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SET 2016

PAPER – III

LIFE SCIENCES

Signature of the Invigilator | Question Booklet No. ...034968.....

1. | OMR Sheet No.. .....

Subject Code 03 | **ROLL No.** | | | | | | | |

Time Allowed : 150 Minutes | **Max. Marks : 150**

No. of pages in this Booklet : **12** | No. of Questions : **75**

INSTRUCTIONS FOR CANDIDATES

1. Write your Roll No. and the OMR Sheet No. in the spaces provided on top of this page.
2. Fill in the necessary information in the spaces provided on the OMR response sheet.
3. This booklet consists of seventy five (75) compulsory questions each carrying 2 marks.
4. Examine the question booklet carefully and tally the number of pages/questions in the booklet with the information printed above. **Do not accept a damaged or open booklet**. Damaged or faulty booklet may be got replaced within the first **5** minutes. Afterwards, neither the Question Booklet will be replaced nor any extra time given.
5. Each Question has four alternative responses marked (A), (B), (C) and (D) in the OMR sheet. You have to completely darken the circle indicating the most appropriate response against each item as in the illustration.



6. All entries in the OMR response sheet are to be recorded in the original copy only.
7. Use only Blue/Black Ball point pen.
8. Rough Work is to be done on the blank pages provided at the end of this booklet.
9. If you write your Name, Roll Number, Phone Number or put any mark on any part of the OMR Sheet, except in the spaces allotted for the relevant entries, which may disclose your identity, or use abusive language or employ any other unfair means, you will render yourself liable to disqualification.
10. You have to return the Original OMR Sheet to the invigilators at the end of the examination compulsorily and must not carry it with you outside the Examination Hall. **You are, however, allowed to carry the test booklet and the duplicate copy of OMR Sheet** on conclusion of examination.
11. Use of any calculator, mobile phone or log table etc. is strictly prohibited.
12. **There is no negative marking.**

03-16

SEAL

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1. Which one of the cellular organelle is the most sensitive indicator of cellular injury ?
(A) Peroxisomes (B) Mitochondria
(C) Lysosomes (D) Ribosomes

2. Maintenance of cellular osmotic equilibrium occurs by :
(A) Active transport of ions
(B) Electrochemical diffusion of ions
(C) Leakage of certain ions
(D) Passive ion flux

3. Separation of homologous kinetochores and sister kinetochores occurs, respectively at :
(A) Anaphase I and anaphase II
(B) Anaphase I and metaphase II
(C) Metaphase I and anaphase II
(D) Metaphase I and metaphase II

4. Which cell type does not belong to "generally not divide" category ?
(A) Skeletal muscle cells
(B) Lymphocytes
(C) Erythrocytes
(D) Nerve cells

5. Histones have high content of amino acids such as :
(A) Arginine and lysine
(B) Tryptophan and leucine
(C) Glutamine and asparagine
(D) Argnine and histidine

6. Fatty acids are not alternate source for energy for :
(A) CNS (B) Liver
(C) PNS (D) Muscle

7. How the blood flow is prevented from flowing backward into the atria ?
(A) The pressure exerted by the ventricles on the blood within their cavities causes the atrioventricular node valves to shut
(B) The pressure exerted by the arteries on the blood within their cavities causes the sinoatrial node valves to shut
(C) The pressure exerted by the ventricles on the blood within their cavities causes the sinoatrial node valves to shut
(D) The pressure exerted by the arteries on the blood within their cavities causes the atrioventricular node valves to shut

8. Ovulation in mammals is triggered mainly by :
(A) Preovulatory LH surge
(B) Preovulatory FSH surge
(C) Preovulatory GnRH surge
(D) Preovulatory GnIH surge

9. Which one of the protein hormones has membrane, cytosolic and nuclear receptors ?
(A) Luteotropin (B) Thyroxine
(C) Insulin (D) Corticoliberin

