

## Life Sciences Paper II

**Time Allowed : 75 Minutes]**

**[Maximum Marks : 100**

**Note :** This Paper contains **Fifty (50)** multiple choice questions, each question carrying **Two (2)** marks. Attempt *All* questions.

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| <p>1. Dosage compensation in <i>Drosophila</i> and mammals differs by :</p> <p>(A) Hyperactivation of single X in <i>Drosophila</i> males and inactivation of X in female mammals</p> <p>(B) Equalisation of transcription in female <i>Drosophila</i> and hyperactivation of transcription in female mammals</p> <p>(C) Inactivation of X in <i>Drosophila</i> females and hyperactivation of X in mammalian female</p> <p>(D) Equalisation of autosomal transcription in <i>Drosophila</i> and reduced expression of one X in mammals</p> | <p>2. During homologous recombination mediated by RecBCD enzyme in <i>E.coli</i> at chi site :</p> <p>(A) Rec BCD proteins bind to DNA to initiate recombination</p> <p>(B) Enzyme produces double stranded breaks in DNA</p> <p>(C) Helicase activity of enzyme starts unwinding DNA</p> <p>(D) Branch migration is terminated</p> <p>3. What is a Pseudogene ?</p> <p>(A) A gene that is only expressed at certain developmental stage</p> <p>(B) A non-functional gene</p> <p>(C) A gene that contains a mutation but is still functional</p> <p>(D) A sequence of DNA that is slowly evolving to become an active gene</p> |
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[P.T.O.]

4. How are proteins able to bind to DNA at specific sequences ?
- (A) By interacting with sugar-phosphate backbone
  - (B) By opening up double helix and forming bonds with the bases
  - (C) By interacting with bases through histone proteins
  - (D) By interacting with bases in the major and minor grooves of double helix
5. Black rats of identical genotypes on mating produced offsprings consisting of 45 black, 15 cream coloured and 15 albino. Which of the following gene interactions may account for these results ?
- (A) Dominant epistasis
  - (B) Recessive epistasis
  - (C) Incomplete dominance and penetrance
  - (D) Complementary gene interactions
6. People suffering from Cockayne syndrome have defective :
- (A) Double strand break repair system
  - (B) Transcription coupled repair system
  - (C) Nucleotide excision repair system
  - (D) Mismatch repair system
7. Virulence of *Corynebacterium diphtheriae* is due to :
- (A) Phage conversion
  - (B) Transformation
  - (C) Transduction
  - (D) Mutation
8. The yeast two hybrid system is designed to identify :
- (A) All components of multiprotein complex
  - (B) Proteins required for binding RNA polymerase
  - (C) Two proteins that directly interact with one another
  - (D) Two proteins involved in consecutive step of a metabolic pathway
9. Diuron inhibits photosynthesis by binding to :
- (A) PS II
  - (B) PS I
  - (C) ATPase
  - (D) Cyt  $b_6f$
10. Which of the following properties of water makes it a universal solvent ?
- (A) Hydrophobic bonds formed between water and fatty acids
  - (B) Strong covalent bonds formed between water and salts
  - (C) High dielectric constant of water
  - (D) Hydrogen bonds formed between water and biochemical molecules

11. Animal system is not able to synthesize ethanol in their body because they lack one of the following enzymes :
- (A) Alcohol dehydrogenase
  - (B) Pyruvate decarboxylase
  - (C) Pyruvate carboxylase
  - (D) Oxidase
12. Which of the following is *true* for uncompetitive inhibitor of enzyme ?
- (A) It decreases the affinity of the substrate for enzyme
  - (B) It increases the affinity of the substrate for enzyme
  - (C) It does not affect the affinity of substrate for enzyme
  - (D) It changes velocity but not  $V_{\max}$  of enzyme catalyzed reaction
13. Which of the following statements is *false* for  $\alpha$ -helix of proteins ?
- (A) Number of amino acids per helical turn is 3.6
  - (B) Size of the helix is  $5.4 \text{ \AA}$
  - (C) Right handed helices are commonly found in proteins
  - (D) Left handed helices are commonly found in proteins
14. Which of the following statements regarding lipids is *false* ?
- (A) Lipids can serve as energy source for cells
  - (B) All cell membranes contain lipids
  - (C) All lipids can form bilayer membranes
  - (D) Lipids can function as hormones
15. Feedback inhibition differs from repression because feedback inhibition :
- (A) is less precise
  - (B) stops synthesis of new enzymes
  - (C) stops the action of pre-existing enzymes
  - (D) is slow acting
16. Which of the following is the first product of the CAM pathway ?
- (A) Oxaloacetate
  - (B) 3-phosphoglycerate
  - (C) Malate
  - (D) Pyruvate

