish, penguins, and dolphins<br>(3) The wings in birds, bats, and insects<br>(4) All of these |
| 49. | The functions of secondary plant metabolites is<br>(1) Make the plant susceptible to unfavourable conditions<br>(2) Provide defence mechanisms against microbial attack<br>(3) Help to increase the growth rate of plant<br>(4) Help in plant reproduction processes |
| 50. | Secondary immune response is generated due to<br>(1) Memory Cells<br>(2) NK Cells<br>(3) Naive T Cells<br>(4) Naive B Cells |
| 51. | Cdc mutants are useful in study of<br>(1) Replication (2) Recombination<br>(3) Cell cycle stages (4) Apoptopsis |
| 52. | In the cell cycle the level of cyclin protein abruptly falls during<br>(1) S phase (2) M phase (3) G1 phase (4) G2 phase |

| Question No. | Questions |
|---|---|
| 53. | Which of the following obeyed the Mendelian inheritance ?<br>(1) Transposons<br>(2) Quantitative traits<br>(3) Gene for vertical transfer of disease<br>(4) Transition |
| 54. | Which of the following chromosomal alterations would you expect to have the most drastic consequences ?<br>(1) Deletion (2) Duplication<br>(3) Translocation (4) Inversion |
| 55. | The X-ray diffraction studies conducted by ___ were key to the discovery of the structure of DNA<br>(1) Chargaff (2) Watson and Crick<br>(3) Franklin (4) McClintock |
| 56. | An individual with Down syndrome contains ____ chromosomes<br>(1) 1.45 (2) 22 (3) 24 (4) 47 |
| 57. | Which of the following statements about the digestion of proteins is correct<br>(1) Protein digestion begins in the stomach<br>(2) Protein digestion begins when the hydrochloric acid first hydrolyses the peptide bonds<br>(3) Protein digestion begins in the stomach<br>(4) Protein digestion begins when trypsinogen has been activated to trypsin by hydrochloric acid |

| Question No. | Questions |
|---|---|
| 58. | Which of the following statements about microtubules is correct ?<br>(1) Microtubules are polymers of β tubulin homodimers<br>(2) β tubulin has latent ATPase activity, which regulates microtubule stability<br>(3) Microtubules are stable structures in the cell<br>(4) Microtubules are hollow tubes consisting of 13 protofilaments |
| 59. | Which vitamin deficiency manifests itself as impaired wound healing, gastrointestinal bleeding, oral tissues ?<br>(1) Vitamin C (2) Vitamin D<br>(3) Vitamin A (4) Vitamin B |
| 60. | Which one of the following pairs of structures distinguishes a nerve cell from other types of cell ?<br>(1) Nucleus and Mitochondria<br>(2) Flagellum and medullary sheath<br>(3) Vacuoles and fibres<br>(4) Perikaryons and dendrites |
| 61. | Order the following events observed during muscle contraction<br>1. The sarcomere shortens 2. ATP is hydrolysed<br>3. $Ca^{+2}$ binds to troponin 4. ATP binds to myosin<br>5. Myosin contract F-actin 6. F-actin moves<br>7. Topomyosin moves 8. $Ca^{+2}$ is released from the sarcoplasmic reticulum<br>(1) 8-4-3-7-2-5-1-6 (2) 4-8-7-2-3-5-6-1<br>(3) 4-8-3-7-5-6-2-1 (4) 4-8-3-7-2-5-6-1 |

| Question No. | Questions |
|---|---|
| 62. | The most important difference between gap junctions between animal cells and plasmodesmata in plant is that in plasmodesmata<br>(1) Ionic coupling occurs<br>(2) Two adjacent plasma membranes are fused<br>(3) Metabolic cooperation occurs<br>(4) Pore diameter is 1 mm |
| 63. | Which of the following statement is false ?<br>(1) Dnase I hypersensitive sites are regions where the DNA free of nucleosomes<br>(2) When gene is active, promoter is generally free of nucleosomes<br>(3) H1 phosphorylation occurs mainly before mitosis<br>(4) DNA sequences called matrix or scaffold associated regions are generally GC rich |
| 64. | Diacylglycerol activate<br>(1) Protein kinase A (2) Protein kinase C<br>(3) MAP kinase (4) Tyrosin kinase |
| 65. | Rhodopsin is a transmembrane protein belonging to a large family of G protein coupled receptor. It is found in the disc of rod cells of human retina. Activation of rhodopsin is due to<br>(1) Phosphorylation of its extracellular tyrosin residues<br>(2) Binding of external ligand to its extracellular loop<br>(3) Photoisomerization of its prosthetic group<br>(4) Binding of calcium ion to its transmembrane aspartic groups |

| Question No. | Questions |
|---|---|
| 66. | In the Meselson and Stahl experiment, E. coli cells grown on heavy nitrogen were transferred to light nitrogen. What % of DNA can be expected to be constituted of light nitrogen after 3 generation of multiplication ?<br>(1) 25 (2) 50 (3) 70 (4) 100 |
| 67. | During DNA synthesis lagging strand is synthesized by<br>(1) DNA polymerase (2) Telomerase<br>(3) DNA polymerase (4) Helicase |
| 68. | Wild type of *E. coli* was plated on a Rifampicin medium and incubated at 37°C. Majority of cella died; however some colonies are appeared after a few days. What is the most likely explaination for this observation?<br>(1) Degradation of rifampicin<br>(2) Mutation in DNA pol III<br>(3) Efflux of rifampicin<br>(4) Mutation in the beta subunit of RNA polymerase |
| 69. | Alternative splicing<br>(a) Uses a completely different mechanism than constitutive splicing<br>(b) Allows generation of protein isoforms from a single gene<br>(c) Involve the use of different 3' and 5' sites<br>(d) It used to make different proteins in different tissues and at different developmental stages<br>(1) a and b (2) a and c (3) a and d (4) b, c and d |

