289

Registration No. :

Centre of Exam. : _____

Name of Candidate : _____

_____
Signature of Invigilator

ENTRANCE EXAMINATION, 2017

Ph.D. BIOTECHNOLOGY

[Field of Study Code : SBTH (904)/SBTJ (815)]

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.

(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 of 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) All questions are compulsory.

(v) Part—A consists of 50 subject specific questions.

(vi) Part—B consists of 50 questions on research methodology.

(vii) Each correct answer carries 1 mark, there is no negative marking.

(viii) Answer written inside the question paper will not be evaluated.

(ix) Simple Calculator and Log Tables may be used.

(x) Pages at the end have been provided for rough work.

(xi) Return the Question Paper and Answer Sheet to the Invigilator at the end of the Entrance Examination.

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 <u>ONLY ONE CIRCLE</u> for each question as shown in example below :

Wrong	Wrong	Wrong	Wrong	Correct
O ⓑ © O	Ⓐ ⓑ © ⓓ	Ⓐ ⓑ © ⓓ	⊙ ⓑ © O	ⓐ ⓑ © O

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.**

/289-A

PART—A

Answer all questions

1. The first recombinant subunit vaccine approved for human use is

   (a) Hepatitis B vaccine

   (b) Hib vaccine

   (c) Var vaccine

   (d) DPT vaccine

2. Following are some of the characteristics of MHC class I and class II molecules except one which is applicable only for MHC class I. Identify the appropriate statement.

   (a) They are expressed constitutively on all nucleated cells.

   (b) They are glycosylated polypeptides with domain structure.

   (c) They are involved in presentation of antigen fragments to cells.

   (d) They are expressed on surface membrane of B cells.

3. What are LAG-3, PD-1 and CTLA-4?

   (a) Markers for Immune Activation

   (b) Immune Inflammation

   (c) Exhaustion Markers

   (d) Senescent Markers

4. Choose the correct statement about peptides in the Ramachandran plot.

   (a) Peptides that are unstructured will have all the backbone dihedral angles in the disallowed regions.

   (b) It is not possible to conclude whether a peptide adopts entirely helix or entirely beta sheet conformation.

   (c) The occurrence of beta turn conformation in a peptide can be deduced.

   (d) The sequence of a peptide can be deduced.

5. A vaccine can be

   (a) an antigenic protein

   (b) weakened pathogen

   (c) live attenuated pathogen

   (d) All of the above

6. Telomerase, an RNA-protein complex which completes the replication of telomeres during DNA synthesis, is a specialised

   (a) RNA dependent DNA polymerase

   (b) DNA dependent DNA polymerase

   (c) DNA dependent RNA polymerase

   (d) RNA dependent RNA polymerase

7. Which one of the following is a food-borne toxin?

   (a) Tetanus toxin

   (b) Botulinum toxin

   (c) Cholera toxin

   (d) Diphtheria toxin

8. Consider the following statements :

   I. For a reaction to occur spontaneously the free energy change must be negative.

   II. The interaction between two nitrogen molecules in the gaseous state is predominantly electrostatic.

   III. By knowing bond energies, it is possible to deduce whether the bond is covalent bond or hydrogen bond.

   IV. Hydrophobic interactions are not important in a folded globular protein.

   Pick tHe combination with ALL WRONG statements.

   (a) I and II

   (b) II and III

   (c) III and IV

   (d) II and IV

9. Which one of the following statements regarding B cell receptor (BCR) and T cell receptor (TCR) is **not** true?

   (a) TCR is membrane-bound and does not appear as soluble form as does the BCR.

   (b) Unlike BCR, most of the TCR are not specific for antigen alone but for antigen combined with MHC.

   (c) In order to activate signal transduction, BCR associates itself with Ig-α/Ig-β whereas TCR associates with CD3.

   (d) The antigen binding interactions of BCR is much weaker than TCR.

