

53

QUESTION PAPER  
SERIES CODE

C

Registration No. :

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Centre of Exam. : \_\_\_\_\_

Name of Candidate : \_\_\_\_\_

\_\_\_\_\_  
Signature of Invigilator

**ENTRANCE EXAMINATION, 2016**

M.Sc. LIFE SCIENCES

[ Field of Study Code : SLSM (225) ]

Time Allowed : 3 hours

Maximum Marks : 100

**INSTRUCTIONS FOR CANDIDATES**

Candidates must read carefully the following instructions before attempting the Question Paper :

- (i) Write your Name and Registration Number in the space provided for the purpose on the top of this Question Paper and in the Answer Sheet.
- (ii) **Please darken the appropriate Circle of Question Paper Series Code on the Answer Sheet.**
- (iii) The Question Paper is divided into two parts : Part—A and Part—B. Both parts have multiple-choice questions. All answers are to be entered in the Answer Sheet provided with the Question Paper for the purpose by darkening the correct choice, i.e., (a) or (b) or (c) or (d) with BALLPOINT PEN only against each question in the corresponding Circle.
- (iv) Part—A consists of 30 questions and all are compulsory.
- (v) Part—B contains 100 questions. **Answer any 70 questions.**  
In case any candidate answers more than the required 70 questions, the first 70 questions attempted will be evaluated.
- (vi) Each correct answer carries 1 mark. **There will be negative marking and ½ mark will be deducted for each wrong answer.**
- (vii) Answer written by the candidates inside the Question Paper will not be evaluated.
- (viii) Calculators and Log Tables may be used.
- (ix) Pages at the end have been provided for Rough Work.
- (x) Return the Question Paper and Answer Sheet to the Invigilator at the end of the Entrance Examination. **DO NOT FOLD THE ANSWER SHEET.**

**INSTRUCTIONS FOR MARKING ANSWERS**

- 1. Use only Blue/Black Ballpoint Pen (do not use pencil) to darken the appropriate Circle.
- 2. Please darken the whole Circle.
- 3. Darken ONLY ONE CIRCLE for each question as shown in example below :

Wrong ● (b) (c) ●	Wrong ● (b) (c) (d) ●	Wrong ● (b) (c) (d) ●	Wrong ● (b) (c) ●	Correct ● (a) (b) (c) ●
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- 4. Once marked, no change in the answer is allowed.
- 5. Please do not make any stray marks on the Answer Sheet.
- 6. Please do not do any rough work on the Answer Sheet.
- 7. Mark your answer only in the appropriate space against the number corresponding to the question.
- 8. **Ensure that you have darkened the appropriate Circle of Question Paper Series Code on the Answer Sheet.**



**PART—A**

Answer **all** questions

1. A body in circular motion with a constant speed has
  - (a) constant velocity
  - (b) no acceleration
  - (c) an inward acceleration
  - (d) an outward radial acceleration
  
2. Which protein (gene) determines the fate of anterior end in *Drosophila* embryo?
  - (a) Bicoid
  - (b) Caudal
  - (c) Nanos
  - (d) Torso
  
3. During gastrulation in frog, the very first cells to move into the interior of the embryo through the blastopore come from the surface layer of cells in the marginal zone, thus giving rise to
  - (a) ectoderm
  - (b) endoderm
  - (c) mesoderm
  - (d) yolk
  
4. During carboxylation in C3 plants, the very first product formed is
  - (a) phosphoglyceraldehyde
  - (b) phosphoglyceric acid
  - (c) oxaloacetic acid
  - (d) malic acid
  
5. Which one of the following statements regarding photosynthesis is correct?
  - (a) Light is absorbed by chlorophyll during Calvin cycle
  - (b) The site of light reaction is the stroma of the chloroplast
  - (c) NADPH and ATP are generated during the light cycle to power Calvin cycle
  - (d) Cyclic phosphorylation produces neither oxygen nor NADPH

6. During photosynthesis, the final product of the Calvin cycle is
- (a) ribulose biphosphate
  - (b) phosphoglycerate
  - (c) glyceraldehyde 3-phosphate
  - (d) pyruvate
7. Evolutionary modifications that improve the survival and reproductive success of an organism are called
- (a) mutations
  - (b) vestigial structures
  - (c) homoplastic traits
  - (d) adaptations
8. Which of the following is a result of increased homozygosity?
- (a) Gene flow
  - (b) Genetic drift
  - (c) Inbreeding depression
  - (d) Heterozygote advantage
9. In plants, meiosis produces
- (a) haploid spore
  - (b) haploid gametes
  - (c) haploid gametophyte
  - (d) haploid sporophyte
10. Infectious single-stranded RNAs in plants, that are not associated with any protein, are called
- (a) satellite RNAs
  - (b) viroids
  - (c) viruses
  - (d) prions