| Question No. | Questions |
|---|---|
| 70. | Which of the following partial diploids will express β-galactosidase constitutively ?<br>(1) F' laco$^{c}$ lacz$^{+}$/laco$^{+}$ lacz$^{+}$ (2) F' lac I$^{-}$ lacz$^{+}$/laci$^{+}$ lacz$^{+}$<br>(3) F' lac I$^{+}$ lacz$^{+}$/laci$^{-}$ lacz$^{+}$ (4) F' lac O$^{c}$ lacz$^{-}$/laco$^{+}$ lacz$^{+}$ |
| 71. | In plasma membrane, carbohydrates present on the<br>(1) Both layers of lipid<br>(2) Only on cytoplasmic side of lipid bilayer<br>(3) Only on non-cytoplasmic side of lipid bilayer<br>(4) None |
| 72. | Which antibody is responsible for allergic reactions ?<br>(1) IgG (2) IgM<br>(3) IgE 4) IgD |
| 73. | A Contractile vacuole is an organelle that pumps excess water out of many freshwater protozoan cells. A freshwater protozoan was placed in solution A and observed to form contractile vacuoles at a rate of 11 per minute. The same protozoan was then placed in solution B and observed to form contractile vacuoles at a rate of 4 per minute. Based on this information, which of the following statements is correct ?<br>(1) Solution A is hyperosmotic to solution B<br>(2) Solutions A and B are isomotic<br>(3) Solution B is hyperosmotic to solution A<br>(4) Solutions A and B are iso-osmotic to the protozoan cell |

| Question No. | Questions |
|---|---|
| 74. | Which of the following is likely to be expressed ?<br>(1) Euchromatin without methylation<br>(2) Heterochromatin with methylation<br>(3) Euchromatin either methylated or not, equally expressed<br>(4) DNA with many methyl groups |
| 75. | What roles in regulating the intrinsic pathway of apoptosis are played by the Bcl-2 protein family members Bax and Bcl-2 ?<br>(1) Bax inhibits apoptosis while Bcl-2 stimulates apoptosis<br>(2) Bax stimulates apoptosis while Bcl-2 inhibits apoptosis<br>(3) Both Bax and Bcl-2 inhibit apoptosis<br>(4) Both Bax and Bcl-2 stimulates apoptosis |
| 76. | What is the term used for small molecules that bind to different regions of a binding site ?<br>(1) Epitopes (2) Epimers<br>(3) Isotopes (4) Isomers |
| 77. | In what way does the *ras* oncogene contribute to cancers ?<br>(1) *Ras* codes for an anti-apoptotic protein, which is produced in abnormally large amounts<br>(2) *Ras* codes for a gtpase switch protein, which in its mutated form cannot be switched off<br>(3) *Ras* codes for a transcription factor, which is produced in abnormally large amounts<br>(4) *Ras* codes for a truncated form of a growth factor receptor, which is continually active |

| Question No. | Questions |
|---|---|
| **78.** | What provides the energy for DNA polymerization?<br>(1) The hydrolysis of ATP (releasing $P_i$)<br>(2) The hydrolysis of GTP (releasing $P_i$)<br>(3) The hydrolysis of incoming nucleoside triphosphates (releasing $pp_i$)<br>(4) None of the above |
| **79.** | If the genome of the bacterium *E. coli* requires about 20 minutes to replicate itself, how can the genome of the fruit fly Drosophila be replicated in only 3 minutes ?<br>(1) The Drosophila genome is smaller than *E. coli* genome<br>(2) Eukaryotic DNA polymerase synthesizes DNA at a much faster rate than prokaryotic DNA polymerase<br>(3) Nuclear membrane keep the Drosophila DNA concentrated in one place in the cell, which increase the rate of polymerization<br>(4) Drosophila DNA contains more origins of replication than *E Coli* |
| **80.** | Telomeres serves as caps at the end of linear chromosomes. Which of the following is not true regarding the replication of telomeric sequences ?<br>(1) The lagging strand telomeres are not completely replicated by DNA polymerase<br>(2) Telomeres are made up of repeated sequences<br>(3) Additional repeated sequences are added to the template strand<br>(4) The leading strand doubles back on itself to form a primer for lagging strand |

| uestion No. | Questions |
|---|---|
| 81. | Somatic mutations of immunoglobin accounts for<br>(1) Allelic mutation<br>(2) Affinity maturation<br>(3) V (D) J recombination<br>(4) Class switching from igm to igg |
| 82. | Which of the following cytokine is released by both Th1 and Th2 type of cells<br>(1) IL-2 (2) IL-3 (3) IL-4 (4) IFN-γ |
| 83. | Junctional diversity mainly affects amino acids sequence in<br>(1) All CDR equally (2) CDR1<br>(3) CDR2 (4) CDR3 |
| 84. | Vagus nerve is<br>(1) Sensory nerve<br>(2) Sensory motor mix nerve<br>(3) Motor nerve<br>(4) Lumbar nerve |
| 85. | In Parkinson disease, there is a predominant loss of dopaminergic neurons primarily in<br>(1) Substantia nigra (2) Cerebellar corte<br>(3) Cerebral cortex (4) Locus cerulous |