17. Fraction of the population dying in each generation because of deleterious mutation at a locus is known as :
- (A) Risk population
  - (B) Mutational load
  - (C) Genetic load
  - (D) Lethal linkage group
18. Characteristics that have arisen as a result of common evolutionary descent are said to be :
- (A) Analogous
  - (B) Parsimonious
  - (C) Morphotypes
  - (D) Homologous
19. Categories of species vulnerable to extinction include all of the following except those that :
- (A) have high genetic variability
  - (B) are hunted by poachers or harvested by people
  - (C) have declining population size
  - (D) are local endemic species
20. A classical example of ortho-evolutionary process is evolution of :
- (A) Man
  - (B) Horse
  - (C) Fish
  - (D) Amphibia
21. Which of the following events could lead to the evolution of new gene that contains exons from two or more other genes ?
- (A) Domain duplication
  - (B) Domain shuffling
  - (C) Gene conversion
  - (D) Gene duplication
22. Mitochondrial DNA can be used to trace parental lineage because it is :
- (A) Paternally transmitted, recombines at low rate
  - (B) Maternally transmitted does not recombine
  - (C) Maternally transmitted, recombines at low rate
  - (D) Biparental transmission, does not recombine
23. A given population with 0.03% frequency of phenylketonuria can be said to be :
- (A) in Hardy-Weinberg equilibrium
  - (B) under selection and migration
  - (C) maintaining balance between mutation and selection
  - (D) not in Hardy-Weinberg equilibrium

24. If genetic code is tetraplet, then what is the possible number of codons which would code for 20 amino acids ?
- (A) 32  
(B) 64  
(C) 256  
(D) 512
25. Lysosomes have a very low pH. This is achieved by :
- (A) Proton pumps that transfer protons down the concentration gradient  
(B) Release of energy by proton pumps  
(C) Proton pumps against the concentration gradient  
(D) Synthesizing acidic components
26. The first step of "proof-reading" during protein synthesis is carried out by :
- (A) Ribosomes  
(B) Initiation factors  
(C) Elongation factors  
(D) Aminoacyl *t*-RNA synthetase
27. Which of the following is the *correct* sequence for T-cell differentiation in thymus ?
- (A) Double negative, Single positive, Double positive  
(B) Double positive, Double negative, Single positive  
(C) Double negative, Double positive, Single positive  
(D) Double positive, Single negative, Double negative
28. If mouse IgG1 is injected as an antigen in mice, it would generate :
- (A) Anti-isotypic antibodies  
(B) Anti-allotypic antibodies  
(C) Anti-idiotypic antibodies  
(D) No antibodies
29. The human immunodeficiency virus interacts with one of the following to gain entry into the cells of the immune system :
- (A) CD-4  
(B) CD-19  
(C) CD-8  
(D) CD-25

30. Nuclear matrix is :
- (A) A complex of histone proteins and DNA that provides structural network throughout the nucleus
  - (B) A mixture of DNA, RNA and proteins that make up nucleus
  - (C) Network of microtubules that provide structural foundation to nucleus
  - (D) A complex network of protein and RNA fibrils that make up nuclear substructure
31. Which of the following is TRUE for secondary messenger molecules ?
- (A) They are hormones that initiate signaling pathway
  - (B) They are receptors that bind to hormones and activate a pathway
  - (C) They are internal molecules that transduce a signal inside the cell
  - (D) They are transcriptional activators that function at the end of a pathway
32. Carmine dye is obtained from :
- (A) Cochined insects
  - (B) Lac insects
  - (C) Aphids
  - (D) Bumble bees
33. The primary causative agents of acid rain are :
- (A) Sulphur dioxides and lead dioxides
  - (B) Sulphur dioxides and nitrogen dioxides
  - (C) Nitrogen dioxides and lead dioxides
  - (D) Sulphur dioxides and carbon dioxides
34. Natural products from one of the following is used as nutraceuticals, pharmaceutical and cosmaceutical :
- (A) *Aloe vera*
  - (B) *Curcuma longa*
  - (C) *Stevia rebaudiana*
  - (D) *Morinda citrifolia*
35. Protection of its occupancy area encapsulates other species defines the :
- (A) Flagship species
  - (B) Umbrella species
  - (C) Key-stone species
  - (D) Exotic species
36. An assemblage of populations of plants, animals, bacteria and fungi that live in an area and interact with each other defines :
- (A) Biological community
  - (B) Ecosystem
  - (C) Population
  - (D) Biome

