Test Centre : _____

Roll No. : _____

Name of the Candidate : _____

S A U

Entrance Test for Ph.D. (Biotechnology) 2017

[PROGRAMME CODE : 50001]

Question Paper Series Code : A

QUESTION PAPER

Time : 3 hours *Maximum Marks* : 70

INSTRUCTIONS FOR CANDIDATES

Please read carefully the following instructions before attempting the Question Paper :

(i) Write your Name, Roll Number and Name of the Test Centre in the space provided for the purpose on the top of this Question Paper and on the OMR Sheet.

(ii) This Question Paper has Two Parts.

(iii) Part—A has 20 questions of **1** mark each. Please attempt all the questions in Part—A.

(iv) Part—B has 100 questions out of which please attempt 50 questions only. Each question carries **1** mark.

(v) For each wrong answer, ¼th of the marks assigned to that question will be deducted.

(vi) Please do not attempt more than 50 questions in Part—B. If you attempt more than 50 questions, only the first 50 will be evaluated.

(vii) Please darken the appropriate circle of the Question Paper Series Code on the OMR Sheet in the space provided.

(viii) Answers written by the candidates inside the Question Paper will not be evaluated.

(ix) Pages at the end of the Question Paper have been provided for Rough Work.

(x) Simple calculators are allowed. Mobile Phones are **NOT** allowed.

(xi) Return the Question Paper and the OMR Sheet to the Invigilator at the end of the Test.

(xii) Do not fold the OMR Sheet.

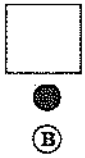
INSTRUCTIONS FOR MARKING ANSWERS ON THE 'OMR SHEET'

Use BLUE/BLACK Ballpoint Pen Only

1. **Please ensure that you have darkened the appropriate circle of 'Question Paper Series Code' and 'Programme Code' on the OMR Sheet in the space provided.**

   Question Paper Series Code

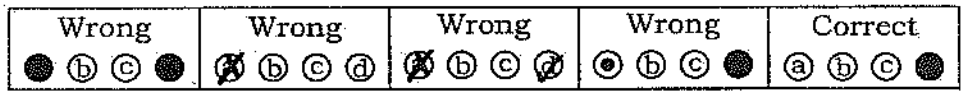
   Write Question Paper Series Code **A** or **B** in the box and darken the appropriate circle.

   A or **B**

2. Use only Blue/Black Ballpoint Pen to darken the circle. Do not use Pencil to darken the circle for Final Answer.
3. Please darken the whole circle. ●
4. Darken ONLY ONE CIRCLE for each question as shown below in the example :

   Example :

Wrong	Wrong	Wrong	Wrong	Correct
● ⓑ ⓒ ●	Ø ⓑ ⓒ ⓓ	Ø ⓑ ⓒ Ø	⊙ ⓑ ⓒ ●	ⓐ ⓑ ⓒ ●

5. Once marked, no change in the answer is possible.
6. Please do not make any stray marks on the OMR Sheet.
7. Please do not do any rough work on the OMR Sheet.
8. Mark your answer only in the appropriate circle against the number corresponding to the question.
9. **A wrong answer will lead to the deduction of one-fourth of the marks assigned to that question.**
10. Write your six-digit Roll Number in small boxes provided for the purpose; and also darken the appropriate circle corresponding to respective digits of your Roll Number as shown in the example below.

    Example :

    ROLL NUMBER

1	3	5	7	2	0	2
●	①	①	①	①	①	①
②	②	②	②	●	②	●
③	●	③	③	③	③	③
④	④	④	④	④	④	④
⑤	⑤	●	⑤	⑤	⑤	⑤
⑥	⑥	⑥	⑥	⑥	⑥	⑥
⑦	⑦	⑦	●	⑦	⑦	⑦
⑧	⑧	⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨	⑨	⑨
⓪	⓪	⓪	⓪	⓪	●	⓪