10. Enzymes accelerate a reaction by which one of the following strategies?

   (a) Decreasing energy required to form the transition state

   (b) Increasing kinetic energy of the substrate

   (c) Increasing the free energy difference between substrate and the product

   (d) Increasing the turnover number of enzymes

11. MX2 is

   (a) promotor for HIV replication

   (b) integrase inhibitor

   (c) an interferon-stimulated gene, which reduces the permissiveness of cell for HIV and other lentiviral infections

   (d) a non-nucleoside reverse transcriptase inhibitor, which inhibits HIV replication

12. An antibiotic that resembles the 3 prime-end of a charged tRNA molecule is

   (a) streptomycin

   (b) sparsomycin

   (c) puromycin

   (d) tetracycline

13. Plasmids encoding antigenic protein from a pathogen that is directly injected into the cells where it expresses, constitute

    (a) protein vaccines

    (b) nucleotide vaccines

    (c) DNA vaccines

    (d) recombined vaccines

14. Cytotoxic T cells express

    (a) CD8 marker and are class II MHC restricted

    (b) CD4 marker and are class I MHC restricted

    (c) CD4 marker and are class II MHC restricted

    (d) CD8 marker and are class I MHC restricted

15. Active immunity may be gained by

    (a) natural infection

    (b) vaccines

    (c) toxoids

    (d) All of the above

16. Which of the following is *not* a second messenger?

    (a) Cyclic GMP

    (b) Diacylglycerol

    (c) Inositol triphosphate

    (d) Phosphatidyl inositol

17. Which of the following is a polysaccharide vaccine?

   (a) Anthrax vaccine

   (b) Rabies vaccine

   (c) Hepatitis A vaccine

   (d) Hib vaccine

18. Which gas *does not* contribute to global warming through its greenhouse effect?

   (a) Nitrous oxide

   (b) Methane

   (c) Carbon dioxide

   (d) Nitric oxide

19. Which one of the following would contribute to intrinsic fluorescence to a protein?

   (a) Aromatic amino acids

   (b) Disulfide bonds

   (c) Charged amino acids

   (d) Branched chain amino acids

20. In SCID, there is

   (a) low IgM

   (b) low number of neutrophils

   (c) low number of T cells and B cells

   (d) low number of macrophages

21. Passive immunization includes

    (a) introduction of antibodies directly

    (b) transfer of maternal antibodies across placenta

    (c) transfer of lymphocyte directly

    (d) All of the above

22. Which of the following is a combined vaccine?

    (a) Hepatitis B vaccine

    (b) Hib vaccine

    (c) Var vaccine

    (d) DPT vaccine

23. All the given vaccines are attenuated or inactivated whole pathogen, *except*

    (a) Salk

    (b) Sabin

    (c) Hepatitis A

    (d) Tetanus

24. Synthetic Biology is a new field towards

    (a) design and construction of biological components

    (b) computational prediction of networks

    (c) random synthesis of biological components

    (d) synthesis of biochemicals

25. The Membrane Attack Complex of the complement system is also known as the

(a) C5b6789 complex

(b) C5b5678 complex

(c) C5b5789 complex

(d) Protein polysaccharide complex

26. Sorting of lysosomal enzymes to lysosomes involve

(a) removal of an N-linked oligosaccharide side chain

(b) transport to the cell surface

(c) retrograde traffic from the Golgi back to the RER

(d) tagging newly synthesized lysosomal enzymes with a phosphomannose signal and recognition of that signal by a mannose-6-phosphate receptor

27. The first published complete genome sequence was

(a) M 13 phage

(b) *E. coli*

(c) MS2 bacteriophage

(d) ϕX174

28. Mitochondrial targeting pre-sequences usually consist of a

(a) hydrophobic segment

(b) hydrophilic segment

(c) negatively charged alpha helix

(d) positively charged alpha helix

29. If we ever wish to find a 'fourth law of Mendelian inheritance', the most promising space for finding such a law would be

(a) telomeric ends of DNA

(b) single nucleotide polymorphisms

(c) biomolecular networks

(d) stem cells

30. Serial analysis of gene expression MAY be used for which of the following applications?

(a) mRNA profiling

(b) tRNA profiling

(c) pseudogene profiling

(d) cDNA profiling

31. In which of the following structures, is the indicated lone pair involved in resonance?
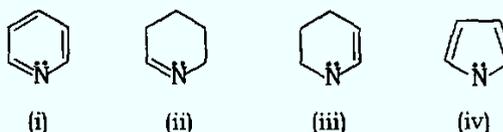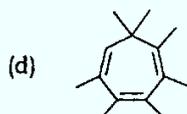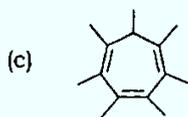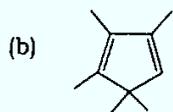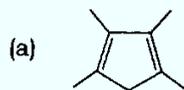