11. The intensity of the earth's magnetic field is given by

(a)  $I = \frac{V^2}{H^2}$

(b)  $I = \sqrt{\frac{V}{H}}$

(c)  $I = V^2 + H^2$

(d)  $I = \sqrt{V^2 + H^2}$

12. The length of an astronomical telescope for normal vision is

(a)  $f_o \times f_e$

(b)  $f_o / f_e$

(c)  $f_o + f_e$

(d)  $f_o - f_e$

13. In a nuclear reactor, which of the following is/are used to slow down the fast neutrons released in the fission process?

(a) The moderator

(b) The control rods

(c) The radiation shielding

(d) The heat exchanger

14. Variation of  $g$  with depth is given by

(a)  $g_d = (1 - d/R)$

(b)  $g_d = (1 - 2d/R)$

(c)  $g_d = g$

(d)  $g_d = g(1 - R/d)$

15. What is the pH of  $10^{-8}$  M HCl solution?

(a) 6-6.5

(b) 6.5-7

(c) 7-7.5

(d) 5.5-6

16. Which of the following is correct?
- (a)  ${}_1\text{H}^1$  and  ${}_2\text{He}^2$  are isotopes
  - (b)  ${}_6\text{C}^{14}$  and  ${}_7\text{N}^{14}$  are isotopes
  - (c)  ${}_{19}\text{K}^{39}$  and  ${}_{20}\text{Ca}^{40}$  are isotones
  - (d)  ${}_9\text{F}^{19}$  and  ${}_{11}\text{Na}^{23}$  are isodiaphers
17. The hybridization of orbitals of N atom in  $\text{NO}_3^-$ ,  $\text{NO}_2^+$  and  $\text{NH}_4^+$  are respectively
- (a)  $sp^2$ ,  $sp^3$ ,  $sp$
  - (b)  $sp^2$ ,  $sp$ ,  $sp^3$
  - (c)  $sp$ ,  $sp^2$ ,  $sp^3$
  - (d)  $sp$ ,  $sp^3$ ,  $sp^2$
18. Buffer solutions have constant acidity and alkalinity because
- (a) they have large excess of  $\text{H}^+$  or  $\text{OH}^-$  ions
  - (b) they have fixed value of pH
  - (c) these give unionized base and acid on reaction with added alkali or acid
  - (d) acid and alkalis in these solutions are shielded from attack by other ions
19. Slope of two non-perpendicular lines is  $\frac{1}{2}$  and  $\frac{7}{4}$ . If  $B$  denotes the angle between the lines, then  $\tan B = ?$
- (a)  $\frac{2}{7}$
  - (b)  $\frac{3}{2}$
  - (c)  $\frac{7}{2}$
  - (d)  $\frac{2}{3}$
20. Which of the following is the correct formula for washing soda?
- (a)  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
  - (b)  $\text{NaHCO}_3 \cdot 10\text{H}_2\text{O}$
  - (c)  $\text{NaOH}$
  - (d)  $\text{Na}_2\text{HCO}_3$

21. Blood coagulation involves a cascade of events. Which one of the following conversion pathways associated with the formation of blood clot is correct?
- (a) Fibrin—Fibrinogen—Fibrin clot
  - (b) Prothrombin—Thrombin—Fibrinogen—Fibrin—Fibrin clot
  - (c) Fibrinogen—Fibrin—Fibrin clot
  - (d) Fibrinogen—Prothrombin—Thrombin—Fibrin—Fibrin clot
22. Bernoulli's equation includes as a special case
- (a) Hooke's law
  - (b) Torricelli's theorem
  - (c) Newton's third law of motion
  - (d) Archimedes' principle
23. In human eyes, the role of iris is to
- (a) protect eye lens
  - (b) regulate the intensity of light that reaches the retina
  - (c) help to adjust the lens curvature to focus on object
  - (d) protect cornea from the mechanical damage
24. In insects, gaseous exchange between body fluid and tissues occurs through
- (a) open circulatory system
  - (b) closed circulatory system
  - (c) tracheal system
  - (d) arteries and capillaries
25. Complete non-mixing of arterial and venous blood is present in
- (a) birds and mammals only
  - (b) crocodilian reptiles, birds and mammals
  - (c) all reptiles, birds and mammals
  - (d) turtles, birds and mammals