PART—A

1. The process of RNA interference has been used for the development of plants resistant to

   a. insects

   b. nematodes

   c. fungi

   d. viruses

2. A specific triplet of nitrogenous bases in the transfer RNA is called

   a. codon

   b. anticodon

   c. genetic code

   d. none of the above

3. Which one of the following enzymes joins the Okazaki fragments?

   a. DNA polymerase

   b. DNA ligase

   c. Restriction enzyme

   d. Helicase

4. Which one of the following pairs of cyclin and cyclin-dependent kinase is involved in G1 phase of cell cycle clock?

   a. Cyclin A/CDK2 complexes

   b. Cyclin D/CDK4/6 complexes

   c. Cyclin E/CDK2 complexes

   d. Cyclin B/CDK1 complexes

5. Synapsis occurs between

a. mRNA and ribosomes

b. male and female gametes

c. two homologous chromosomes

d. spindle fibers and chromosomes

6. The organic compounds that first formed on earth and which were required for the origin of life are

a. proteins and amino acids

b. proteins and nucleic acids

c. urea and amino acids

d. urea and nucleic acids

7. Cold-blooded animals are also called

a. ectotherms

b. psychotherms

c. endotherms

d. thermophiles

8. In hexaploid wheat, the haploid (n) and basic (x) numbers of chromosomes are

a. $n = 21$ and $x = 7$

b. $n = 7$ and $x = 21$

c. $n = 21$ and $x = 21$

d. $n = 21$ and $x = 14$

9. Which one of the following pairs is ***not*** correctly matched?

a. IAA—Cell wall elongation

b. Abscisic acid—Stomatal closure

c. Gibberellic acid—Leaf fall

d. Cytokinin—Cell division

10. Which one of the following animals is correctly matched with its particular named taxonomic category?

a. Housefly—Musca, an order

b. Tiger—Tigris, the species

c. Cuttlefish—Mollusca, a class

d. Humans—Primata, the family

11. Which one of the following enzymes carries out the initial step in the digestion of milk in humans?

a. Trypsin

b. Pepsin

c. Rennin

d. Lipase

12. Where will you look for the sporozoites of the malarial parasite?

a. Salivary glands of freshly moulted female anopheles mosquito

b. Saliva of infected female anopheles mosquito

c. Red blood corpuscles of humans suffering from malaria

d. Spleen of infected humans

13. Though retroviruses have RNA genome, they replicate through double-stranded DNA formation. This process involves

a. a polymerase coded by the virus itself

b. a polymerase coded by the host

c. host DNA polymerase

d. an unknown mechanism

14. A nerve impulse is transmitted through synaptic junction by

a. acetyl-CoA

b. acetocarmine

c. acetylcholine

d. acetoorcein

15. When an individual is infected while in hospital or health care facility, the infection is called

a. nosocomial

b. latrogenic

c. vertical

d. horizontal

16. Which one of the following is required for binding of ribosomal subunits?

a. Mg^{++}

b. Mn^{++}

c. Ca^{++}

d. Al^{+++}

17. The theory that life originated elsewhere but was seeded on earth is called

a. meteorite evolution

b. panspermia

c. extraterrestrial ecology

d. exobiology

18. The dental formula of a rabbit is

a. 2, 0, 3, 3/1, 0, 2, 3

b. 1, 0, 2, 3/2, 2, 0, 3

c. 1, 0, 3, 3/2, 2, 0, 3

d. 2, 1, 3, 2/2, 1, 2, 3

19. An ultracentrifuge is run at 50000 r.p.m. The $r_{average}$ is 4 cm. What is the RCF of the centrifugation?

a. 22400 g

b. 44800 g

c. 11200 g

d. 10000 g

20. Which one of the following isotopes is used to determine the function of thyroid?

a. Na^{24}

b. K^{42}

c. Ca^{45}

d. I^{131}

PART—B

21. The proton pump operates across the

a. outer mitochondrial membrane and the protons flow into the mitochondrial matrix

b. inner mitochondrial membrane and protons flow into the cytoplasm

c. inner mitochondrial membrane and protons flow into the mitochondrial matrix

d. outer mitochondrial membrane and the protons flow into the cytoplasm

22. Which one of the following products in the urea cycle moves out of the mitochondria?

a. Ornithine

b. Citrulline

c. Arginosuccinate

d. Fumarate

23. Why is it that for each molecule of NADH, more ATP is produced as compared to each molecule of $FADH_2$?

a. NADH donates its electrons at Complex I

b. More NADH is produced in the Krebs cycle than FADH2

c. NADH is in its reduced form and FADH2 is in its oxidized form

d. FADH2 donates its electrons at Complex I

24. Which one of the following is ***not*** an advantage of having a large multisubunit complex enzyme 'pyruvate dehydrogenase'?