(i) (ii) (iii) (iv)

(a) (i), (iii) and (iv)

(b) (iii) and (iv)

(c) (i) and (iv)

(d) (ii) and (iii)

32. Identify the correct order for the electron density in the aromatic ring for the following compounds :
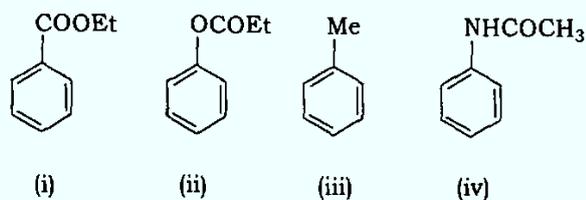
(i) (ii) (iii) (iv)

(a) (iv) > (iii) > (ii) > (i)

(b) (i) > (ii) > (iv) > (iii)

(c) (iv) > (ii) > (iii) > (i)

(d) (iv) > (i) > (ii) > (iii)

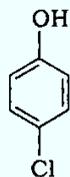**33.** Which one of the following compounds is the most acidic?

(a)

(b)

(c)

(d)

34. Identify the product for the following transformation :

$$PhMgBr + CH_3CH_2OH \rightarrow Product$$

(a) Ph—H

(b) Ph—OCH$_2$CH$_3$
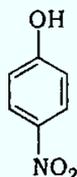
(c) Ph—OH

(d) Ph—CH$_2$CH$_3$

35. Arrange the compounds in the order of increasing acidity :
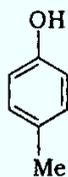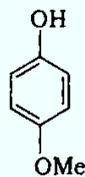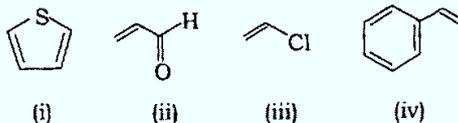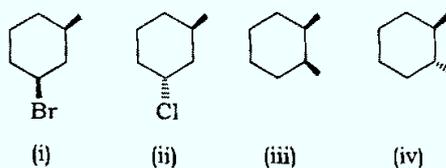

(i)   (ii)   (iii)   (iv)

(a) (i) < (iii) < (ii) < (iv)

(b) (iv) < (ii) < (i) < (iii)

(c) (ii) < (iv) < (i) < (iii)

(d) (iv) < (iii) < (ii) < (i)

36. Which of the following compounds can undergo polymerization readily?

(i)   (ii)   (iii)   (iv)

(a) (ii) and (iii) only

(b) (iii) and (iv) only

(c) (i), (ii), (iii) and (iv)

(d) (ii), (iii) and (iv)

37. Arrange the compounds in the correct order of the increasing stability :

Br   Cl
(i)   (ii)   (iii)   (iv)

(a) (ii) < (i) < (iii) < (iv)

(b) (i) < (ii) < (iii) < (iv)

(c) (ii) < (i) < (iv) < (iii)

(d) (i) < (ii) < (iv) < (iii)

38. Which of the following compounds shows tautomerism?

$C_3H_7NO_2$ OH   O   Br
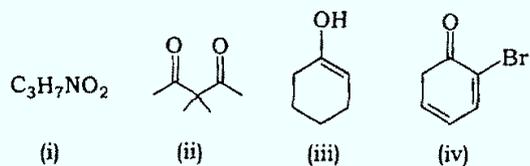
(i)   (ii)   (iii)   (iv)

(a) (i), (ii), (iii) and (iv)

(b) (ii) and (iv)

(c) (i), (ii) and (iv)

(d) (i), (ii) and (iii)

39. For the following ions, the correct order of nucleophilic strength is

(a) $C_6H_5O^- < CH_3O^- < CH_3COO^- < OH^-$

(b) $CH_3COO^- < OH^- < C_6H_5O^- < CH_3O^-$

(c) $CH_3COO^- < C_6H_5O^- < OH^- < CH_3O^-$

(d) $C_6H_5O^- < CH_3COO^- < CH_3O^- < OH^-$

40. Conventional adsorption is a/an

(a) reversible process

(b) irreversible process

(c) either reversible or irreversible process

(d) None of the above

41. A genetic change that is completely fixed in a population is

(a) substitution

(b) mutation

(c) recombination

(d) polymorphism

42. If the viscosity of a fluid decreases with increasing stirrer speed, the nature of the fluid is

(a) Newtonian

(b) pseudoplastic

(c) dilatant

(d) thixotropic

13

43. Which of the following terms refers to the molecular modelling computational method that uses equations obeying the laws of classical physics?