10. Hibernating mammals are :
(A) Homeotherms and endothermic
(B) Heterotherms and endothermic
(C) Heterotherms and ectothermic
(D) Homeotherms and ectothermic

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11. Which step you consider most important to prove the immunoreactive signal is specific when performing immunohistochemistry ?
(A) Preadsorb the primary antibody with the primary antigen before use to compare with specific antibody reaction
(B) Preadsorb the primary antibody with the secondary antigen before use to compare with specific antibody reaction
(C) Preadsorb the secondary antibody with the secondary antigen before use to compare with specific antibody reaction
(D) Preadsorb the secondary antibody with the primary antigen before use to compare with specific antibody reaction

12. Two tests most commonly used when checking for a disease which elicits immune response :
(A) qPCR and in situ PCR
(B) Western blot and ELISA
(C) Northern and Southern blot
(D) Dot blot and Flowcytometry

13. "Organisms adapting themselves best to their environment will survive" was quoted by :
(A) Kenneth R. Miller
(B) Jean-Baptiste Lamarck
(C) Charles Darwin
(D) Alfred Russel Wallace

14. Which one of the following is not related to spontaneous mutations ?
(A) Recombination (B) Replication
(C) Transposons (D) Tautomerism

15. What approximate resolution can be attained with a lower power (10x, N.A. 0.25) objective lens ?
(A) 0.5 microns (B) 0.25 microns
(C) 0.9 microns (D) 0.3 microns

16. Which one of the following is not related to gross change in genome sequence ?
(A) Recombination
(B) Non-homologous end joining
(C) Transposons
(D) Tautomerism

17. Which one of the following is an integral component of mitotic apparatus ?
(A) Asters and spindle fibers
(B) Centrioles
(C) Microfilaments and microtubules
(D) Kinetochore

18. Alterations in routing of lysosomal enzymes occur after the treatment of cultured cells, with :
(A) Colchicine (B) Cytochalasin-B
(C) Cyclohexamide (D) Tunicamycin

19. Förster resonance energy transfer-based biosensors cannot be used for visualizing :
(A) Free radicals (B) cGMP
(C) cAMP (D) Ca^{2+}

20. Addition of cytochalasin-B to cultured mammalian cells that have just begun mitosis results in :
(A) The cells will arrest at mitotic metaphase
(B) The cells will cease metabolism and die
(C) The cells will complete mitosis and arrest at cytokinesis
(D) The cells will arrest at mitotic anaphase

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21. Which one of the following statements is most correct about the differential Gram stain ?
(A) Crystal violet differentially stains Gram positive cells
(B) Gram's iodine differentially stains Gram positive cells
(C) Acetone differentially destains Gram negative cells
(D) Saffron red differentially stains Gram negative cells

22. Which one of the following genes in relation to sex determination/differentiation is most conserved in several organisms ?
(A) dmrt1 (B) sry
(C) vasa (D) sox9

23. Which one of the following hormones does not have lactogenic activity ?
(A) Luteotropin
(B) Somatomammotropin
(C) Somatotropin
(D) Gonadotropin

24. Which one of the following hormones plays a crucial role in the luteal phase of human ovary ?
(A) Progesterone (B) Estradiol
(C) FSH (D) hCG

25. Conversion of ammonia to urea is by :
(A) Ornithine cycle (B) Citric acid cycle
(C) Arginine cycle (D) Fumaric cycle

26. In ureocotelic animals urea is removed by :
(A) Ornithine cycle (B) Citric acid cycle
(C) Arginine cycle (D) Cori cycle

27. Which one of the following statements is false about the stress response ?
(A) The physiological response differs from person to person
(B) Psychological responses to stressors can be positive or negative
(C) The physiological reaction to a stressor happens quickly
(D) Physiological changes prepare the body to face the stressor

28. Which cell organelle is well known for mixed model of biogenesis ?
(A) Lysosomes (B) Peroxisomes
(C) Mitochondria (D) Golgi complex

29. Which cell organelle shows high degree of pleomorphism ?
(A) Lysosomes (B) Peroxisomes
(C) Mitochondria (D) Chloroplast