a. Enzymatic reaction rates are limited by diffusion. With shorter distance between subunits, an enzyme can almost direct the substrate from one subunit (catalytic site) to another

b. Channeling metabolic intermediates between successive enzymes minimizes side reactions

c. Multienzyme complexes can aid in reduction of the activation energy of successive enzymes

d. The reactions of a multienzyme complex can be coordinately controlled

25. Will a diet rich in fat and low in carbohydrates worsen or improve the symptoms in someone who has pyruvate dehydrogenase deficiency?

a. Worsen—there will be an increase in pyruvate production and decrease in acetyl-CoA production

b. Improve—there will be a decrease in pyruvate production and increase in acetyl-CoA production

c. Worsen—there will be a decrease in pyruvate production and increase in acetyl-CoA production

d. Improve—there will be an increase in pyruvate production and decrease in acetyl-CoA production

26. Which one of the following is ***not*** a property of an ideal drug target?

a. Target is disease-modifying and/or has a proven function in the pathophysiology of a disease

b. Modulation of the target is less important under physiological conditions or in other diseases

c. Target has a favorable 'assayability' enabling high throughput screening

d. Target expression is uniformly distributed throughout the body

27. In various genetic engineering applications, such as the synthesis of dsDNA from an ssDNA template, 'filling-in' of recessed 3′ ends, digesting 3′ overhangs, or in the preparation of DNA probes, Klenow fragment is preferred over DNA pol I. The purpose is to essentially get rid of the holoenzymes'

a. processivity

b. proofreading activity

c. 5′→ 3′ exonuclease activity

d. 3′→ 5′ exonuclease activity

28. Poly(dA.dT).poly(dT.dA) sequences may acquire a D form of DNA (also known as D-DNA). D-DNA has 8 bp per turn, with a rise of 3·03 Å per base pair. The helix twist angle (θ) would be

a. 32·7°

b. 36°

c. 38·6°

d. 45°

29. Tautomerization of guanine to its enol form can still fit in the B-DNA structure by pairing with

a. cytosine

b. thymine

c. enol form of thymine

d. imino form of cytosine

30. BrdU allows mispairing at both A-T and G-C base pairs because

a. it intercalates randomly between the DNA strands

b. it is a major groove binder which is sequence-specific

c. it can undergo reversible tautomerization after incorporation

d. it can deaminate A, G and C residues in the DNA

31. The presence of the 2′ – OH group on a ribose sugar

a. causes resistance to hydrolysis in alkaline solution

b. permits RNA enzymatic activity

c. allows DNase to act

d. does not allow isomerase to act

32. All of the following molecules mimic each other and bind to the same site within the ribosome, ***except***

a. IF2-GTP-tRNA

b. EF-Tu-GTP-tRNA

c. EF-G-GTP

d. RF1/RF2

33. The respiratory control centre is located within the

a. midbrain

b. pons

c. medulla oblongata

d. inferior temporal lobe

34. Which one of the following tissues does ***not*** have a mesodermal origin?

a. Heart

b. Muscle

c. Kidney

d. Thyroid

35. During refractory period, the membrane is

a. depolarized

b. repolarized

c. hyperpolarized

d. apolarized

36. Which one of the following is responsible for the generation of an action potential?

a. Passive channel

b. Na^+/K^+-ATPase

c. Voltage-gated Na^+ channel

d. Muscarinic receptor

37. The nodes of Ranvier assist in the transmission of nerve impulses through

a. electronic conduction

b. saltatory conduction

c. fast anterograde conduction

d. graded potential transmission

38. Which one of the following statements about basal promoters is true?

a. Basal promoters can be located in the 3′ UTR.

b. Basal promoters are necessary for enhancer trapping.

c. Basal promoters are necessary for heterologous expression.

d. Basal promoters are sufficient for expression in the shoot apical meristem.