    (a) Quantum mechanics

    (b) Molecular calculations

    (c) Molecular mechanics

    (d) Quantum theory

44. The gravitational force between two objects A and B is given by 4·8 N. The mass of B was reduced to one-half while A's mass remained the same. Calculate the new gravitational force.

    (a) 9·6 N

    (b) 4·8 N

    (c) 2·4 N

    (d) 1·2 N

45. If two objects with molecular masses, m_1 and m_2 (where $m_1 > m_2$), are connected with a string on a single pulley, then the acceleration of the system will be given by

    (a) $(m_2 - m_1)\,g\,/(m_1 + m_2)$

    (b) $(m_1 - m_2)\,g\,/(m_1 + m_2)$

    (c) $(m_1 + m_2)\,g\,/(m_1 - m_2)$

    (d) $(m_1 + m_2)\,/(m_1 - m_2)\,g$

46. Find the center of the circle, if the equation is given by $x^2 + 8x + y^2 - 6y + 40 = 0$.

    (a) 4, –3

    (b) 2, 3

    (c) – 4, 3

    (d) 3, – 4

47. Let L be the line passing through the point (4, 6) with slope 3/2. The x-intercept and y-intercept of L is given by

(a) 1, –3

(b) 1, 3

(c) –3, 1

(d) 3, –1

48. If $m\sin\theta = n\sin(\theta + 2\alpha)$, then $\tan(\theta + \alpha)\cot\alpha$ can be represented by

(a) $(m + n)/(m - n)$

(b) $(n + m)/(n - m)$

(c) m/n

(d) $(m - n)/(m + n)$

49. Find the number that exceeds its square by maximum amount.

(a) $\frac{1}{4}$

(b) $\frac{1}{2}$

(c) 2

(d) 4

50. Find the determinant of the matrix
$$\begin{bmatrix} 3 & 7 & 6 \\ 5 & 4 & 10 \\ 4 & 3 & 8 \end{bmatrix}$$

(a) 12

(b) 1

(c) 0

(d) 24

51. Type-I error is

(a) when the null hypothesis is true and you reject it

(b) when the null hypothesis is false and you accept it

(c) when the alternate hypothesis is true and you reject it

(d) when the alternate hypothesis is false and you accept it

52. Which one of the following is a Type-II error?

(a) A fire alarm going on indicating a fire when in fact there is no fire

(b) A blood test failing to detect the disease it was designed to detect

(c) A blood test detecting a disease when in fact the patient does not have the disease

(d) An experiment indicating that a medical treatment should cure a disease when in fact it does not

53. Which of the following statements is *not* correct?

(a) Screening test would be cheap.

(b) Screening test would be easy to administer.

(c) Screening test produces less false-negatives.

(d) Screening test produces less false-positives.

54. Which one of the following is *not* a primary source?

(a) Journal article

(b) Blueprint

(c) Thesis

(d) Technical report

55. Which one of the following is *not* considered as a part of research design?

(a) Field study

(b) Market analysis

(c) Expert opinion

(d) Literature survey

56. In clinical study research, which one of the following is secondary research?

(a) Interventional study

(b) Meta-analysis

(c) Prognostic study

(d) Animal study

57. Shotgun cloning differs from the clone-by-clone method in which of the following ways?

(a) The location of the clone being sequenced is known relative to other clones within the genomic library in shotgun cloning

(b) Genetic markers are used to identify clones in shotgun cloning

(c) The entire genome is sequenced in the clone-by-clone method, but not in shotgun sequencing

(d) No genetic or physical maps of the genome are needed to begin shotgun cloning

58. One limitation of computational systems biology

(a) cannot capture emergent properties

(b) cannot model gene expression events

(c) cannot capture cell-cell interactions

(d) modelling predictions are inaccurate

59. Transgenic organisms are identified by hybridizing them with

    (a) host

    (b) vector

    (c) Both (a) and (b)