| Question No. | Questions |
|---|---|
| 86. | Which of the following is not a function of gilia<br>(1) Providing support to neural tissue<br>(2) Conduction and processing of neural signal<br>(3) Myelination of neuron<br>(4) Help in neuronal growth |
| 87. | Which of the following amino acid is coded by maximum number of codons<br>(1) Leucine (2) Tryptophan<br>(3) Valine (4) Alanine |
| 88. | Two proteins have the same molecular mass as well as the same isoelectric point. The best way to separate them would be to use<br>(1) Reverse phase chromatography<br>(2) Gel filtration chromatography<br>(3) Ion-exchange chromatography<br>(4) Chromatofocusing |
| 89. | A set of two or more overlapping DNA fragments that form a contigous stretch of DNA is called<br>(1) Contigs (2) BAC clones<br>(3) YAC clones (4) Map |
| 90. | Sickle-cell anemia is an example of Single Nucleotide Polymorphism (SNP) of<br>(1) A to T mutation (2) T to A mutation<br>(3) G to C mutation (4) C to G mutation |

| Question No. | Questions |
|---|---|
| 91. | Which of the following techniques is the most suitable for detecting a metabolite labelled with $^{14}C$ ?<br>(1) Mass spectrometry<br>(2) Infra red spectroscopy<br>(3) Scintillation counting (detection of radioactivity)<br>(4) Nuclear magnetic resonance spectroscopy |
| 92. | Which of the following microscopy techniques relies on the specimen interfering with the wavelength of light to produce a high contrast image without the need for dyes or any damage to the sample ?<br>(1) Phase contrast microscopy<br>(2) Conventional bright field light microscopy<br>(3) Fluorescence microscopy<br>(4) Electron microscopy |
| 93. | Which of the following statements about the ECG are true ?<br>(1) The P-Q interval is normally about 0.1 s<br>(2) The P wave of the ECG reflects artrial contraction<br>(3) The peak amplitude of the R wave recorded by limb leads is about 10 mV<br>(4) All the above are true |
| 94. | Which one of the following is a primary protein database ?<br>(1) NCBI (2) SWISS-PROT<br>(3) EMBL (4) DDBJ |
| 95. | Gene duplication results in __<br>(1) Xenologs (2) Zoologs<br>(3) Paralogs (4) Orthologs |

| Question No. | Questions |
|---|---|
| **96.** | Introduction of DNA into cells by exposing to high voltage electric pulse is<br>(1) Electroporation (2) Electrofusion<br>(3) Electrolysis (4) Electrofission |
| **97.** | Which of the following drug was not isolated from natural source ?<br>(1) Artemisin (2) Isoniazid<br>(3) Quinine (4) Morphine |
| **98.** | Pollination is the process by which plants transfer male sex cells from one plant to another. How does the nucleus of the male cell reach the female cell ?<br>(1) It blows in the wind<br>(2) It travels on the legs of bees and sticks to the egg cell<br>(3) The pollen grain grows a pollen tube and the nucleus travels down the pollen tube to reach the egg cell<br>(4) None of the above |
| **99.** | The use of double haploid in plant breeding helps to :<br>(1) Develop somatic hybrid<br>(2) Introgressing transgenic traits<br>(3) Reduce generation time while introgressing dominant traits<br>(4) Reduce generation time while introgressing recessive traits |
| **100.** | Respiratory enzymes are located in :<br>(1) Mitochondrial matrix (2) Cristae<br>(3) Outer membrane (4) Perimitochondrial space |

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

**(Ph.D/URS–EE–2015)**

Sr. No. 10152 **Subject : LIFE SCIENCE** **Code D**

**Time : 1¼ Hours** **Max. Marks : 100** **Total Questions : 100**

Roll No. _____ (in figure) _____ (in words)

Name : _____ Father's Name : _____

Mother's Name _____ Date of Examination _____

(Signature of the candidate) (Signature of the Invigilator)

**CANDIDATES MUST READ THE FOLLOWING INFORMATION/ INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.**

1. All questions are compulsory and carry equal marks. The candidates are required to attempt all questions.
2. The candidates must return the Question book-let as well as OMR answer-sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / misbehaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such candidate will not be evaluated.
3. In case there is any discrepancy in any question(s) in the Question Booklet, the same may be brought to the notice of the Controller of Examinations in writing **within two hours** after the test is over. No such complaint(s) will be entertained thereafter.
4. The candidate **MUST NOT** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question book-let itself. Answers **MUST NOT** be ticked in the Question book-let.
5. **Use only Black or Blue BALL POINT PEN of good quality in the OMR Answer-Sheet.**
6. **There will be NEGATIVE marking. Each correct answer will be awarded one full mark and each incorrect answer will be negatively marked for which the candidate will get ¼ discredit. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.**
7. BEFORE ANSWERING THE QUESTIONS, THE CANDIDATES SHOULD ENSURE THAT THEY HAVE BEEN SUPPLIED CORRECT AND COMPLETE BOOK-LET. COMPLAINTS, IF ANY, REGARDING MISPRINTING ETC. WILL NOT BE ENTERTAINED 30 MINUTES AFTER STARTING OF THE EXAMINATION.