30. Which one of the following is not a characteristic feature of endorphins ?
(A) Activation of endorphin receptors by endogenous endorphins causes dependence
(B) Endorphins trigger a "positive feeling" in the body like that of morphine
(C) Endorphins act as analgesics that mean they diminish the perception of pain
(D) The neuron receptors endorphins bind to are the same correlates that bind some medicines for pain

31. The innermost tissue layer of arteries is composed of :
(A) Endothelium (B) Purkinje fibres
(C) Connective tissue (D) Smooth muscle

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32. During heavy exercise, which of the following should happen ?

(A) Vasodilation of blood vessels in skin

(B) Vasoconstriction of blood vessels in skin

(C) Decreased heart rate

(D) Decreased stroke volume

33. At a large Institution, the probability that a student taking biostatistics and bioinformatics in the same winter semester is 0.0125. The probability that student taking bioinformatics is 0.125. What is the probability of a student taking biostatistics, given that he or she is taking bioinformatics ?

(A) 0.1125 (B) 0.1

(C) 0.00125 (D) 0.1375

34. To compare the average amount of time that teachers and students spend commuting to reach university, a researcher collects samples of 50 teachers and 60 students. The teachers spend average of 4.6 hours a week commuting, with standard deviation 2.9 hours. The mean and standard deviation for the sample of students is 5.2 hours and 1.3 hours, respectively. The standard error of the difference of sample means is

(A) 0.443

(B) 2.314

(C) 0.196

(D) Cannot be compared as sample sizes are different

35. Soon after parturition in higher primates, which one of the following hormone is responsible for initiation of "milk let down reflex" ?

(A) hCG (B) Progesterone

(C) Prolactin (D) Oxytocin

36. Which hormone is considered as a "mitogenic" ?

(A) Progesterone (B) Cortisol

(C) Estradiol (D) Testosterone

37. Kidney stones can be caused by any of the following except :

(A) Calcium (B) Sodium

(C) Potassium (D) Oxalate

38. Which one of the following systems is important for regulating arterial pressure, blood volume and systemic vascular resistance ?

(A) Thymus-thymosin-lymphatic system

(B) Renin-angiotensin-aldosterone system

(C) Insulin-glucagon-glucose system

(D) Hypothalamo-hypohyseal-adrenal cortex system

39. Which one of the following is considered important for pancreatic secretion ?

(A) Pancreatic secretion is inhibited by gastrin secreted by the G cells of the antrum

(B) Pancreatic acinar cells contain trypsin

(C) Acidity in the duodenum stimulates pancreatic secretion

(D) Cholecystokinin inhibits secretion from the exocrine pancreas

40. Which of the following plants is used as a model system in vitro for studies on organogenesis ?

(A) *Daucus carota* L.

(B) *Gossypium hirsutum* L.

(C) *Nicotiana tabacum* L.

(D) *Ricinus communis* L.

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41. Male gametophyte of angiosperms is shed as :
(A) four celled pollen grain
(B) three celled pollen grain
(C) microspore mother cell
(D) anther

42. Various factors controlling *in vitro* somatic embryogenesis include all *except* :
(A) Genotype (B) Auxins
(C) Explant (D) Pollen

43. A diploid female plant and a tetraploid male plant are crossed. The endosperm shall be :
(A) tetraploid (B) triploid
(C) diploid (D) pentaploid

44. A phenotypically normal couple has had one normal child and a child with cystic fibrosis, an autosomal recessive disease. The incidence of cystic fibrosis in the population from which this couple came is 1/1000. If their normal child eventually marries a phenotypically normal person from the same population, what is the risk that the newlyweds will produce a child with cystic fibrosis ?
(A) 0.01 (B) 0.02
(C) 0.04 (D) 0.06

45. Molecular phylogenies in eukaryotes are constructed based on the nucleotide sequence analysis of the gene encoding :
(A) 5S rRNA (B) 16S rRNA
(C) 23S rRNA (D) 18S rRNA

