



Previous Year Question Paper
of

SET MH (MAHARASHTRA)

LIFE SCIENCES

Question Paper – II

State Eligibility Test

2021, September

(Original Question Paper with Answer Key)

State Eligibility Test



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**Maharashtra SET Life Sciences Exam Paper II
September 2021**

- 1. Sodium Dodecyl Sulphate (SDS) is used while separating proteins by polyacrylamide gel electrophoresis because:**
 - (A) It helps in solubilization of proteins making it easier to separate
 - (B) It binds to proteins and confers a uniform negative charge density thereby making them move during electrophoresis
 - (C) Decreases surface tension of the buffer used for electrophoresis
 - (D) Stabilizes the protein
- 2. Cytochalasin D inhibits the formation of microfilaments. Which of the following biological activities will not be hindered?**
 - (A) Muscle contraction
 - (B) Cytosolic transport of vesicles
 - (C) Amoeboid movement of phagocytic cells
 - (D) Formation of cleavage furrow following telophase of mitosis
- 3. Which of the following statements for 'Genetic drift' is FALSE ?**
 - (A) Genetic drift can cause allele frequencies to change at random
 - (B) Genetic drift can lead to richness of genetic variation within populations
 - (C) Genetic drift can cause harmful alleles to become fixed
 - (D) Genetic drift affects allele frequencies stronger in small populations
- 4. According to Oparin, which of the following was not present in the primitive atmosphere of the earth?**
 - (A) methane
 - (B) hydrogen
 - (C) water
 - (D) oxygen
- 5. Life is said to have originated as coacervates that were formed by:**
 - (A) DNA
 - (B) Radiations
 - (C) Polymerization and aggregation
 - (D) Heat
- 6. When a taxon is restricted to a particular geographical region, then it is called:**
 - (A) Endemic
 - (B) Low risk
 - (C) Threatened
 - (D) Critically endangered
- 7. Severe combined immunodeficiency (SCID) mice do not have:**
 - (A) B & T cells
 - (B) Eosinophils
 - (C) Basophils
 - (D) Neutrophils
- 8. The lichen Roccella is source of:**
 - (A) Condiment
 - (B) Dye
 - (C) Antibiotic
 - (D) Therapeutic compounds

9. **Seasonal activity of cambium leads to:**
(A) Ring porous wood
(B) Both ring porous and diffuse porous wood
(C) diffuse porous wood
(D) Heteroporous wood
10. **Cytoplasmic male sterility occurs as a result of interaction of:**
(A) Nucleus and plastid
(B) Mitochondria and plastid
(C) Nucleus and Golgi
(D) Nucleus and mitochondria
11. **The enzyme acetyl CoA carboxylase belongs to which class of enzyme?**
(A) Transferases
(B) Hydrolases
(C) Lyses
(D) Ligases
12. **According to Vavilov, mango, nobel canes, rice and brinjal are some of the crop plants originate in:**
(A) Hindustan centre
(B) Abyssinian centre
(C) Asia minor centre
(D) China centre
13. **Which of the following technique is best for determining the precise location of the radioactive isotopelocated in a specimen?**
(A) Ultracentrifugation
(B) Atomic force microscope
(C) Autoradiography
(D) Fluorescence microscope
14. **In bacterial glucose phospho-transferase system, glucose is converted to glucose 6-phosphate.What is thesource of phosphate?**
(A) ATP
(B) Inorganic phosphate
(C) Phosphoenol pyruvate
(D) Creatine phosphate
15. **The end product of adenosine mono- phosphate (AMP) and guanosine monophosphate (GMP) catabolism innormal humans is:**
(A) Urea
(B) Creatinine
(C) Xanthine
(D) Uric acid
16. **Which of the following bonds in proteins have a partial double bond character ?**
(A) $C\alpha - C$
(B) $C\alpha - C\beta$
(C) $C\alpha - N$
(D) $C - N$
17. **When bacteria growing at 20°C are transferred to 40°C, they are most likely to synthesize membrane lipids with more:**
(A) Short chain saturated fatty acids
(B) Long chain saturated fatty acids
(C) Short chain unsaturated fatty acids