| Question No. | Questions |
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| 3. | In the urine of Burkitt's lymphoma patient abnormal quantities of the following is detected<br>(1) Bence-Jones Proteins<br>(2) Human Chorionic Gonadotrophin (hcg)<br>(3) Carcinoembryonic antigen (CEA)<br>(4) Alpha-fetoprotein (AFP) |
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| 6. | DNA has deoxy position of deoxyribose at<br>(1) 1st position (2) 2nd position<br>(3) 3rd position (4) 4th position |

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| 9. | Si RNA (s) interfere at<br>(1) DNA replication level (2) Transcription level<br>(3) Translational level (4) Post translational level |
| 10. | Highest capacity vector is<br>(1) M13 (2) YAC<br>(3) Cosmid (4) Lambda phage vector |
| 11. | Which of the following post translational modification of proteins does not occur in the lumen of the endoplasmic reticulum ?<br>(1) Glycosylation<br>(2) Formation of disulphide bond<br>(3) Folding and formation of quaternary structure<br>(4) Ubiquitination |
| 12. | Which of the following chemical mutagen is likely to cause GC → AT transition<br>(1) 5-bromouracil (2) 2-aminipurine<br>(3) Acridine orange (4) Hydroxylamine |

| Question No. | Questions |
|---|---|
| 13. | The oxidation of 1 mol of Glucose by anaerobic glycolysis yields a net of<br>(1) 2 mol of lactate, 2 mol of NADH and 2 mol of ATP<br>(2) 2 mol of lactate and 2 mol of ATP<br>(3) 2 mol of lactate, 2 mol of $NAD^+$ and 6 mol of ATP<br>(4) 2 mol of Acetyl co-A and 2 mol of ATP |
| 14. | A $C_3$ mustard plant was grown at 300 ppm of $CO_2$ in14 hr light/10 hr dark cycles, it was transferred to 1000 ppm $CO_2$, this will lead to (other environmental parameters remaining identical)<br>(1) Increase in photosynthetic rate<br>(2) Decrease in photosynthetic rate<br>(3) Increase in respiration rate<br>(4) No change |
| 15. | Which of the following is correct about nitrate reductase ?<br>(1) FAD, Mo and heme act as prosthetic groups<br>(2) Catalyzed the conversion of $NO_3^-$ to $NH_4^+$<br>(3) $FADH_2$ act as electron donor<br>(4) A plant growing naturally on calcareous soil |
| 16. | Which of the following plant hormone is icorrectly paired with its function?<br>(1) Auxin–responsible for apical dominance<br>(2) Abscisic acid–regulates the rate of transpiration<br>(3) Cytokinins–delays senescence<br>(4) Gibberellins–promotes bud and seed dormancy |

| Question No. | Questions |
|---|---|
| 17. | Which of the following organs are incorrectly paired with their respective organism<br>(1) Insects (grasshoppers)-Malpighian tubules<br>(2) Earthworms-Nephridia<br>(3) Freshwater Protista-Flame Cells<br>(4) Platyhelminthes (planaria)-Flame Cells |
| 18. | Which of the following statements relating to the menstrual cycle are correct ?<br>(a) The period before ovulation is called the follicular phase<br>(b) The luteal phase is associated with a large increase in progesterone secretion<br>(c) Ovulation gives rise to a surge in the secretion of luteinising hormone (LH)<br>(d) Ovulation marks the completion of one menstrual cycle<br>(e) The cervical mucus is at its most viscous around ovulation<br>(f) Typically the luteal phase lasts for around 2 days in the absence of pregnancy<br>(1) a and b only (2) a, c and d<br>(3) d and e (4) All the above |
| 19. | TCR recognition of peptide-MHC class II depends on<br>(1) Covlent binding<br>(2) The presence of beta$_2$ microglobulin<br>(3) CDR-mediated binding<br>(4) A minimum of 2 peptides occupying the binding groove of each MHC molecule |

| Question No. | Questions |
|---|---|
| 20. | Most isolated congenital anomalies exhibit<br>(1) Mendelian inheritance (2) Chromosomal inheritance<br>(3) Multifactorial inheritance (4) Maternal inheritance |
| 21. | In plasma membrane, carbohydrates present on the<br>(1) Both layers of lipid<br>(2) Only on cytoplasmic side of lipid bilayer<br>(3) Only on non-cytoplasmic side of lipid bilayer<br>(4) None |
| 22. | Which antibody is responsible for allergic reactions ?<br>(1) IgG (2) IgM<br>(3) IgE 4) IgD |
| 23. | A Contractile vacuole is an organelle that pumps excess water out of many freshwater protozoan cells. A freshwater protozoan was placed in solution A and observed to form contractile vacuoles at a rate of 11 per minute. The same protozoan was then placed in solution B and observed to form contractile vacuoles at a rate of 4 per minute. Based on this information, which of the following statements is correct ?<br>(1) Solution A is hyperosmotic to solution B<br>(2) Solutions A and B are isomotic<br>(3) Solution B is hyperosmotic to solution A<br>(4) Solutions A and B are iso-osmotic to the protozoan cell |
| 24. | Which of the following is likely to be expressed ?<br>(1) Euchromatin without methylation<br>(2) Heterochromatin with methylation<br>(3) Euchromatin either methylated or not, equally expressed<br>(4) DNA with many methyl groups |