    (d) DNA probe

60. The addition of poly A tails in PCR reactions is dependent on the

    (a) template

    (b) type of Taq polymerase

    (c) primer

    (d) composition of the PCR buffer

61. Molecular dynamics differs from molecular mechanics by taking into account

    (a) the velocities of the constituent particles

    (b) the effect of the solvent medium

    (c) the non-bonded interactions

    (d) the periodic boundary condition

62. What is the nucleotide sequence of the DNA region displayed in the autoradiogram of a sequencing gel below?
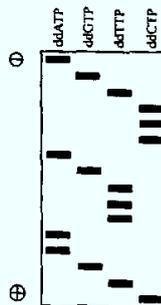
    (a) 5'-primer-AGTCCCAGTTTAAGTC-3'

    (b) 5'-AGTCCCAGTTTAAGTC-primer-3'

    (c) 5'-primer-CTGAATTTGACCCTGA-3'

    (d) 5'-AGTCCCAGTTTAAGTC-3'

63. What does E denote in E-value?

   (a) Expectation value

   (b) Expectant value

   (c) Exponential value

   (d) Expert value

64. Cell organelle markers are important for

   (a) diagnosis

   (b) studying cellular signalling

   (c) monitoring protein trafficking

   (d) Both (b) and (c)

65. During an experiment, a student found increased activity of a protein, for which there were three possible explanations, viz., increased expression of the protein, increased phosphorylation, or increased interaction with other effector proteins. After conducting several experiments, the student concluded that increased activity was due to increased phosphorylation.

   Which one of the following experiments will *not* support/provide the correct explanation drawn by the student?

   (a) Western blot analysis

   (b) Analysis of transcription rate

   (c) Mass spectroscopy

   (d) Phosphoamino acid analysis

66. As topoisomerases play an important role during replication, a large number of anticancer drugs have been developed that inhibit the activity of these enzymes. Which of the following statements is *not* true about topoisomerases as a potential anticancer drug target?

   (a) As cancer cells are rapidly growing cells, they usually contain higher level of topoisomerases.

   (b) The transient DNA breaks created by topoisomerases are usually converted to permanent breaks in the genome in the presence of topoisomerase targeted drugs.

   (c) As cancer cells often have impaired DNA repair pathways, they are more susceptible towards topoisomerase targeted drugs.

   (d) The drugs which specifically target topoisomerases, usually do not affect normal fast growing cells.

67. Immunoglobulins have therapeutic applications in cancer treatment, infection clearance and targeted drug delivery. For this reason, immunoglobulins are briefly cleaved by the enzyme pepsin. Following are some of the statements regarding the brief digestion of immunoglobulin by pepsin.

(i) F(ab)2 fragment is generated which retains the antigen binding activity.

(ii) F(ab) fragment having antigen binding activity and the crystallizable Fc fragment are generated.

(iii) The fragment generated on incubation with a proper antigen forms a visible precipitate.

(iv) The fragment generated is incapable of forming a visible precipitate on incubation with a proper antigen.

Which of the above statements are correct?

(a) (i) and (ii)

(b) (i) and (iii)

(c) (i) and (iv)

(d) (ii) and (iii)

68. In an experiment, peritoneal macrophages were isolated from strain A of guinea pig. These cells were then incubated with an antigen. After the antigen pulsed macrophages processed the antigen and presented it on their surface, these were mixed with T cells from (i) strain A or (ii) strain B (a different strain of guinea pig) or (iii) F1 progeny of both strains. T cell proliferation was measured in response to antigen pulsed macrophages.

T cells of which strain of guinea pig will be activated?

(a) Strain A only

(b) Strain B only

(c) Strain A and F1 progeny

(d) Strain B and F1 progeny

69. In a typical gene cloning experiment, by mistake a researcher introduced the DNA of interest within the ampicilin resistant gene instead of lac z gene. The competent cells were allowed to take up the plasmid and then plated in the media containing ampicilin, X-gal and IPTG and subjected to blue-white screening. Considering all plasmids were recombinant, which one of the following statements correctly describes the outcome of the experiment?

(a) The bacteria which took up the plasmids would grow and give blue colonies.

(b) The bacteria which took up the plasmids would not grow.

(c) The bacteria which took up the plasmids would form white colonies.

(d) All of the bacteria would grow and give white colonies.

70. Radioimmunoassay (RIA) can be employed for the detection of insulin in blood plasma. For this, ^{125}I-labelled insulin is mixed and allowed to bind with a known concentration of anti-insulin antibody. A known volume of patients' blood plasma is then added to the conjugate and allowed to compete with the antigen binding sites of antibody. The bound antigen is then separated from unbound ones and the radioactivity of free antigen is then measured by a gamma counter.