(D) Long chain unsaturated fatty acids

18. The type of microscopy we would use to examine bacteria that are stained by gram staining procedure is:

- (A) Bright field microscope
- (B) Fluorescence microscopy
- (C) Dark field microscopy
- (D) Transmission electron microscopy

19. Mesenteries are found in:

- (A) Diploblastic animals
- (B) Triploblastic animals
- (C) Friploblastic animals
- (D) Pseudocoelomates

20. In a DNA sequence, if nucleotide A is replaced by nucleotide G, the resulting mutation will be mutation.

- (A) Transversion
- (B) Frameshift
- (C) Missense
- (D) Transition

21. Which one of the following is correct for $Na - K$ ATP ase ?

- (A) Na^+ and K^+ bind on the extracellular side, while ATP and ouabain bind on the intracellular side
- (B) Na^+ and K^+ bind on the intracellular side, while ATP and ouabain bind on the extracellular side
- (C) K^+ and ATP bind on the intracellular side, while Na^+ and ouabain bind on the extracellular side
- (D) Na^+ and ATP bind on the intracellular side, while K^+ and ouabain bind on the extracellular side

22. The sequencing of..... helped investigators conclude that all living things can be classified into three domains

- (A) DNA
- (B) Cytochrome C
- (C) *rRNA*
- (D) Haemoglobin

23. Mark the correct statement:

- (A) In active transport molecules move from higher to lower concentration
- (B) Carrier protein is involved in both active transport and facilitated diffusion
- (C) Energy is consumed to move molecules against concentration gradient in active transport only
- (D) In active transport, only water molecules are transported with consuming energy

24. Hybrid zone is a region where:

- (A) Hybrids can develop
- (B) Genetically distinct populations meet and interbreed to some extent
- (C) Genetically similar populations meet but cannot interbreed
- (D) Populations of the same geographic region meet and exchange genes

25. The sedimentation coefficient increases with:

- (A) Increase in solvent density
- (B) Increase in friction
- (C) Decrease in mass of the particle
- (D) Decrease in partial specific volume

26. Peptide antigens assemble with class I MHC, aided by:

- (A) Chaperone molecules
- (B) Immunoglobulins
- (C) T cell receptor

(D) Cytokines

27. Type II glycogen storage disease i.e. Pompe disease is a genetic disorder in which the defective enzyme is :

- (A) $\alpha - 1, 4 \rightarrow \alpha - 1, 6$ branching enzyme
- (B) $\alpha - 1, 6$ Glucosidase
- (C) $\alpha - 1, 4$ Glucosidase
- (D) Phosphorylase Kinase

28. Which one of the following is an example of an autoimmune disease?

- (A) Parkinson's
- (B) Alzheimer's
- (C) Spasticity
- (D) Myasthenia Gravis

29. Which of the following statements about LEAFY (LFY), a regulatory gene in Arabidopsis thaliana is correct?

- (A) LFY is involved in floral meristem identity
- (B) LFY is involved in leaf expansion
- (C) LFY is involved in root meristem identity
- (D) LFY is involved in shoot differentiation

30. Binomial nomenclature include name of the plant in two words that designate

- (A) Family and generic name
- (B) Generic name and species name
- (C) Generic name and specific epithet
- (D) Species name and varietal epithet

31. The causal organism for rice blast disease is

- (A) Xanthomonas oryzae
- (B) Magnaporthe grisea
- (C) Rhizoctonia solani
- (D) Helminthosporium oryzae

32. The centre of origin of Potato is:

- (A) India
- (B) Brazil
- (C) Australia
- (D) Peru

33. Helicobacter pylori uses urease to counteract a chemical defense in the human organ in which it lives. This chemical defense is:

- (A) Lysozyme
- (B) Hydrochloric acid
- (C) Superoxide radicals
- (D) Sebum

34. Which of the following pair of sugars is of non-reducing nature?

- (A) Glucose and galactose
- (B) Sucrose and trehalose
- (C) Trehalose and glucose
- (D) Sucrose and heptulose

35. The enzyme involved in the following reaction is

Amino acid + ATP + tRNA \rightleftharpoons aminoacyl RNA + AMP + PPI

- (A) Aminoacyl tRNA transferase
- (B) Aminoacyl tRNA synthetase
- (C) Peptidyl transferase

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(D) RNA polymerase

36. The resting membrane potential is determined by:

- (A) The K^+ gradient
- (B) The Na^+ gradient
- (C) The Ca^{2+} gradient
- (D) The Cl^- gradient

37. When a robin eats an earthworm, the following happens?

- (A) Detrital food webs contribute energy to grazing food webs
- (B) Grazing food webs can contribute energy to detrital food webs
- (C) Transition of energy from primary producers to primary consumers occurs
- (D) Transition of energy from primary consumers to secondary consumers takes place

38. Which of the following is known as the sedimentary cycle because its reservoir is sedimentary rock?

- (A) Carbon cycle
- (B) Hydrological cycle
- (C) Nitrogen cycle
- (D) Phosphorus cycle

39. Which of the following proteins binds to calcium during excitation contraction coupling?

- (A) Tropomyosin
- (B) Actin
- (C) Myosin
- (D) Troponin

40. Both the substrates A and B must be present at the enzyme active site simultaneously is a characteristic feature of

- (A) All be substrate reactions
- (B) Double displacement reactions
- (C) Single displacement reactions
- (D) Both (B) and (C)

41. Number of nuclear pores depend on the

- (A) Surface volume of nuclear membrane
- (B) Transcription activity of the cell
- (C) DNA content of the cell
- (D) Size of the nucleus

42. How many different linear tripeptides can be made from three different $L - \alpha$ neutral amino acids, using each amino acid only once in the chain?

- (A) 3
- (B) 6
- (C) 12
- (D) 27

43. The characteristics of organisms involved in symbiotic relationships have developed

- (A) by chance
- (B) Through co-evolution
- (C) by character displacement
- (D) Through resource partitioning

44. M-STrIPES is associated with one of the following:

- (A) Captive breeding of wild fauna
- (B) Indigenous satellite navigation system
- (C) Security of national highways
- (D) Maintenance of tigers

45. Which of the following is not a method of enzyme immobilization?
- (A) Entrapment
 - (B) Adsorption
 - (C) Absorption
 - (D) Cross-linking
46. As part of the circadian clock, transfer of phosphate groups from adenosine triphosphate (ATP) to PER is required. This is achieved by one of the following:
- (A) Caesin kinase 1
 - (B) Caesin kinase 2
 - (C) Tyrosine kinase 1
 - (D) Tyrosine kinase 2
47. In lake succession, the stages are observed in the following order :
- (A) Oligotrophic-Mesotrophic Eutrophic
 - (B) Oligotrophic-Eutrophic-Mesotrophic
 - (C) Mesotrophic-Oligotrophic-Eutrophic
 - (D) Eutrophic-Mesotrophic-Oligotrophic
48. The carrying capacity of a population is determined by its :
- (A) Gross primary production
 - (B) Net energy
 - (C) Net production
 - (D) Gross usage
49. Chlorophyll-*b* is distinguished from chlorophyll-*a* by having a Group in place of a group.
- (A) Acetyl, formyl
 - (B) Methyl, formyl
 - (C) Formyl, methyl
 - (D) Formyl, acetone
50. The proteins that are sorted to mitochondrial matrix arein nature.
- (A) hydrophobic
 - (B) hydrophilic
 - (C) amphipathic
 - (D) amphoteric
51. Normal RBCs are:
- (A) Biconcave in humans and in frogs
 - (B) Nucleated in camels and enucleated in humans
 - (C) Biconcave in camels and in frogs
 - (D) Enucleated in humans and in camels
52. Which one of the following pairs execute their functions by binding with cytoplasmic receptors ?
- (A) Estrogen and noradrenaline
 - (B) Growth hormone and progesterone
 - (C) Growth hormone and GABA
 - (D) Estrogen and progesterone
53. Artificial ripening of banana can be induced by :
- (A) Auxin
 - (B) Cytokinin
 - (C) Ethylene
 - (D) Polyamines