| Question No. | Questions |
|---|---|
| 25. | What roles in regulating the intrinsic pathway of apoptosis are played by the Bcl-2 protein family members Bax and Bcl-2 ?<br>(1) Bax inhibits apoptosis while Bcl-2 stimulates apoptosis<br>(2) Bax stimulates apoptosis while Bcl-2 inhibits apoptosis<br>(3) Both Bax and Bcl-2 inhibit apoptosis<br>(4) Both Bax and Bcl-2 stimulates apoptosis |
| 26. | What is the term used for small molecules that bind to different regions of a binding site ?<br>(1) Epitopes (2) Epimers<br>(3) Isotopes (4) Isomers |
| 27. | In what way does the *ras* oncogene contribute to cancers ?<br>(1) *Ras* codes for an anti-apoptotic protein, which is produced in abnormally large amounts<br>(2) *Ras* codes for a gtpase switch protein, which in its mutated form cannot be switched off<br>(3) *Ras* codes for a transcription factor, which is produced in abnormally large amounts<br>(4) *Ras* codes for a truncated form of a growth factor receptor, which is continually active |
| 28. | What provides the energy for DNA polymerization?<br>(1) The hydrolysis of ATP (releasing $P_i$)<br>(2) The hydrolysis of GTP (releasing $P_i$)<br>(3) The hydrolysis of incoming nucleoside triphosphates (releasing $pp_i$)<br>(4) None of the above |

| Question No. | Questions |
|---|---|
| 29. | If the genome of the bacterium *E. coli* requires about 20 minutes to replicate itself, how can the genome of the fruit fly Drosophila be replicated in only 3 minutes ?<br>(1) The Drosophila genome is smaller than *E. coli* genome<br>(2) Eukaryotic DNA polymerase synthesizes DNA at a much faster rate than prokaryotic DNA polymerase<br>(3) Nuclear membrane keep the Drosophila DNA concentrated in one place in the cell, which increase the rate of polymerization<br>(4) Drosophila DNA contains more origins of replication than *E Coli* |
| 30. | Telomeres serves as caps at the end of linear chromosomes. Which of the following is not true regarding the replication of telomeric sequences ?<br>(1) The lagging strand telomeres are not completely replicated by DNA polymerase<br>(2) Telomeres are made up of repeated sequences<br>(3) Additional repeated sequences are added to the template strand<br>(4) The leading strand doubles back on itself to form a primer for lagging strand |
| 31. | Which of the following techniques is the most suitable for detecting a metabolite labelled with $^{14}C$ ?<br>(1) Mass spectrometry<br>(2) Infra red spectroscopy<br>(3) Scintillation counting (detection of radioactivity)<br>(4) Nuclear magnetic resonance spectroscopy |

| Question No. | Questions |
|---|---|
| 32. | Which of the following microscopy techniques relies on the specimen interfering with the wavelength of light to produce a high contrast image without the need for dyes or any damage to the sample ?<br>(1) Phase contrast microscopy<br>(2) Conventional bright field light microscopy<br>(3) Fluorescence microscopy<br>(4) Electron microscopy |
| 33. | Which of the following statements about the ECG are true ?<br>(1) The P-Q interval is normally about 0.1 s<br>(2) The P wave of the ECG reflects artrial contraction<br>(3) The peak amplitude of the R wave recorded by limb leads is about 10 mV<br>(4) All the above are true |
| 34. | Which one of the following is a primary protein database ?<br>(1) NCBI (2) SWISS-PROT<br>(3) EMBL (4) DDBJ |
| 35. | Gene duplication results in __<br>(1) Xenologs (2) Zoologs<br>(3) Paralogs (4) Orthologs |
| 36. | Introduction of DNA into cells by exposing to high voltage electric pulse is<br>(1) Electroporation (2) Electrofusion<br>(3) Electrolysis (4) Electrofission |

| Question No. | Questions |
|---|---|
| 37. | Which of the following drug was not isolated from natural source ?<br>(1) Artemisin (2) Isoniazid<br>(3) Quinine (4) Morphine |
| 38. | Pollination is the process by which plants transfer male sex cells from one plant to another. How does the nucleus of the male cell reach the female cell ?<br>(1) It blows in the wind<br>(2) It travels on the legs of bees and sticks to the egg cell<br>(3) The pollen grain grows a pollen tube and the nucleus travels down the pollen tube to reach the egg cell<br>(4) None of the above |
| 39. | The use of double haploid in plant breeding helps to :<br>(1) Develop somatic hybrid<br>(2) Introgressing transgenic traits<br>(3) Reduce generation time while introgressing dominant traits<br>(4) Reduce generation time while introgressing recessive traits |
| 40. | Respiratory enzymes are located in :<br>(1) Mitochondrial matrix (2) Cristae<br>(3) Outer membrane (4) Perimitochondrial space |
| 41. | The fluid that fills the posterior chamber of the eye is<br>(1) Choroid humor (2) Vitreous humor<br>(3) Aqueous humor (4) Lacrimal fluid |