26. Which of the following disaccharides *does not* test positive when treated with Fehling's solution?
- (a) Maltose
  - (b) Lactose
  - (c) Sucrose
  - (d) Cellobiose
27. Competitive inhibitor of an enzyme will affect the double reciprocal plot by
- (a) increasing the slope of the line
  - (b) decreasing the slope of the line
  - (c) not affecting the slope
  - (d) increasing the slope first and then decreasing it
28. A near-equilibrium reaction is defined as a reaction that
- (a) is usually the rate-limiting step in a metabolic pathway
  - (b) is the slowest step in a metabolic pathway
  - (c) has a free energy change near zero
  - (d) is accompanied with large negative free energy change
29. Average translational KE of  $O_2$  molecules (molecular weight = 32) at a particular temperature is 0.035 eV. What is the average translational KE of  $N_2$  molecules (molecular weight = 28) at the same temperature?
- (a) 0.028 eV
  - (b) 0.055 eV
  - (c) 0.035 eV
  - (d) 0.075 eV
30. The average kinetic energy of molecules is
- (a) directly proportional to square root of temperature
  - (b) directly proportional to absolute temperature
  - (c) independent of absolute temperature
  - (d) inversely proportional to absolute temperature



**PART—B**

Answer *any seventy* questions

31. Of all the fungi that cause disease in compromised hosts, none are as widely distributed as which of the following species?
- (a) *Candida*
  - (b) *Aspergillus*
  - (c) *Pneumocystis*
  - (d) *Blastomyces*
32. Continuous feed fermentation is used to maintain
- (a) temperature
  - (b) water level
  - (c) product concentration
  - (d) substrate concentration
33. K12 strain of which bacteria is used routinely in rDNA laboratory?
- (a) *Enterobacter aerogenes*
  - (b) *Klebsiella pneumoniae*
  - (c) *Salmonella typhi*
  - (d) *Escherichia coli*
34. Which of the following is the most appropriate regarding gene transcription and mRNA splicing?
- (a) mRNA splicing is co-transcriptional
  - (b) mRNA splicing and transcription are sequential
  - (c) mRNA splicing and transcription are independent events to generate mRNA
  - (d) mRNA splicing and transcription take place in different cellular organelles
35. Assume you inoculated 100 cells into 100 ml of nutrient broth and 100 cells in 200 ml of nutrient broth. After incubation for 24 hours, the cultures have entered stationary phase. You should have
- (a) more cells per ml in the 100 ml
  - (b) more cells per ml in the 200 ml
  - (c) the same number of cells per ml in each
  - (d) less cells per ml in 100 ml

36. In some halophytes, such as sea lavender, salt may be exuded via
- (a) hydathodes
  - (b) stomata
  - (c) plasmodesmata
  - (d) cauline leaves
37. Which of the following drugs acts by inhibiting cell wall synthesis of the microorganisms?
- (a) Vancomycin
  - (b) Gentamicin
  - (c) Amphotericin B
  - (d) Erythromycin
38. Which of the following is an example of a cell wall-less Archaea?
- (a) Halobacterium
  - (b) Thermoplasma
  - (c) Cyanobacterium
  - (d) Methanobacterium
39. Which of the following is true regarding the discovery by Avery, Macleod and McCarthy?
- (a) Identified DNA as the genetic material
  - (b) Showed that genetic material can be transferred between bacteria
  - (c) RNA can serve as genetic material in some viruses
  - (d) Demonstrated RNA as genetic material in bacteriophage
40. During DNA synthesis by DNA polymerase, which of the following mechanism ensures high fidelity?
- (a) 3'-5' exonuclease activity of DNA polymerase
  - (b) 5'-3' primase activity of DNA polymerase
  - (c) 5'-3' exonuclease activity of DNA polymerase
  - (d) Uncharacterized endonuclease activity