54. Diplospory and parthenogenesis leads to development of :

- (A) Haploid embryo
- (B) Diploid embryo
- (C) Viviparous embryo
- (D) Adventive embryo

55. Which one of the following is a true combination for Kala-azar disease?

- (A) Sand fly and Leishmania
- (B) Glossina fly and Trypanosoma
- (C) Mosquito and Plasmodium
- (D) Mosquito and Micro-filarial Worm

56. Match the following and choose the correct combination :

- | | |
|----------------|-----------------|
| (a) Sulphur | (1) Chlorophyll |
| (b) Zinc | (2) Nitrogenase |
| (c) Magnesium | (3) Methionine |
| (d) Molybdenum | (4) Auxin |
- (A) $a - 1, b - 2, c - 3, d - 4$
 - (B) $a - 3, b - 4, c - 1, d - 2$
 - (C) $a - 3, b - 1, c - 2, d - 4$
 - (D) $a - 2, c - 4, c - 1, d - 3$

57. are the simplest transposable element that contain inverted repeat sequences at each end and a gene

encoding transposase.

- (A) Composite transposon
- (B) Insertion element
- (C) Virus
- (D) Prion

58. The common feature of the following bacteriophages $\phi \times 174$, OB, N4 and P1 is :

- (A) Single stranded DNA genome
- (B) RNA genome
- (C) Circular genome
- (D) All infect E. coli

59. Protein synthesis in eukaryotes is inhibited by :

- (A) Chloramphenicol
- (B) Streptomycin
- (C) Cephalosporin C
- (D) Cycloheximide

60. With reference to plants, gynogenesis refers to :

- (A) Initiation of gynoecium
- (B) Development of gynoecium
- (C) Development of haploid plants from the egg cell of unfertilized female gametophyte in vitro
- (D) Development of an ovary

61. A linear DNA is 100% labelled at one end and has 3 restriction sites for EcoRI. If it is digested by EcoRI so that possible fragments are produced, how many of these fragments will be labelled and how many non-labelled ?

- (A) 4 labelled and 6 unlabelled
- (B) 6 labelled and 4 unlabelled
- (C) 3 labelled and 5 unlabelled
- (D) 3 labelled and 3 unlabelled

- 62. Inclusive fitness is a measure of:**
(A) The selective advantage of group fitness
(B) The reproductive fitness of an organism and its relatives
(C) The selective advantage of assortative selection
(D) The selective advantage of stabilizing selections
- 63. NMR is a very important technique for determination of biopolymer structure. NMR experiments are not limited to the study of protons only. Which of the following represents a correct group of isotopes used to obtain resonance signals?**
(A) ^1H , ^{12}C , ^{15}N , ^{19}F (B) ^1H , ^{13}C , ^{14}N , ^{19}F (C) ^1H , ^{12}C , ^{14}N , ^{19}F (D) ^1H , ^{13}C , ^{15}N , ^{19}F
- 64. Cryopreservation is a process of :**
(A) ex situ in vitro conservation
(B) ex situ ex vitro conservation
(C) in situ in vitro conservation
(D) in situ ex vitro conservation
- 65. Which of the following does not need an insect vector for transmission ?**
(A) *Rickettsia prowazekii*
(B) *Rickettsia rickettsi*
(C) *Ehrlichia chaffeensis*
(D) *Coxiella burnetii*
- 66. Hepadnaviruses (e.g. Hepatitis B virus) differ from other DNA viruses as their genome replication involves :**
(A) DNA-dependent DNA polymerase
(B) Reverse transcriptase
(C) RNase H
(D) RNA-dependent RNA polymerase
- 67. In fermentor, the top portion left without broth is called :**
(A) Shaft
(B) Headspace
(C) Impeller
(D) Sparger
- 68. Which of the following organisms get energy only by fermentative metabolism ?**
(A) *Lactobacillus bulgaricus*
(B) *Bacillus subtilis*
(C) *E. coli*
(D) *Pseudomonas putida*
- 69. In the fertilised egg, cortical granule reaction required for slow block polyspermy, is initiated by :**
(A) Na^+
(B) Mg^{2+}
(C) K^+
(D) Ca^{2+}
- 70. When the velocity of enzyme activity is plotted against substrate concentration, which of the following is obtained ?**
(A) Hyperbolic curve
(B) Parabola
(C) Straight line with positive slope