Following are some of the statements made about this assay :

(i) The ratio of radioactive count for unbound antigen to the bound one is more at the end of reaction.

(ii) The ratio of radioactive count for unbound antigen to the bound one is less at the end of reaction.

(iii) For a diabetic patient, the radioactive count for free antigen is less than that for a normal individual.

(iv) For a diabetic patient, the radioactive count for free antigen is more than that for a normal individual.

Which of the above statements are true?

(a) (i) and (iii)

(b) (i) and (iv)

(c) (ii) and (iii)

(d) (ii) and (iv)

71. The secondary antibodies routinely used for the detection of primary antibodies in Western blotting experiment are

(a) anti-allotypic

(b) anti-idiotypic

(c) anti-isotypic

(d) anti-paratypic

72. Which one of the following analytical techniques does *not* involve an optical measurement?

(a) ELISA

(b) Microarray

(c) Flow cytometry

(d) Differential Scanning Calorimetry

21

73. The presence and distribution of specific mRNAs within a cell can be detected by

   (a) Northern blot analysis

   (b) RNase protection assay

   (c) *in situ* hybridization

   (d) real-time PCR

74. An optical measurement of a protein is taken both before and after digestion of the protein by a protease. In which of the following spectroscopic measurements the signal change, i.e., before versus after protease treatment, could be the maximum?

   (a) Absorbance at 280 nm

   (b) Circular dichroism

   (c) Absorbance at 340 nm

   (d) Fluorescence value

75. Which among the following is the simplest method to estimate the concentration of glycerol in an aqueous solution of glycerol?

   (a) UV absorption spectroscopy

   (b) Gas chromatography

   (c) pH measurement

   (d) Viscosity measurement

76. A gene expressing a 50 kDa protein from a eukaryote was cloned in an *E.coli* plasmid under the lac promoter and operator. Upon addition of IPTG, the 50 kDa protein was not detected.

   Which one of the following explains the above observation?

   (a) The cloned sequence lacked the Kozak sequence

   (b) *E.coli* does not make proteins larger than 40 kDa

   (c) Differences in codon preference

   (d) 50 kDa protein contains a nuclear localization signal

77. For identification of three proteins moving together (as a single band) upon loading in a single lane of an SDS-PAGE gel, the best method is

   (a) one-step Western blot

   (b) NMR spectroscopy

   (c) Western blot followed by stripping and reprobing

   (d) ESR spectroscopy

78. Which one of the following techniques will you use to identify more than 1000 differentially expressed genes in normal and tumor tissues in one single experiment?

   (a) RAPD

   (b) Genome sequencing

   (c) ChIP assay

   (d) Transcriptome analysis

79. A culture medium contains two carbon sources, one is preferred carbon source (glucose) and the second is a non-preferred source (lactose). Which one below is correct regarding the nature of growth curve of *E. coli* cultured in this medium?

   (a) Growth curve will be same as when grown in presence of only glucose

   (b) Growth curve will be same as when grown in presence of only lactose

   (c) A lag phase will be observed between the two exponential phases

   (d) Two lag phases will be observed between the two exponential phases

80. Which one of the following statements is correct for amplified-fragment length polymorphism (AFLP)?

   (a) PCR using a combination of random and gene-specific primers

   (b) PCR amplification followed by digestion with restriction enzymes

   (c) Digestion of DNA with restriction enzymes followed by one-step PCR

   (d) Digestion of DNA with restriction enzymes followed by two-step PCR

81. Serum has essentially the same composition as plasma *except* that it lacks

(a) albumin

(b) Stuart-Prower factor

(c) anti-hemophilic factor

(d) Hageman factor

82. Addition of the antibiotic cephalexin to growing *E.coli* cells lead to filamentation of the cells, followed by lysis. Cephalexin is an inhibitor of

(a) protein synthesis

(b) DNA synthesis

(c) peptidoglycan synthesis

(d) RNA polymerase

83. If your results say that the p value is < 0·001, what can you conclude?

(a) There was not a significant result, this would have only arose 10/100 through chance

(b) There was a significant result and this would never have happened through chance

(c) There was a significant result, this would have only arose 10/100 through chance

(d) There was a significant result and this would have only arose 1/100 through chance

84. By looking at the expression profile of cell surface markers, CCR7 and CD45RO on CD8 T cells, suggest which quadrant will represent TEM (Effector memory T cells).