39. Cyanide causes death by inhibiting mitochondrial electron transport at

a. NADH oxidase step (Complex I)

b. succinate dehydrogenase step (Complex II)

c. cytochrome c oxidase step (Complex III)

d. cytochrome a-a_3 oxidase step (Complex IV)

40. Which one of the following is ***not*** a part of the natural *Agrobacterium* T-DNA region?

a. Auxin biosynthesis gene

b. Opine biosynthesis gene

c. Plant selection marker gene

d. Cytokinin biosynthesis gene

41. In the binary vector system

a. vir genes and T-DNA are in the same plasmid

b. plant selectable marker is outside the T-DNA region

c. bacterial selection marker is within the T-DNA region

d. plant selectable marker is within the T-DNA region

42. The function of vir E in *Agrobacterium* is to

a. promote transcription of other vir genes

b. bind and protect single-stranded T-DNA

c. create nick in right border of T-DNA

d. create single-stranded DNA

43. Which one of the following statements is true with regard to reverse northern?

a. Amplified PCR products are fixed on a membrane

b. RNAs from different samples are fixed on a membrane

c. cDNA is made and fixed on a membrane

d. Synthesized oligos are fixed on a membrane

44. In an enzyme-catalyzed reaction, substrate was used at a concentration 100 times K_m. The velocity observed under the conditions would be

a. 90% of V_{max}

b. 50% of V_{max}

c. 99% of V_{max}

d. 99·9% of V_{max}

45. Which one of the following is ***not*** true for an ideal reporter gene?

a. High endogenous background

b. Non-destructive assay

c. Quantitative assay

d. High sensitivity

46. Increasing the refractive index of the medium between the object and the objective lens increases

a. refraction

b. reflection

c. magnification

d. resolution

47. If you are using a microscope with a 10 × ocular lens and a 100 × objective lens, what is the total magnification?

a. 10-fold

b. 100-fold

c. 110-fold

d. 1000-fold

48. X-ray diffraction and phase-contrast microscopy both involve

a. wave interference

b. observation of living specimens

c. differential stains

d. simple stains

49. The use of antibodies linked to fluorophores is known as

a. fluorescence

b. immunofluorescence

c. X-ray diffraction

d. atomic force microscopy

50. Which form of microscopy can be used with DNA microarrays to observe differences in gene expression?

a. Atomic force microscopy

b. SEM

c. TEM

d. Confocal fluorescence microscopy

51. The process by which bacteriophages carry host DNA from one cell to another is known as

a. conjugation

b. transformation

c. recombination

d. transduction

52. Which one of the following drugs is a nonribosomal-peptide antibiotic?

a. Erythromycin

b. Penicillin

c. Tetracycline

d. Vancomycin

53. The energy-yielding process of _____ occurs only in the Archaea.

a. fermentation

b. sulfur oxidation

c. hydrogen oxidation

d. methanogenesis

54. UV rays cause

a. deletion of pyramidines

b. dimerization of pyramidines

c. substitution of purine for pyramidine

d. cross-linking of purine with pyramidine

55. The weakest force is

a. van der Waals

b. covalent bond

c. ionic bond

d. hydrogen bonding

56. Covalent bonding between two molecules requires

a. electron with opposite spins

b. no effect of spins

c. electron with same spins

d. electron of the same orbital

57. Which one of the following rays is ***not*** emitted by radioactive substances?

a. Gamma

b. Beta

c. Alpha

d. X-ray

58. Hertz is a unit of

a. loudness

b. intensity

c. frequency

d. power

59. The mass number of a radioactive atom _____ in case of alpha decay.

a. decreases by 4

b. decreases by 2

c. increases by 4

d. increases by 2

60. Thermodynamic probability is _____ to mathematical probability.

a. directly proportional

b. inversely proportional

c. not related

d. equal

61. During osmosis

a. a diluted solution is concentrated

b. salts are filtered out

c. salts are concentrated

d. a concentrated solution becomes diluted

62. When the heart rate increases

a. the duration of the diastole decreases

b. the duration of the diastole increases

c. the blood volume increases

d. the blood pressure decreases

63. Which one of the following types of interaction occurs between water molecules in liquid water?

a. Oxygen bonds

b. Hydrogen bonds

c. Sulfide bonds

d. Covalent bonds

64. Transmembrane proteins can be extracted by using

a. detergents

b. phosphate-buffered saline

c. phosphate-buffered saline with EDTA

d. chelating agents

65. The best conductor of electricity is

a. graphite

b. coal

c. coke

d. diamond

66. What is the mode in the distribution of 25, 17, 23, 23, 24, 25, 23?

a. 25

b. 23

c. 24

d. 17

67. The graph, which shows a parametric test, generally represents

a. median and standard error

b. mean and mode

c. mean and standard deviation

d. mean and range

68. A physician wants to calculate a measure of linear association between two continuous variables. Which one of the following should he use?