(D) Straight line with negative slope

- 71. Anticancer drug, cyclophosphamide, is metabolised in the body by glutathionation reaction. What is the type of this reaction?**
(A) Reduction
(B) Glucuronidation
(C) Conjugation
(D) Oxidation
- 72. In non-competitive inhibition,**
(A) Inhibitor binds to the active site of enzyme
(B) Inhibitor binds at a site other than active site and may bind to either E or ES complex
(C) Inhibitor binds to a site other than active site and binds only to the ES complex
(D) Inhibitor binds at a site other than active site and binds only to E
- 73. Mangrove swamps are found along**
(A) Tropical and subtropical coast-lines
(B) Rocky coastlines
(C) Temperate coastlines
(D) Arctic coastlines
- 74. Indicate the ionic species that predominates at pH 4, 8 and 11 for ammonia :**
(A) NH_4^+ at pH 4, NH_4^+ at pH 8 and NH_3 at pH 11
(B) NH_4^+ at pH 4, NH_3 at pH 8 and NH_4^+ at pH 11
(C) NH_3 at pH 4, NH_4^+ at pH 8 and NH_4^+ at pH 11
(D) NH_3 at pH 4, NH_4^+ at pH 8 and NH_3 at pH 11
- 75. Which of the following transcription factor act as positioning factor for RNA polymerase II and binds to the promoter?**
(A) TF II B
(B) TF II C
(C) TF II D
(D) TF II E
- 76. Ti plasmid used in genetic engineering is obtained from:**
(A) *Bacillus thuringensis*
(B) *Agrobacterium schizogenes*
(C) *Thermus aquaticus*
(D) *Agrobacterium tumefaciens*
- 77. Which enzyme of the following is used as a marker for lysosomal fraction?**
(A) Pyruvate dehydrogenase
(B) Phospholipase
(C) Acid phosphatase
(D) Succinate dehydrogenase
- 78. The formation of Z ring in bacteria is important for :**
(A) Septum formation
(B) Formation of pill
(C) Helpful in attachment
(D) Useful in movement
- 79. Which of the following is NOT true of Spermatogenesis?**
(A) Four gametes are formed per meiosis
(B) Sex chromosomes are excluded from recombination and transcription during the first meiotic prophase
(C) Meiosis occurs continuously in mitotically dividing stem cells
(D) Differentiation of the gamete occurs; while in diploid, during first meiotic prophase