41. With reference to DNA structure, which of the following forms of DNA adopts left-handed helix?
- (a) B-DNA
  - (b) A-DNA
  - (c) Z-DNA
  - (d) Both A-DNA and B-DNA
42. Which of the following is the most likely consequence of the loss of telomerase in an eukaryotic cell?
- (a) Rapid cell proliferation
  - (b) Premature aging
  - (c) DNA polymerase would be non-functional
  - (d) Cells become polyploidy
43. For which of the following applications, a monoclonal antibody is essentially required to detect an antigen?
- (a) Bacterial agglutination
  - (b) Immunoprecipitation
  - (c) Western blotting
  - (d) Diagnostic tissue typing
44. The immune system protects against both extracellular and intracellular pathogens. Out of the following diseases which one is caused by an intracellular pathogen?
- (a) Tetanus
  - (b) Sleeping sickness
  - (c) Chickenpox
  - (d) Schistosomiasis
45. Monocytes are
- (a) phagocytic cells of the central nervous system
  - (b) generally first cells to arrive at the site of inflammation
  - (c) circulating blood cells that differentiate into macrophages in the tissues
  - (d) white blood cells that migrate into the tissues and play an important role in the development of allergies

46. Which one of the following is **not** a characteristic attribute of adaptive immunity mediated by lymphocytes?
- (a) Self-/non-self recognition
  - (b) Quick response
  - (c) Diversity
  - (d) Memory
47. Nail biters often have red, warm and swollen areas around the cuticles. What kind of response does this condition indicate?
- (a) Antibody response
  - (b) Inflammatory response
  - (c) Autoimmune response
  - (d) Hypersensitivity response
48. RNA is often chemically reactive due to its
- (a) uracil base
  - (b) ribose sugar
  - (c) single-stranded nature
  - (d) sugar-phosphate backbone
49. Most of the cell membrane is
- (a) negatively charged
  - (b) positively charged
  - (c) neutral
  - (d) hydrophobic
50. Macromolecular transport across the nuclear envelope needs
- (a) ATP
  - (b) GTP
  - (c) creatine phosphate
  - (d) phosphoenol pyruvate

51. Initiation of transcription in prokaryotes needs which of the following of the sigma 70 factor (s 70) to recognize the -10 and -35 elements in the promoter respectively?
- (a) Regions 1 and 2
  - (b) Regions 2 and 3
  - (c) Regions 2 and 4
  - (d) Regions 1 and 4
52. During translation, GTP-hydrolysis is carried out on the ribosome at
- (a) A site
  - (b) P site
  - (c) 30 S subunit
  - (d) 50 S subunit
53. Beak morphology of finches on Galapagos Islands is an example of
- (a) convergent evolution
  - (b) adaptive radiation
  - (c) parallel evolution
  - (d) Lamarckism
54. The first publication proposing the *Theory of Evolution by Natural Selection* was authored by
- (a) Charles Darwin
  - (b) Alfred Russell Wallace
  - (c) Charles Darwin and Alfred Russell Wallace
  - (d) Charles Darwin and David Quammen
55. Ferritin, transferrin, myoglobin and hemoglobin are each bound to iron in humans. Which of these four molecules has the maximum number of iron atoms?
- (a) Hemoglobin
  - (b) Ferritin
  - (c) Transferrin
  - (d) Myoglobin

56. Evolution happens by
- (a) progressive magnification of highly used traits
  - (b) changes inheritable traits across generations
  - (c) improvement in traits towards an optimum value across generations
  - (d) disuse of traits leading to loss of maladaptive traits
57. Which part of the human anatomy is involved in mutualistic interactions with bacteria?
- (a) Small intestine
  - (b) Large intestine
  - (c) Throat
  - (d) Oesophagus
58. In the scientific method, a hypothesis is a
- (a) possible question for data
  - (b) possible test for the experiment
  - (c) possible explanation for observations
  - (d) possible experiment
59. To apply a linear regression model, which of the following assumptions has to be true?
- (a)  $X$  variable has to be normally distributed
  - (b)  $Y$  variable has to be normally distributed
  - (c) Both  $X$  and  $Y$  have to be normally distributed
  - (d) Residuals have to be normally distributed
60. Pancreas is called
- (a) autocrine gland
  - (b) paracrine gland
  - (c) mixed gland
  - (d) serous gland

61. Kupffer's cells are present in
- (a) pancreas
  - (b) liver
  - (c) lung
  - (d) heart
62. Stool of a person is whitish grey colored due to malfunction of
- (a) kidney
  - (b) liver
  - (c) pancreas
  - (d) spleen
63. The animal which uses saliva and urine for cooling is
- (a) lizard
  - (b) cat
  - (c) bear
  - (d) bat
64. There is a thick layer of insulating fat in whales and seals which protects them from colder water. This layer is called
- (a) brown fat
  - (b) cuticle
  - (c) blubber
  - (d) flipper
65. Multi-chambered digastric stomach is found in
- (a) bison
  - (b) rabbit
  - (c) fish
  - (d) poultry