a. Simple linear regression

b. Multivariate analysis (MVA)

c. Pearson's correlation coefficient

d. Rank correlation coefficient

69. If a graph is made comparing cold intensity with the temperature, it will provide

a. a perfect positive correlation

b. a perfect negative correlation

c. zero correlation

d. $r = 0$

70. Another name for type–I error is

a. level of significance

b. alpha error

c. beta error

d. *P*-value

71. Which one of the following is ***not*** an example of natural selection?

a. Stabilizing selection

b. Disruptive selection

c. Operational selection

d. Directional selection

72. Sex is determined differently in different species. However, some commonalities still exist. Which of the following mechanisms is common to sex determination in *Drosophila*, *C. elegans*, mammals and plants?

a. Alternative splicing in sex-specific manner

b. Transcriptional regulation

c. Environmental control of sex determination

d. Y-chromosome

73. In the intestinal microvilli, several disaccharidases are present that break down food to simple monosaccharides. Which one of the following is ***not*** a disaccharidase in the intestine?

a. Amylase

b. Lactase

c. Sucrase

d. Trehalase

74. Rational drug design approach is the method of designing molecules complementary in shape and charge to the biomolecular target to which they bind. Cimetidine was one of the first drugs discovered through such an approach at GlaxoSmithKline by Sir James Black who was awarded the Nobel Prize in 1988 (for a different molecule). Cimetidine is the first line of therapeutic against peptic ulcer. It acts by targeting

a. pepsin

b. chloride channels

c. histamine H2 receptors

d. Na^+/H^+ antiporter

75. The commonly called 'good cholesterol' refers to

a. chylomicrons-bound cholesterol

b. very low density lipoprotein-bound cholesterol

c. low density lipoprotein-bound cholesterol

d. high density lipoprotein-bound cholesterol

76. Aquatic invertebrates such as cnidarians, cephalopods, crustaceans and echinoderms contain statocyst which is lined with sensory setae. The animal itself introduces minute sand grains (statoliths) that remain attached to the setae due to the glandular secretions from the tissue. The purpose of these statocysts is essentially to

a. maintain the equilibrium of the body

b. camouflage it in the presence of a predator

c. increase sensory perception

d. provide a protective shell to the underlying nervous system

77. The bicuspid or mitral valve separates the

a. right auricle and ventricle

b. left auricle and ventricle

c. right ventricle and pulmonary aorta

d. left ventricle and systematic or left aorta

78. The end product of glycolysis in erythrocytes is always

a. carbon dioxide

b. oxaloacetate

c. acetyl-CoA

d. lactate

79. A cardiac muscle differs from a skeletal muscle in that

a. it is striped or striated

b. it has autonomic innervations

c. it requires calcium for contraction

d. it acts voluntarily

80. Which one of the following is ***not*** a component of bacterial lipopolysaccharide?

a. Lipid A

b. Cholesterol

c. Endotoxin

d. Abequose

81. Leaves on a stem or branch are arranged so as to avoid shading one another. For example, in the China rose the sixth leaf stands over the first, and the genetic spiral completes two circles to come to that particular leaf. Such arrangements are generally termed as