CD8 T cells

CCR7	A	B
	C	D

CD45RA
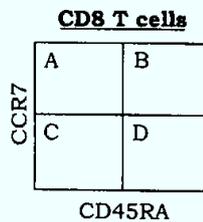
(a) A

(b) B

(c) C

(d) D

85. You are infected with X virus. Which of the following methods will you use to detect X-specific CD8 T cell response in your peripheral blood?

   (a) ELISA

   (b) ELISPOT

   (c) Immunoblot assay

   (d) RFLP

86. A nonparametric test that is often conducted in crossover designs of paired samples is

   (a) ANOVA

   (b) Mann-Whitney U-test

   (c) Chi-test

   (d) Wilcoxon Signed-Rank test

87. Bone marrow purging in myeloid leukemias can be successfully carried out using antibodies to

   (a) CD3

   (b) CD33

   (c) CD5

   (d) CD45

88. If a solute passes through a membrane freely, the rejection coefficient is

   (a) 1

   (b) 0

   (c) > 1

   (d) < 1

89. Which of the following operations *does not* come under upstream processing?

(a) Media preparation

(b) Inoculum development

(c) Effluent treatment

(d) Storage of substrate material

90. Chromatography is based on the

(a) different rate of movement of different solutes in the column

(b) separation of one solute from the other constituents by capture on the adsorbent

(c) different rate of movement of the elutant in the column

(d) All of the above

91. A liquid is flowing at 11400 L/hr along a pipeline having a diameter of 4 cm. If the liquid has a density of 1 g/mL and viscosity of 0.001 kg m^{-1} s^{-1}, then the liquid would be in

(a) laminar flow

(b) transient flow

(c) turbulent flow

(d) Any of the above is possible

92. In an animal cell bioreactor, bubble damage can be minimized by

(a) addition of a shear protectorant

(b) using bubble-free oxygen delivery system

(c) headspace aeration

(d) All of the above

93. After cell wall disruption, the viscosity of the fermentation broth rises, because

(a) nucleic acids are released in the broth

(b) long chain proteins are released in the broth

(c) globular proteins are released in the broth

(d) lipo-polysaccharides are released in the broth

94. A protein solution has an absorbance of 0·2 at 280 nm. If the molar extinction coefficient of the protein at 280 nm is given by 40000 $M^{-1}\,cm^{-1}$, find the concentration of the protein in the solution.

(a) $5 \times 10^{-7}\ M$

(b) $5 \times 10^{-4}\ M$

(c) $5 \times 10^{-6}\ M$

(d) $8 \times 10^{-7}\ M$

95. The structure of the protein has been unfolded using urea. Which of the techniques will *not* be able to quantitatively measure the unfolding?

(a) Circular dichroism

(b) Fluorescence spectroscopy

(c) Isothermal calorimetry

(d) UV-Vis spectroscopy

96. If the native protein gel is run at pH 6·8 instead of pH 8·8, what will be the migration profile of the whole cell proteins?

(a) All the proteins will stack at the stacking gel

(b) Some proteins will enter the gel but fail to migrate

(c) There will be no change in the migration profile at all

(d) Some protein bands will be missing

97. If 6 gm of NaOH is dissolved in 180 mL of the solution, what is the normality of NaOH solution?

(a) 0·833 N

(b) 8·33 N

(c) 1·667 N

(d) 0·1667 N

98. What is it called when the participants are not revealed to anyone but researcher and staff?

(a) Confidentiality

(b) Ethics

(c) Anonymity

(d) Discretion

99. Which of the following is necessary in obtaining informed consent?

(a) A description of the statistical analyses that will be carried out

(b) A description of the purpose of the research

(c) A description of the reliability and validity of test instruments

(d) A list of publications that the researcher has had in the last ten years

100. Accuracy can be defined as

(a) closeness of a measured value to the real value

(b) number of significant figures used in a measurement

(c) measure of how often an experimental value can be repeated

(d) None of the above

10

11.

12.

SPACE FOR ROUGH WORK

/289-**A**

SPACE FOR ROUGH WORK

SPACE FOR ROUGH WORK

★ ★ ★