37. In India, air quality is monitored using levels of :
- (A) SPM, RPM, CO<sub>2</sub> and NO<sub>2</sub>
  - (B) SPM, RPM, SO<sub>2</sub> and NO<sub>2</sub>
  - (C) RPM, CO<sub>2</sub>, SO<sub>2</sub> and NO<sub>2</sub>
  - (D) SPM, CO<sub>2</sub>, SO<sub>2</sub> and NO<sub>2</sub>
38. DNA fingerprinting makes use of the following :
- (A) Retroposon rearrangements in an organism
  - (B) Differences in gene families
  - (C) Polymorphism in splicing pattern
  - (D) Sequence heterogeneity and polymorphism
39. Which one of the following would need conservation on higher priority ?
- (A) Species which flowers rarely and has specific pollinator
  - (B) Species which flowers normally and is wind pollinated
  - (C) Species which flowers rarely and has non-specific pollinator
  - (D) Species which reproduces vegetatively
40. Species represented by a group of populations throughout distribution range is called :
- (A) Taxonomic species
  - (B) Biological species
  - (C) Synthetic species
  - (D) Polyphyletic species
41. A species is designated as “vulnerable” when :
- (A) It is not critically endangered but is facing a high risk of extinction in the wild in the near future
  - (B) It is not critically endangered but is facing a high risk of extinction in the wild in the immediate future
  - (C) It is critically endangered already
  - (D) 50% population got extinct in the last 10 years
42. Metagenomics refers to :
- (A) Genomics of metabolic pathways
  - (B) Genomics of metallothionine gene
  - (C) Genomic sequencing of pool of DNA fragments
  - (D) Genomes of bacteria associated with metal bioremediation
43. Alpha, beta and gamma diversity refer to :
- (A) Genetic diversity
  - (B) Landscape diversity
  - (C) Species diversity
  - (D) Population diversity

44. Which of the following processes *does not* generate ATP/GTP ?
- (A) Oxidative phosphorylation
  - (B) TCA cycle
  - (C) Glycolysis
  - (D) Calvin's cycle
45. By which of the following mechanisms does an enzyme increase the rate of a reaction ?
- (A) It provides energy to start the reaction
  - (B) It increases the rate of collision between molecules
  - (C) It lowers the activation energy of the reaction
  - (D) It changes the equilibrium point of the reaction
46. The most selective antimicrobial activity would be exhibited by a drug that :
- (A) Inhibits cell wall synthesis
  - (B) Inhibits protein synthesis
  - (C) Injures plasma membrane
  - (D) Inhibits nucleic acid synthesis
47. Osmotolerant yeasts are able to grow at high salt concentrations because their cytoplasm contains high concentration of :
- (A) Divalent cations
  - (B) Lipids
  - (C) Amino acids
  - (D) Polyalcohols
48. In a seed, which of the following represents sporophytic tissue ?
- (A) Testa
  - (B) Cotyledon
  - (C) Endosperm
  - (D) Hypocotyle
49. The type of nitrogenous excretory product, in animals, primarily depends on :
- (A) The quantum of protein availability to the animals
  - (B) The quantum of food availability to the animals
  - (C) Starvation
  - (D) The quantum of water availability to the animals
50. Development of gametophyte from sporophyte without formation of spores is called :
- (A) Homospory
  - (B) Apospory
  - (C) Oospory
  - (D) Haplospory



**AUG - 34211/II**

**ROUGH WORK**

AUG - 34211/11

**ROUGH WORK**