46. In a genetic study, 80 people were found to have alleles for polydactyly. Only 36 of them were polydactylous. What is the extent of penetrance percentage ?
(A) 45 (B) 36
(C) 80 (D) 28

47. The herbicide glyphosate targets the enzyme :
(A) Acetolactate synthetase
(B) 5-enolpyruvyl shikimate-3-phosphate
(C) Nitrilase
(D) Dehalogenase

48. The wood of which one of the following trees is used for making musical instruments :
(A) Acacia catechu
(B) Dalbergia latifolia
(C) Quercus floribundas
(D) Artocarpus integrifolia

49. Identify the type of reactions during the conversion of pyruvate to acetyl CoA :
(A) Oxidation and reduction
(B) Dehydrogenation and decarboxylation
(C) Oxidation and dehydrogenation
(D) Reduction and decarboxylation

50. Chemoautotrophs can survive on _____ alone.
(A) Minerals (B) CO_2
(C) Minerals and CO_2 (D) Methane

51. Consider a spherical eukaryotic cell that is 20 μm in diameter and a virus that is a cube with sides of 200Å. The maximum number of virus particles that could adhere to the surface of the cell would be :
(A) 3×10^{16} (B) 3×10^{9}
(C) 3×10^{6} (D) 3×10^{3}

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52. You are studying two traits in mice: coat colour (black or white) and tail (long or short). In a cross of a black, long tailed mouse, heterozygous for both traits, with a white short tailed mouse, you find only parental types: black, long tailed progeny and white tail-less progeny in equal numbers. What is the likely explanation ?

(A) Black is dominant over white

(B) Coat colour and tail length genes are tightly linked

(C) Both are co-dominant traits

(D) The traits show incomplete dominance

53. You have a liquid culture of yeast *Saccharomyces cerevisiae*. You have diluted it 10^5 fold and plated 0.1 ml of the diluted culture on a solid agar plate to obtain 63 colonies. What was the OD_{600} of the initial culture ? [Given that $IOD_{600} = 3 \times 10^7$ cells/ml.]

(A) 0.21 (B) 0.33

(C) 2.1 (D) 3.3

54. The complementation data shown in the accompanying table are observed. The numbers refer to particular mutations. The symbols + and - indicate that the two mutations do and do not complement respectively. Which mutations are on the same gene ?

	Mutants						
	1	*2*	*3*	*4*	*5*	*6*	*7*
1	–	+	+	+	+	+	–
2		–	+	–	+	+	+
3			–	+	+	–	+
4				–	+	+	+
5					–	+	+
6						–	+
7							–

(A) 1 and 4 (B) 2 and 5

(C) 3 and 6 (D) 4 and 5

55. How many screenings are required using a probe to obtain a single clone from a cDNA library ?

(A) Primary (B) Secondary

(C) Tertiary (D) Quaternary

56. In order to express a recombinant protein that is a dimer, which one of the vectors will be useful if the aim is to get into a medium ?

(A) Bacteria (B) Insect

(C) Yeast (D) Plant

57. The role of sigma factor in RNA polymerase of bacteria is :

(A) To act as a catalyst for RNA synthesis

(B) To position RNA polymerase correctly on the template DNA

(C) To position RNA polymerase to unwind DNA template

(D) To terminate RNA synthesis

58. Which one of the following sugar moiety is important to target acid hydrolases from the Golgi complex to Lysosomes ?

(A) Mannose 6 phosphate

(B) Glucose 6 phosphate

(C) Ribose 6 phosphate

(D) Galactose 6 phosphate

59. Molecular action within biological membrane is best characterized by which one of the following statements ?

(A) Lipid molecules readily "flip-flop" from one side of the membrane to the other

(B) Lipid molecules exhibit lateral movement within the membrane bilayer

(C) Protein molecules in membranes are all situated on the cytoplasmic surface of the bilayer