66. Digestion of protein is accomplished in
- (a) stomach
  - (b) rectum
  - (c) ileum
  - (d) duodenum
67. Nitric oxide synthase produces NO in biological system from which of the following amino acids?
- (a) Phenylalanine
  - (b) Asparagine
  - (c) Arginine
  - (d) Lysine
68. The pre-initiation complex in eukaryotes contains
- (a) general transcription factors and unphosphorylated RNA polymerase II
  - (b) general transcription factors and serine 2 phosphorylated RNA polymerase II
  - (c) general transcription factors and serine 5 phosphorylated RNA polymerase II
  - (d) general transcription factors and serine 7 phosphorylated RNA polymerase II
69. Which of the following molecular markers is **not** codominant?
- (a) Restriction Fragment Length Polymorphism (RFLP)
  - (b) Amplified Fragment Length Polymorphism (AFLP)
  - (c) Random Amplified Polymorphic DNA (RAPD)
  - (d) Simple Sequence Repeats (SSR)
70. Which of the following statements about genomic imprinting is **not** true?
- (a) Genomic imprinting shows Mendelian pattern of inheritance
  - (b) Genomic imprinting involves silencing of either paternal or maternal alleles
  - (c) Every cell contains the same parent-specific imprinting
  - (d) Genomic imprinting involves epigenetic mechanisms



71. Black fur in mice ( $B$ ) is dominant to brown fur ( $b$ ), short tails ( $T$ ) are dominant to long tails ( $t$ ). What fraction of the progeny of the cross  $BbTt \times BBtt$  will have black fur and long tails?
- (a)  $1/16$
  - (b)  $3/16$
  - (c)  $3/8$
  - (d)  $1/2$
72. Suppose a father of blood type B and a mother of blood type O have a child of blood type O. What are the chances that their next child will be of blood type O?
- (a) 10%
  - (b) 25%
  - (c) 50%
  - (d) 100%
73. The minimum progeny population size allowing for random union of all kinds of gametes from  $AaBbCcDd$  parents is
- (a) 16
  - (b) 64
  - (c) 256
  - (d) 1024
74. A child is born with an extra chromosome in each of its cells. This condition is usually the result of
- (a) crossing-over
  - (b) hybridization
  - (c) segregation
  - (d) non-disjunction
75. Most of the substances present in the blood plasma are filtered out in the glomerular filtrate, **except**
- (a) blood cells
  - (b) blood cells and large protein
  - (c) blood cells, large protein and sugar
  - (d) large protein

76. Tadpoles and frogs excrete nitrogenous waste in the form of
- (a) urea and uric acid respectively
  - (b) uric acid and ammonia respectively
  - (c) ammonia and urea respectively
  - (d) urea only
77. Through which of the following processes, oxygen reaches to the pulmonary capillaries from the alveoli of the lungs?
- (a) Active transport
  - (b) Secondary active transport
  - (c) Facilitated diffusion
  - (d) Passive diffusion
78. An individual not having cloth on his body is inside a room where the air temperature is 21 °C and the humidity is 80%. The greatest amount of heat will be lost from the body through
- (a) elevated metabolism
  - (b) respiration
  - (c) urination
  - (d) radiation and conduction
79. The equilibrium constant for the reaction catalyzed by malate dehydrogenase (malate to oxaloacetate) is about  $5.9 \times 10^{16}$ . Which of the following best describes the situation in which malate is converted to oxaloacetate during the citric acid (Krebs) cycle?
- (a) The reaction is exergonic under standard conditions in the direction of the citric acid cycle and this drives the reaction
  - (b) The next reaction of the cycle, citrate synthase, is highly exergonic and it pulls the malate dehydrogenase reaction forward by removing oxaloacetate
  - (c) Malate dehydrogenase catalyzes an irreversible reaction in the citric acid cycle
  - (d) Malate dehydrogenase changes the equilibrium constant for the reaction, allowing it to proceed rapidly
80. UDP glucose is
- (a) an intermediate of TCA cycle
  - (b) an intermediate of pentose phosphate pathway
  - (c) generated during the breakdown of glycogen
  - (d) required for the addition of glucose residues to glycogen