a. leaf mosaic

b. phyllotaxy

c. aestivation

d. Fibonacci series

82. Which one of the following structures is a modification of the root?

a. Rhizome

b. Bulb

c. Tuber

d. Velamen

83. In C4 plants, carbon dioxide is fixed in the mesophyll cells in the form of

a. 3-phosphoglycerate

b. erythrose 4-phosphate

c. ribulose 1,5-bisphosphate

d. oxaloacetate

84. Which of the cell wall components is impermeable to water and thus assists in preventing its evaporation?

a. Cellulose

b. Lignin

c. Suberin

d. Inulin

85. Nitrogen fixation is essentially an anaerobic process because

a. of the high electrophilic property of oxygen

b. of the presence of leghemoglobin

c. all nitrogen-fixing bacteria are anaerobic

d. nitrogen is fixed as ammonia rather than as nitrate

86. Annual rings, which can readily be seen with the naked eye in the logs of a tree trunk, as in the pine, can be counted to approximately determine the age of a plant. These annual rings are formed due to the activity of

a. cambium

b. duramen

c. alburnum

d. phellogen

87. Anaphase promoting complex catalyzes the ubiquitylation and destruction of

a. securin

b. S-cyclin

c. M-cyclin

d. all of the above

88. During ATP synthesis by ATP synthase in mitochondrial membrane, 0-state conformation of the nucleotide binding site of β subunit binds

a. ADP and Pi more strongly

b. ATP very poorly, and ADP and Pi weakly

c. ATP and Pi very tightly

d. Cannot bind ATP

89. Cyclic electron flow through photosystem I (PSI) generates

a. proton motive force

b. NADPH

c. O_2

d. all of the above

90. Which one of the following is the primary lipid component of biomembranes?

a. Phospholipid

b. Sphingolipid

c. Sterol

d. Chylomicron

91. What is the main advantage of the C4 photosynthesis strategy over the C_3 strategy?

a. It allows the plant to avoid photorespiration by producing a four-carbon sugar in place of glucose

b. It makes it possible for the plant to use the Calvin cycle at night as well as during the day

c. It allows the plant to fix carbon more efficiently under the conditions of low atmospheric CO_2

d. It helps the plant to conserve water and synthesize glucose efficiently under hot, dry conditions

92. The maximum diversity in receptors is found in

a. nuclear receptors

b. voltage-gated ion channels

c. GPCR

d. tyrosine kinases

93. The covalent attachment of enzyme molecules is via

a. nonessential amino acids residues to water insoluble, functional supports

b. essential amino acids residues to water insoluble, functional supports

c. nonessential amino acids residues to water soluble, functional supports

d. essential amino acids residues to water soluble, functional supports

94. *Saccharomyces cerevisiae*, grown in a chemostat, converts glucose to biomass, ethanol, glycerol and carbon dioxide. At steady state, the concentration of glucose, biomass, ethanol and glycerol will

a. decrease with time

b. increase with time

c. be constant

d. change randomly with time

95. Which one of the following electron carriers in the respiratory chain is a protein-bound prosthetic group?

a. Coenzyme Q

b. Ubiquinone

c. Cytochrome c

d. Both a and b

96. Which one of the following does ***not*** take place in the 5′ to 3′ direction?

a. DNA replication

b. Transcription

c. Nick translation

d. RNA editing

97. In the Meselson-Stahl DNA replication experiment, what percent of the DNA was composed of one light strand and one heavy strand after one generation of growth in ^{14}N containing growth media?

a. 0

b. 25

c. 50

d. 100

98. In the classical model of transcriptional control by Jacob and Monod, a repressor protein binds to

a. an enhancer

b. an AUG sequence

c. a TATA box

d. an operator

99. DNA polymerase III is thought to add nucleotides to the

a. 5′ end of the RNA primer

b. 3′ end of the RNA primer

c. place of the primer RNA after it is removed

d. single-stranded templates without need for an RNA primer

100. Frederick Griffith accidentally discovered transformation when attempting to develop a vaccine for pneumonia. He injected mice with samples from S-strain (virulent) and/or R-strain (nonvirulent) pneumococci bacteria (*Streptococcus pneumoniae*). Which of the following results is ***not*** consistent with Griffith's experiments?