| Question No. | Questions |
|---|---|
| 42. | Creatinine the waste product closely regulated by the brain and kidneys is the end product of the metabolism of ____<br>(1) Anaerobic (2) Ammonia<br>(3) Muscle (4) Nucleotide |
| 43. | Diabetes insipidus is caused by a lack of _____<br>(1) ADH hormone (2) FSH hormone<br>(3) TSH hormone (4) Insulin |
| 44. | Which technique is used to locate the specific genes in chromosomes ?<br>(1) Western blotting (2) Northern blotting<br>(3) In situ hybridisation (4) Colony hybridisation |
| 45. | PCR is used in<br>(1) Site specific translocation<br>(2) Site directed mutagenesis<br>(3) Site specific recombination<br>(4) All of the above |
| 46. | The variation in the restriction fragment length between individuals of a species is called<br>(1) RAPD (2) AFLP (3) RFLP (4) SSR |
| 47. | Which of the following is an example of a neutral mutation ?<br>(1) A codon that normally codes for valine is mutated. The mutated codon now codes for isoleucine<br>(2) A codon that normally codes for valine is mutated. The mutated codon still codes for valine<br>(3) A codon that normally codes for valine is disrupted when an extra base is inserted into the codon<br>(4) A codon that normally codes for valine is mutated. The mutated codon is now a "stop" codon |

| Question No. | Questions |
|---|---|
| 48. | In the lytic cycle the bacterial cell is ruptured by the action of<br>(1) Bacterial enzyme (2) Polymerase<br>(3) Transposon enzyme (4) Lysozyme |
| 49. | Which of the following statements about Nuclear Magnetic Resonance (NMR) is correct ?<br>(1) NMR is used to determine the amino acid sequence of proteins<br>(2) A disadvantage of NMR analysis is that it requires a large amount of protein<br>(3) The majority of known protein structures have been determined using NMR<br>(4) NMR requires crystallisation of proteins |
| 50. | Which correlation is the strongest ?<br>(1) +.10 (2) –.95 (3) +.90 (4) –1.00 |
| 51. | Somatic mutations of immunoglobin accounts for<br>(1) Allelic mutation<br>(2) Affinity maturation<br>(3) V (D) J recombination<br>(4) Class switching from igm to igg |
| 52. | Which of the following cytokine is released by both Th1 and Th2 type of cells<br>(1) IL-2 (2) IL-3 (3) IL-4 (4) IFN-γ |
| 53. | Junctional diversity mainly affects amino acids sequence in<br>(1) All CDR equally (2) CDR1<br>(3) CDR2 (4) CDR3 |

| Question No. | Questions |
|---|---|
| 54. | Vagus nerve is<br>(1) Sensory nerve<br>(2) Sensory motor mix nerve<br>(3) Motor nerve<br>(4) Lumbar nerve |
| 55. | In Parkinson disease, there is a predominant loss of dopaminergic neurons primarily in<br>(1) Substantia nigra (2) Cerebellar corte<br>(3) Cerebral cortex (4) Locus cerulous |
| 56. | Which of the following is not a function of gilia<br>(1) Providing support to neural tissue<br>(2) Conduction and processing of neural signal<br>(3) Myelination of neuron<br>(4) Help in neuronal growth |
| 57. | Which of the following amino acid is coded by maximum number of codons<br>(1) Leucine (2) Tryptophan<br>(3) Valine (4) Alanine |
| 58. | Two proteins have the same molecular mass as well as the same isoelectric point. The best way to separate them would be to use<br>(1) Reverse phase chromatography<br>(2) Gel filtration chromatography<br>(3) Ion-exchange chromatography<br>(4) Chromatofocusing |

| Question No. | Questions |
|---|---|
| **59.** | A set of two or more overlapping DNA fragments that form a contigous stretch of DNA is called<br>(1) Contigs (2) BAC clones<br>(3) YAC clones (4) Map |
| **60.** | Sickle-cell anemia is an example of Single Nucleotide Polymorphism (SNP) of<br>(1) A to T mutation (2) T to A mutation<br>(3) G to C mutation (4) C to G mutation |
| **61.** | High solubility of amino acid in water is due to<br>(1) Presence of side chain<br>(2) Dipolar ion structure<br>(3) Unipolarity<br>(4) Hydrophilic nature of amino acid |
| **62.** | DNA polymerase contains a Glutamate residue that is important for binding to DNA Mutations was found that converted this glutamate residue to either lysine, glycine, valine or arginine. Which mutations would be predicted to be the most and least harmful to the ability of the enzyme to bind DNA ?<br>Most Least<br>(1) Glycine Arginine<br>(2) Arginine Glycine<br>(3) Lysine Valine<br>(4) Lysine Aspartic acid |

| Question No. | Questions |
|---|---|
| 63. | Choose the correct statement<br>(a) Phenylisothyocynate - hydrolysis of peptide bonds on the carboxyl side of amino acid residue<br>(b) Dansyl chloride - identification of amino terminal residue of a peptide<br>(c) Chymotrypsin - hydrolysis of peptide bonds on the carboxyl side of aromatic residue<br>(d) CnBr - cleavage of peptide bonds on the carboxyl side of methionines<br>(1) Both a and d statements are correct<br>(2) b, c and d are correct<br>(3) Only b and c are correct<br>(4) All the above |
| 64. | Initiation codon for protein synthesis in eukaryotes is<br>(1) AUG (2) AAA (3) GCA (4) CCG |
| 65. | Melting temperature of DNA, Tm of a DNA duplex is defined as the temperature at which half the molecules have dissociated in to single strand. Tm will be maximal at<br>(1) Low ionic strength and high DNA concentration<br>(2) High ionic strength and high DNA concentration<br>(3) High ionic strength and low DNA concentration<br>(4) Low ionic strength and low DNA concentration |
| 66. | Which of the following enzyme transfers a phosphate group from ATP to another molecule ?<br>(1) Phosphatase (2) Phosphodiesterase<br>(3) Kinase (4) Esterase |