(D) Lipid molecules do not exhibit any kind of movement within the membrane bilayer

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60. Cytochrome P450s comes under which of the following sub-class of oxidoreductases ?
(A) Oxidases (B) Oxygenases
(C) Peroxidases (D) Dehydrogenases

61. The type of DNA polymerase involved in the replication of mitochondrial DNA is :
(A) α (B) β
(C) γ (D) ε

62.. Which one of the following membranes would be the most fluid ?
(A) A bilayer made of lipids with polyunsaturated 18–carbon fatty acids
(B) A bilayer made of lipids with saturated 18–carbon fatty acids
(C) A bilayer made of lipids with saturated 16–carbon fatty acids
(D) A bilayer made of lipids with polyunsaturated 16–carbon fatty acids

63. Of the following membrane lipids, which is not found in prokaryotes ?
(A) Phospholipids
(B) Glycolipids
(C) Cholesterol
(D) Diacylglycerol phosphate

64. A bacterium containing sodium ions at a concentration of 0.1 mM lives in a pond that contains sodium ions at 0.005 mM. Evidently, sodium ions are entering the cell by :
(A) Active transport (B) Endocytosis
(C) Diffusion (D) Osmosis

65. Which one of the following Electron Transport Chain complexes contains a protein bound FAD ?
(A) Complex I
(B) Complex II
(C) Complex III
(D) Complex IV

66. Which one of the following is a citric acid cycle enzyme ?
(A) Succinate dehydrogenase
(B) NADH oxidoreductase
(C) Cytochrome C oxidase
(D) Pyruvate dehydrogenase

67. The soluble electron transfer component of electron transport chain of mitochondria is :
(A) Ubiquinone (B) Cytochrome C1
(C) Cytochrome C (D) Cytochrome b

68. How many moles of ATP are generated from the catabolism of one mole of glucose under anaerobic fermentation ?
(A) 2 (B) 1
(C) 4 (D) 3

69. Which carbohydrate molecule is common to both the glycogen phosphorylase and glycogen synthetase ?
(A) Glucose 1 Phosphate
(B) Glucose 6 Phosphate
(C) Fructose 1 Phosphate
(D) Fructose 6 Phosphate

70. To increase the fluidity of a membrane :
(A) Increase the chain length of the fatty acids in membrane lipids
(B) Decrease the number of double bonds in membrane fatty acid chains
(C) Increase the chain length containing saturated fatty acids
(D) Increase the number of unsaturated fatty acids

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71. The disease beriberi is caused by a nutritional deficiency in vitamin B1 (thiamin). What key mitochondrial enzyme that is required for the production of acetyl CoA from glucose uses thiamin as a coenzyme in the reaction mechanism ?
(A) Pyruvate dehydrogenase
(B) Citrate synthase
(C) Pyruvate carboxylase
(D) Pyruvate decarboxylase

72. What two products of the photosynthetic electron transport system are required in addition to H_2O by the Calvin cycle to synthesize hexose phosphates ?
(A) ATP and FADH2 (B) NADH and FADH2
(C) ATP and NADH (D) ATP and GTP

73. In bacterial promoters,which of the following describes the 'Pribnow box' ?
(A) The 5' untranslated region
(B) The -10 box
(C) The -35 box
(D) The 3' termination sequence

74. Dideoxynucleoside triphosphates (ddNTPs) are used in sequencing DNA because :
(A) ddNTPs are fluorescent
(B) ddNTPs cannot be incorporated into DNA by DNA polymerase
(C) ddNTPs prevent further DNA synthesis once they are incorporated into the DNA sequence
(D) ddNTPs are incorporated very efficiently into DNA by DNA polymerase

75. Which one of the following statements about forensic analysis of DNA is correct ?
(A) A DNA profile using short tandem repeats is unique to each person
(B) Forensic analysis uses SNPs in coding sequences to distinguish between samples
(C) DNA fingerprinting analysis cannot be used for paternity testing
(D) DNA finger printing requires PCR-based amplification

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