a. Injected S-strain; mouse dies

b. Injected R-strain; mouse lives

c. Injected heat-killed S-strain; mouse lives

d. Injected mixture of heat-killed S-strain and live R-strain; mouse lives

101. The immobilized enzyme produced by microencapsulation technique provides

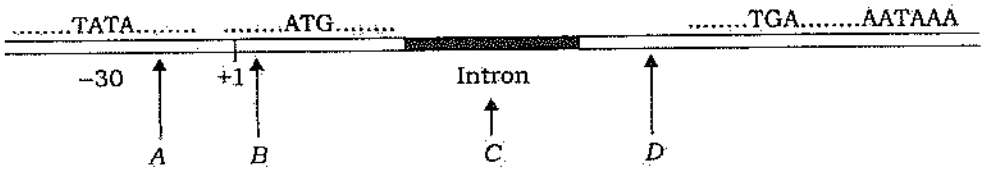
a. an extremely large surface area

b. reduced surface area

c. high amount of solvent

d. similar surface area

102. The diagram below depicts an eukaryotic gene. In which region would the insertion of a single base pair of DNA be most likely to cause a frameshift mutation?



a. *A*

b. *B*

c. *C*

d. *D*

103. What provides the energy that drives the addition of nucleotides to a growing DNA chain during replication?

a. The release of a pyrophosphate

b. The hydrolysis of ATP

c. The hydrolysis of a pyrophosphate

d. The hydrolysis of GTP

104. Termination of transcription by eukaryotic RNA polymerase II

a. is triggered by a stop codon

b. is catalyzed by poly-A polymerase

c. takes place precisely at the polyadenylation signal

d. is triggered by a stem-loop structure in the RNA

105. Regarding transcription of eukaryotic genes by RNA polymerase II, enhancers are best characterized as

a. DNA sequences to which transcriptional activators bind

b. proteins that stimulate transcriptional initiation

c. DNA sequences to which basal transcription factors bind

d. proteins that inhibit transcriptional initiation

106. Transition state idea in chemical reactions led Linus Pauling to predict

a. catalytic antibody

b. ribozymes

c. autoantibodies

d. induced antibodies

107. Hapten-specific antibodies can be generated by

a. using alum instead of FCA

b. immunizing with hapten-protein conjugate

c. injecting horse instead of rabbit

d. administering glucocorticoids along with the hapten

108. Which type of cells is known to be involved in the initial presentation of antigen to T-lymphocytes?

a. Dendritic cells

b. Plasma cells

c. Neutrophil polymorphonuclear leucocytes

d. Erythrocytes

109. Which one of the following types of cells produces IgE?

a. Mast cells

b. Eosinophils

c. T-lymphocytes

d. Plasma cells

110. Cancer cells often have reduced amounts of cell surface proteins, including class-I MHC antigens. Which one of the following cells of the immune system can exploit this property to kill cancer cells?

a. Cytotoxic T-cell

b. Natural killer cell

c. Helper T-cell

d. Macrophage

111. Which one of the following molecules is recognized by a T-cell receptor?

a. Immunoglobulin

b. MHC complex

c. B-cell receptor

d. Integrin

112. Which one of the following proteins is ***not*** a part of pre-B-cell receptor?

a. VpreB

b. λ5

c. Mu heavy chain

d. Beta-2-microglobulin

113. Which one of the following molecules does ***not*** belong to immunoglobulin superfamily?

a. MHC class-II molecule

b. ICAM molecule

c. Beta-2-microglobulin

d. LFA-1 molecule

114. Which one of the following proteins is ***not*** involved in LPS signaling?

a. CD14

b. G protein

c. TLR4

d. myD88

115. Which cell surface molecule/molecules on T-helper cells binds/bind HIV?

a. CD4 molecule alone

b. CD4 and CCR5 molecules

c. CD8 molecule alone

d. CD8 and CXCR4 molecules

116. Which one of the following molecules serves as opsonin?

a. C5a

b. C3a

c. Light chain

d. C3b

117. Inflammatory reaction results in the generation of

a. C-reactive protein

b. interleukin-2

c. antigen-specific IgG

d. IgE

118. Affinity maturation of antibodies does ***not*** require

a. DNA rearrangement

b. B-cell division

c. antigen

d. genetic mutations

119. The rule of 12 and 23 is about

a. DNA rearrangement in constant domains of IgG light chains

b. DNA rearrangement in variable Ig domains of IgG heavy chains

c. RNA splicing of heavy chain transcripts

d. RNA splicing of light chain transcripts

120. The ABO blood group system is based on the differences in the expression of

a. glycerophospholipids

b. glycosphingolipids

c. gangliosides

d. proteoglycans

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