| Question No. | Questions |
|---|---|
| 67. | Correct equation for reduction of $NADP^+$ is<br>(1) $NADP^+ + 2H^+ \rightarrow NADPH^+ + H^+$<br>(2) $NADP^+ + H^+ + e^- \rightarrow NADPH$<br>(3) $NADP^+ + H^+ + 2e^- \rightarrow NADPH$<br>(4) $NADP^+ + 2H^+ + 2e^- \rightarrow NADPH_2$ |
| 68. | Which of the following statements is not true for fatty acids found in most mammalian cells ?<br>(1) They usually contain 12-20 carbons<br>(2) Polyunsaturated fatty acids contain conjugated double bonds<br>(3) All double bond are in *cis* configuration<br>(4) Free fatty acids are ionized at physiological pH |
| 69. | You have homogenized plant tissue and would like to separate chloroplasts from nuclei. Which of the following methods would be most suitable ?<br>(1) Polyacrylamide gel electrophoresis<br>(2) Differential centrifugation using sucrose gradient<br>(3) Equilibrium density gradient centrifugation on cscl gradient<br>(4) Gel filteration |
| 70. | A protein which spans the lipid bilayer<br>(1) Cannot diffuse in the plane of the membrane<br>(2) Cannot have any attachment to cytoplasmic components<br>(3) Cannot have bound carbohydrate<br>(4) Usually has both hydrophobic and hydrophilic regions |

| Question No. | Questions |
|---|---|
| 71. | When oxygen is released as a result of photosynthesis, it is a by product of which of the following :<br>(1) Splitting the water molecules<br>(2) Reducing NADP+<br>(3) Chemiosmosis<br>(4) None of these |
| 72. | Which one of the following is not used for *ex situ* plant conservation ?<br>(1) Seed bank (2) Shifting cultivation<br>(3) Botanical Gardens (4) Field gene banks |
| 73. | The botanical name of Senna herbal plant is :<br>(1) *Cassia angustifolia* (2) *Cassia tora*<br>(3) *Solanum nigrum* (4) *Cappris aphylla* |
| 74. | Phytoremediation can clean up polluted soil by using<br>(1) Plants to take up and accumulate the pollutant so that it can be removed when the plant is harvested<br>(2) Anaerobic bacteria to degrade toxic compounds<br>(3) Plants covers up to prevent surface soil heating<br>(4) All of the above |
| 75. | Which of the following is an example of carbon-dioxide sequestration ?<br>(1) The reversal of global warming<br>(2) The injection of carbon dioxide into subsurface geologic reservoirs<br>(3) Smoke-stack emissions<br>(4) Emissions trading |

| Question No. | Questions |
|---|---|
| 76. | Which one of the following areas in India, is a hotspot of biodiversity ?<br>(1) Sunderbans (2) Gangetic Plain<br>(3) Eastern Ghats (4) Western Ghats |
| 77. | The gap in Darwin's theory of evolution was his inability to ____<br>(1) Explain the basis of evolution<br>(2) Observe variation<br>(3) Observe large populations<br>(4) Explain migration |
| 78. | An example of convergent evolution is<br>(1) Australian marsupials and placental mammals<br>(2) The flippers in fish, penguins, and dolphins<br>(3) The wings in birds, bats, and insects<br>(4) All of these |
| 79. | The functions of secondary plant metabolites is<br>(1) Make the plant susceptible to unfavourable conditions<br>(2) Provide defence mechanisms against microbial attack<br>(3) Help to increase the growth rate of plant<br>(4) Help in plant reproduction processes |
| 80. | Secondary immune response is generated due to<br>(1) Memory Cells<br>(2) NK Cells<br>(3) Naive T Cells<br>(4) Naive B Cells |

| Question No. | Questions |
|---|---|
| **81.** | Order the following events observed during muscle contraction<br>1. The sarcomere shortens 2. ATP is hydrolysed<br>3. $Ca^{+2}$ binds to troponin 4. ATP binds to myosin<br>5. Myosin contract F-actin 6. F-actin moves<br>7. Topomyosin moves 8. $Ca^{+2}$ is released from the sarcoplasmic reticulum<br>(1) 8-4-3-7-2-5-1-6 (2) 4-8-7-2-3-5-6-1<br>(3) 4-8-3-7-5-6-2-1 (4) 4-8-3-7-2-5-6-1 |
| **82.** | The most important difference between gap junctions between animal cells and plasmodesmata in plant is that in plasmodesmata<br>(1) Ionic coupling occurs<br>(2) Two adjacent plasma membranes are fused<br>(3) Metabolic cooperation occurs<br>(4) Pore diameter is 1 mm |
| **83.** | Which of the following statement is false ?<br>(1) Dnase I hypersensitive sites are regions where the DNA free of nucleosomes<br>(2) When gene is active, promoter is generally free of nucleosomes<br>(3) H1 phosphorylation occurs mainly before mitosis<br>(4) DNA sequences called matrix or scaffold associated regions are generally GC rich |