81. From the following two half reactions shown below, what is the  $\Delta G'^{\circ}$  of the complete reaction?
- (1)  $\text{PEP} + \text{H}_2\text{O} \rightarrow \text{Pyruvate} + \text{P}_i$ ;  $\Delta G'^{\circ} = -61.9 \text{ kJ/mol}$
- (2)  $\text{ADP} + \text{P}_i \rightarrow \text{ATP} + \text{H}_2\text{O}$ ;  $\Delta G'^{\circ} = +30.5 \text{ kJ/mol}$
- (a)  $+92.4 \text{ kJ/mol}$
- (b)  $-92.4 \text{ kJ/mol}$
- (c)  $+31.4 \text{ kJ/mol}$
- (d)  $-31.4 \text{ kJ/mol}$
82. During non-cyclic photophosphorylation, plants and cyanobacteria produce
- (a) ATP
- (b) NADPH
- (c) NADPH and ATP
- (d) NADH and ATP
83. In CAM plants, which one of the following works as a  $\text{CO}_2$  acceptor?
- (a) RuBP
- (b) PEP
- (c) OAA
- (d) PGA
84. Import of vitamin  $\text{B}_{12}$  into gram-negative bacterial cells is facilitated by a special class of proteins in the outer membrane known as
- (a) integrins
- (b) adhesins
- (c) tubulins
- (d) porins
85. The velocity of sound in any gas depends upon
- (a) wavelength of sound only
- (b) density and elasticity of gas
- (c) intensity of sound waves only
- (d) amplitude and frequency of sound

86. The velocity of sound in vacuum is
- (a) zero
  - (b) 27.5 m/s
  - (c) 156 m/s
  - (d) 330 m/s
87. Sound wave is an example of
- (a) longitudinal wave
  - (b) transverse wave
  - (c) stationary wave
  - (d) All of the above
88. Virus-free plants have been propagated commercially through
- (a) cell culture
  - (b) pollen culture
  - (c) apical meristem culture
  - (d) embryo culture
89. Through an experiment, Dr. Brown demonstrated intake of 100 molecules of  $\text{CO}_2$ . How many water molecules (approximately) got evaporated from leaf surface for intake of such amount of  $\text{CO}_2$  from the atmosphere?
- (a) 400
  - (b) 4000
  - (c) 40000
  - (d) 40
90. Casparian strips located in root \_\_\_\_\_ facilitate \_\_\_\_\_ movement of water uptake through roots.
- (a) endodermis, apoplastic
  - (b) endodermis, symplastic
  - (c) exodermis, symplastic
  - (d) hypodermis, apoplastic

91. The neo-Darwinism theory of evolution deals with what?
- (a) Natural selection
  - (b) Inheritance of acquired characters
  - (c) Modern synthesis of synthetic theory of evolution
  - (d) Sexual reproduction in every generation creates a new variable population of individuals to be acted upon by natural selection
92. Random evolutionary changes in a small breeding population is known as
- (a) gene flow
  - (b) genetic drift
  - (c) disruptive selection
  - (d) mutation
93. A species introduced into an area from somewhere else is called a/an \_\_\_\_\_ species.
- (a) wild
  - (b) natural
  - (c) exotic
  - (d) native
94. The two gases making highest relative contribution to the greenhouse gases are
- (a)  $\text{CO}_2$  and  $\text{N}_2\text{O}$
  - (b)  $\text{CO}_2$  and  $\text{CH}_4$
  - (c)  $\text{CH}_4$  and  $\text{N}_2\text{O}$
  - (d)  $\text{CFC}_5$  and  $\text{N}_2\text{O}$
95. Which of the following is true about plant homeotic genes?
- (a) Plants do not contain homeotic genes as there is no segmentation of the body structure
  - (b) Plants contain homeotic gene with homeobox similar to that is found in animals
  - (c) Plants contain homeotic genes, but the proteins do not have a DNA binding domain
  - (d) Plants contain homeotic genes, but the DNA binding domain is different from homeodomains