80. A population of cells grown in adherent culture contains 0.4 mg protein per 10^6 cells. Actin comprises 4.5% of the total protein. Given the Mr of actin is 42000 daltons and Avogadro number is 6.02×10^{23} which of the following equals the mean number of actin molecules per cell?
- (A) 2.58×10^{14} actin molecules
 - (B) 2.58×10^{14} actin molecules
 - (C) 2.58×10^8 actin molecules
 - (D) 2.58×10^{10} actin molecules
81. Which of the following is a natural dye obtained from plant ?
- (A) Acid fuchsin
 - (B) Haematoxylin
 - (C) Carmine
 - (D) Aniline blue
82. The groups which are evolved from more than one ancestor are known as:
- (A) Monophyletic
 - (B) Paraphyletic
 - (C) Polyphyletic
 - (D) Heterophyletic
83. Which of the following is an example of a symmetrical animal?
- (A) Hydra
 - (B) Frog
 - (C) Sponges
 - (D) Sea Anemone
84. Which of the following chemical mutagens are incorporated into the genome by the DNA polymerase during genome replication?
- (A) Alkylating agents
 - (B) Base analogues
 - (C) Deaminating agents
 - (D) Intercalating agents
85. Progesterone:
- (A) Is synthesized in the hypothalamic neurons and stored in the posterior pituitary
 - (B) Plays a major role in preparing the uterus for implantation
 - (C) Is a protein hormone and solely responsible for the maintenance of secondary sex characteristics
 - (D) Is exclusively responsible for stimulation of FSH production and follicle growth
86. When somatic cells of ovule directly form embryos, the phenomenon is called as
- (A) Adventive embryony
 - (B) Diplospory
 - (C) Apospory
 - (D) Parthenogenesis
87. Globin synthesis in the absence of heme in RBC is regulated by the phosphorylation of this factor:
- (A) EF1
 - (B) eIF2
 - (C) EFG
 - (D) eIF3
88. In anaerobic glycolysis, 2 moles of inorganic phosphate are used per mole of glucose consumed. Which of the following enzymes catalyzes the uptake of inorganic phosphate?
- (A) Hexokinase
 - (B) Phosphofructokinase
 - (C) Glyceraldehyde 3-phosphate dehydrogenase
 - (D) Pyruvate kinase

89. When oxygen reacts with rubisco enzyme the following products will be formed?
(A) 3-phosphoglycerate and 2-phosphoglycolate
(B) Two molecules of 3-phosphoglycerate
(C) Two molecules of 2-phosphoglycolate
(D) Glyceraldehyde 3-phosphate and 2-phosphoglycolate
90. Which one of the following is a functional excretory unit of cephalochordata?
(A) Nephridia
(B) Flame cell
(C) Solanocytes
(D) Nephron
91. Weismann proposed the theory of:
(A) Continuity of germplasm
(B) Continuity of protoplasm
(C) Continuity of plasma cells
(D) Continuity of cytoplasms
92. RAPD marker is:
(A) Recessive
(B) Co-dominant
(C) Dominant
(D) Partially dominant
93. Which of the following chromosomal aberration results in formation of dicentric and acentric chromosomes?
(A) Paracentric inversion
(B) Pericentric inversion
(C) Reciprocal translocation
(D) Deletion
94. In a hypothetical diploid animal species, there is a locus with two alleles A and B. If A and B are co-dominant, then how many different phenotypes are possible in this species?
(A) 1
(B) 2
(C) 3
(D) 4
95. If a woman having blood group A with |A|O genotype married a man having a blood group with |B|B genotype, the expected proportion of heterozygotes among their children is:
(A) 25%
(B) 50%
(C) 75%
(D) 100%
96. Type of migration where marine fishes migrate to freshwater for their reproduction is:
(A) Anadromus
(B) Catadromus
(C) Oceanodromus
(D) Potamodromus
97. The propeller twist in B-form of DNA is approximately:
(A) 30°
(B) -30°
(C) 36°
(D) -36°

98. The protein binding site in DNA can be identified by the following experiment:

- (A) DNA footprinting
- (B) Mobility shift assay
- (C) Western blotting
- (D) DNA fingerprinting

99. Noble laureate Barbara McClintock observed frequent breakage of maize chromosome 9 due to which of the following transposons?

- (A) IS (Insertion elements)
- (B) AC-Ds (Activator-Dissociator elements)
- (C) Mu (Mutator)
- (D) Spm/En (Suppressor-Mutator/enhancer)

100. Red green colour blindness is an example of genetic disorder.

- (A) X-linked recessive
- (B) X-linked dominant
- (C) Y-linked recessive
- (D) Y-linked dominant

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