| Question No. | Questions |
|---|---|
| 84. | Diacylglycerol activate<br>(1) Protein kinase A (2) Protein kinase C<br>(3) MAP kinase (4) Tyrosin kinase |
| 85. | Rhodopsin is a transmembrane protein belonging to a large family of G protein coupled receptor. It is found in the disc of rod cells of human retina. Activation of rhodopsin is due to<br>(1) Phosphorylation of its extracellular tyrosin residues<br>(2) Binding of external ligand to its extracellular loop<br>(3) Photoisomerization of its prosthetic group<br>(4) Binding of calcium ion to its transmembrane aspartic groups |
| 86. | In the Meselson and Stahl experiment, E. coli cells grown on heavy nitrogen were transferred to light nitrogen. What % of DNA can be expected to be constituted of light nitrogen after 3 generation of multiplication ?<br>(1) 25 (2) 50 (3) 70 (4) 100 |
| 87. | During DNA synthesis lagging strand is synthesized by<br>(1) DNA polymerase (2) Telomerase<br>(3) DNA polymerase (4) Helicase |
| 88. | Wild type of *E. coli* was plated on a Rifampicin medium and incubated at 37°C. Majority of cella died; however some colonies are appeared after a few days. What is the most likely explaination for this observation?<br>(1) Degradation of rifampicin<br>(2) Mutation in DNA pol III<br>(3) Efflux of rifampicin<br>(4) Mutation in the beta subunit of RNA polymerase |

| Question No. | Questions |
|---|---|
| 89. | Alternative splicing<br>(a) Uses a completely different mechanism than constitutive splicing<br>(b) Allows generation of protein isoforms from a single gene<br>(c) Involve the use of different 3' and 5' sites<br>(d) It used to make different proteins in different tissues and at different developmental stages<br>(1) a and b (2) a and c (3) a and d (4) b, c and d |
| 90. | Which of the following partial diploids will express β-galactosidase constitutively ?<br>(1) F' $laco^c$ $lacz^+$/$laco^+$ $lacz^+$ (2) F' lac $I^-$ $lacz^+$/$laci^+$ $lacz^+$<br>(3) F' lac $I^+$ $lacz^+$/$laci^-$ $lacz^+$ (4) F' lac $O^c$ $lacz^-$/$laco^+$ $lacz^+$ |
| 91. | Cdc mutants are useful in study of<br>(1) Replication (2) Recombination<br>(3) Cell cycle stages (4) Apoptopsis |
| 92. | In the cell cycle the level of cyclin protein abruptly falls during<br>(1) S phase (2) M phase (3) G1 phase (4) G2 phase |
| 93. | Which of the following obeyed the Mendelian inheritance ?<br>(1) Transposons<br>(2) Quantitative traits<br>(3) Gene for vertical transfer of disease<br>(4) Transition |

| Question No. | Questions |
|---|---|
| **94.** | Which of the following chromosomal alterations would you expect to have the most drastic consequences ?<br>(1) Deletion (2) Duplication<br>(3) Translocation (4) Inversion |
| **95.** | The X-ray diffraction studies conducted by ___ were key to the discovery of the structure of DNA<br>(1) Chargaff (2) Watson and Crick<br>(3) Franklin (4) McClintock |
| **96.** | An individual with Down syndrome contains ____ chromosomes<br>(1) 1.45 (2) 22 (3) 24 (4) 47 |
| **97.** | Which of the following statements about the digestion of proteins is correct<br>(1) Protein digestion begins in the stomach<br>(2) Protein digestion begins when the hydrochloric acid first hydrolyses the peptide bonds<br>(3) Protein digestion begins in the stomach<br>(4) Protein digestion begins when trypsinogen has been activated to trypsin by hydrochloric acid |
| **98.** | Which of the following statements about microtubules is correct ?<br>(1) Microtubules are polymers of β tubulin homodimers<br>(2) β tubulin has latent ATPase activity, which regulates microtubule stability<br>(3) Microtubules are stable structures in the cell<br>(4) Microtubules are hollow tubes consisting of 13 protofilaments |

| Question No. | Questions |
|---|---|
| **99.** | Which vitamin deficiency manifests itself as impaired wound healing, gastrointestinal bleeding, oral tissues ?<br>(1) Vitamin C (2) Vitamin D<br>(3) Vitamin A (4) Vitamin B |
| **100.** | Which one of the following pairs of structures distinguishes a nerve cell from other types of cell ?<br>(1) Nucleus and Mitochondria<br>(2) Flagellum and medullary sheath<br>(3) Vacuoles and fibres<br>(4) Perikaryons and dendrites |

PHD/URS-EE-15/ Life Sciences Set No. I

## ANSWER – KEY

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|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 2 | 4 | 2 | 1 | 2 | 3 | 3 | 2 | 2 | 4 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 3 | 3 | 3 | 1 | 3 | 1 | 2 | 3 | 4 | 4 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 4 | 2 | 4 | 2 | 3 | 3 | 3 | 4 | 4 | 1 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 4 | 4 | 3 | 2 | 1 | 4 | 3 | 1 | 3 | 1 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 3 | 2 | 4 | 2 | 1 | 2 | 1 | 1 | 1 | 1 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 2 | 3 | 1 | 3 | 1 | 2 | 3 | 1 | 4 | 2 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 3 | 2 | 3 | 1 | 3 | 4 | 1 | 4 | 1 | 4 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 2 | 3 | 1 | 3 | 2 | 3 | 2 | 4 | 2 | 4 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 3 | 1 | 1 | 2 | 3 | 1 | 2 | 3 | 4 | 2 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |
| 1 | 2 | 1 | 1 | 2 | 4 | 1 | 4 | 2 | 1 |