96. What is the most correct definition of a secondary meristem?
- (a) Secondary meristem has only secondary roles for a plant
  - (b) Secondary meristem develops during secondary growth of the plants
  - (c) Secondary meristem develops after the primary meristem stops growing
  - (d) Secondary meristem develops from differentiated cells
97. Binding of cytokinin to its receptor activates cytokinin signaling by which of the following mechanisms?
- (a) Activates a proteosomal complex that degrades an inhibitor of cytokinin signaling
  - (b) Leads to phosphorylation of the receptor, which activates a phosphorylation cascade required for cytokinin signaling
  - (c) Leads to inactivation of phosphatase and thereby activates the signaling pathway
  - (d) The receptor forms an active transcription factor complex to activate signaling
98. Which hormone plays most significant role in abscission of leaf petioles or flower petal?
- (a) Abscisic acid
  - (b) Cytokinin
  - (c) Jasmonic acid
  - (d) Ethylene
99. Which of the following is a characteristic feature of chromatin of RNA pol II promoters?
- (a) Nucleosomes are completely disordered
  - (b) There are positioned nucleosomes with a nucleosome-free region
  - (c) Nucleosomes are positioned at regular intervals
  - (d) Most regions of promoters are tightly packed by nucleosomes
100. What is true about Tetracycline (Tet) ON and Tet OFF systems of gene expression?
- (a) In the Tet ON system, binding of Tet with TetR suppresses gene expression
  - (b) In the Tet OFF system, binding of Tet with TetR induces gene expression
  - (c) The Tet OFF system uses the TetR that binds to DNA when bound to Tet
  - (d) The Tet ON system uses the TetR that binds to DNA when bound to Tet

101. Which of the following statements **does not** form a part of Bohr's model of hydrogen atom?
- (a) Energy of the electron in orbit is quantized
  - (b) The electron in the orbit nearest to the nucleus has lowest energy
  - (c) Electrons revolve in different orbits around the nucleus
  - (d) The position and velocity of the electrons in the orbit cannot be determined
102. An ether is more volatile than alcohol having the same molecular formula. This is due to
- (a) dipolar character of ethers
  - (b) alcohols having resonance structure
  - (c) intermolecular hydrogen bonding in ethers
  - (d) intermolecular hydrogen bonding in alcohols
103. A car is moving with a speed of  $10 \text{ ms}^{-1}$  on a circular track of radius 25 m. If its speed is increasing at the rate of  $3 \text{ ms}^{-1}$ , its resultant acceleration is
- (a)  $2.5 \text{ ms}^{-1}$
  - (b)  $5 \text{ ms}^{-1}$
  - (c)  $7.5 \text{ ms}^{-1}$
  - (d)  $10 \text{ ms}^{-1}$
104. A carriage of mass 5000 kg moving with the speed of  $10 \text{ ms}^{-1}$  strikes a stationary carriage of the same mass. After the collision, the carriages get coupled and move together. What is their common speed after collision?
- (a)  $2.5 \text{ ms}^{-1}$
  - (b)  $5 \text{ ms}^{-1}$
  - (c)  $7.5 \text{ ms}^{-1}$
  - (d)  $10 \text{ ms}^{-1}$
105. Three capacitors of  $2 \mu\text{F}$ ,  $3 \mu\text{F}$  and  $6 \mu\text{F}$  are joined in series and the combination is charged by means of a 30-volt battery. The potential difference between the plates of the  $6 \mu\text{F}$  capacitor is
- (a) 10 volts
  - (b) 5 volts
  - (c) 6 volts
  - (d) 8 volts

106. The equation  $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$  represents a
- (a) straight line
  - (b) hyperbola
  - (c) sphere
  - (d) parabola
107. The probability that at least one of the events  $E_1$  and  $E_2$  will occur is 0.4. The probability that both  $E_1$  and  $E_2$  will happen simultaneously is 0.2. What is the sum  $P(\bar{E}_1) + P(\bar{E}_2)$ ? Given that  $P(\bar{E})$  is a complement of  $P(E)$ .
- (a) 0.6
  - (b) 1.0
  - (c) 1.4
  - (d) 1.8
108. Which of the following are used as ion exchanger to soften hard water?
- (a) Carbonates
  - (b) Zeolites
  - (c) Nitrides
  - (d) Borates
109. Lithium nitrate ( $\text{LiNO}_3$ ) when heated gives
- (a)  $\text{LiNO}_2$
  - (b)  $\text{LiH}$
  - (c)  $\text{Li}_2\text{O}$
  - (d)  $\text{LiOH}$
110. Which of the following Group 6 elements forms a hydride?
- (a) Cr
  - (b) Mo
  - (c) W
  - (d) Sg



111. The Joule-Thomson effect can be used as the basis for developing a
- (a) heating device
  - (b) charge storage device
  - (c) refrigerating device
  - (d) magnetic device
112. An ideal solution is that in which every component obeys \_\_\_\_\_ over the entire range of its composition.
- (a) Boyle's law
  - (b) Charles' law
  - (c) Gay-Lussac's law
  - (d) Raoult's law
113. Fick's law applies to
- (a) diffusion processes
  - (b) centrifugation processes
  - (c) hydration processes
  - (d) oxidation-reduction processes
114. Which of the following statements is **not** true for an enzyme?
- (a) Enzymes alter the speed of a chemical reaction
  - (b) Enzymes affect the direction of a chemical reaction
  - (c) A particular enzyme can catalyze reactions involving many different substrates
  - (d) Some enzymes are not proteins
115. Which of the following fluorescent dye is used for staining nucleus?
- (a) DAPI
  - (b) FM 4-64
  - (c) Fura 2-AM
  - (d) Rhodamine 123

116. Which of the following antibiotic **does not** inhibit translation in bacteria?
- (a) Chloramphenicol
  - (b) Tetracycline
  - (c) Puromycin
  - (d) Rifamycin
117. You are measuring reversion frequencies of few *lac* mutants. Which of the following mutants will revert least frequently?
- (a) Single-point mutants
  - (b) Amber mutants
  - (c) Double mutants (two nucleotide deletions)
  - (d) Double mutants and definitely not deletions
118. A multi-subunit enzyme runs at 100 kDa in native PAGE and shows three bands of mol. wt. 30 kDa, 20 kDa and 10 kDa in SDS-PAGE. The enzyme is most likely to contain the following number of subunits.
- (a) Three
  - (b) Four
  - (c) Seven
  - (d) Eight
119. Three micrograms of 1 kb double-strand linear DNA contains how many picomole 5'-ends? (1 bp = 600 Da)
- (a) 5
  - (b) 9
  - (c) 10
  - (d) 12
120. How many peptide bonds are there in the following peptide?
- $\text{H}_2\text{N}$ —alanine—tryptophan—serine—proline—leucine—iso-leucine—glycine— $\text{COOH}$
- (a) Five
  - (b) Six
  - (c) Seven
  - (d) Eight

121. If the ratio of (A+G)/(T+C) in one strand of DNA is 0.80, what would be this ratio in the complementary strand of the DNA?
- (a) 0.40
  - (b) 0.60
  - (c) 0.80
  - (d) 1.25
122. A competitive inhibitor of an enzyme
- (a) increases the  $K_m$
  - (b) decreases the  $K_m$
  - (c) decreases the  $V_{max}$
  - (d) decreases both  $K_m$  and  $V_{max}$
123. Which of the following sequences correctly describes the cell cycle?
- (a)  $G_1$  phase :  $G_2$  phase : S phase : Mitosis
  - (b)  $G_1$  phase : S phase : Mitosis :  $G_2$  phase : Cytokinesis
  - (c) Mitosis :  $G_1$  phase :  $G_2$  phase : S phase : Cytokinesis
  - (d)  $G_1$  phase : S phase :  $G_2$  phase : Mitosis : Cytokinesis
124. Gradual physiological adjustment to slowly changing new environmental conditions is called
- (a) adaptation
  - (b) acclimatization
  - (c) acclimation
  - (d) echolocation
125. Lateral line system in fishes, responsible for the detection of motion in the surrounding water, contains
- (a) hair cells
  - (b) tuft of cilia
  - (c) flagella
  - (d) free nerve endings

126. Tendency towards relative stability in the internal environment of an organism is called
- (a) homeostasis
  - (b) acclimation
  - (c) acclimatization
  - (d) adaptation
127. In terrestrial vertebrates, high-quality image focussed on retina is due to
- (a) relatively small aperture and refractive lens
  - (b) large aperture only
  - (c) two-chambered eye
  - (d) large number of cone cells
128. Which of the following is best to sterilize a heat labile solution?
- (a) Dry heat
  - (b) Autoclave
  - (c) Membrane filtration
  - (d) Pasteurization
129. Which of the following refers to the addition of microorganisms to the diet in order to provide health benefits beyond basic nutritive value?
- (a) Antibiotics
  - (b) Prebiotics
  - (c) Synbiotics
  - (d) Probiotics
130. The holes produced in bacterial 'lawns' by viruses are called
- (a) colonies
  - (b) plaques
  - (c) patches
  - (d) clearance

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