

Roll. No.

Question Booklet Number

O.M.R. Serial No.

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**B.Sc. (PART-II) EXAMINATION, 2021
BIOTECHNOLOGY (NEW COURSE)**

[PAPER First (BBT-201)]

(Instrumentation & Bio-Analytical Techniques)

Paper ID

5

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**Question Booklet
Series**

D

Time : 1 : 30 Hours

Max. Marks : 150

Instructions to the Examinee :

परीक्षार्थियों के लिए निर्देश :

1. Do not open this Booklet until you are told to do so.
2. Candidates should fill their roll number, subject and series of question booklet details correctly, otherwise, in case of any discrepancy in the evaluation, it will be the responsibility of the examinee himself.
3. There are 100 questions in the booklet. Examinee is required to answer only 75 questions in the OMR Answer Sheet provided. Four alternative answer to each question are given below the question, out of these four only one answer is correct. The answer which you think is correct or most appropriate, completely fill in the circle containing its letter in your answer sheet (O.M.R. Answer Sheet) with black or blue ball point pen.

1. जब तक कहा न जाये, इस प्रश्नपुस्तिका को न खोलें।
2. परीक्षार्थी अपने अनुक्रमांक, विषय एवं प्रश्नपुस्तिका की सिरिज का विवरण यथास्थान सही-सही भरें, अन्यथा मूल्यांकन में किसी भी प्रकार की विसंगति की दशा में उसकी जिम्मेदारी स्वयं परीक्षार्थी की होगी।
3. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को केवल 75 प्रश्नों का उत्तर दी गई OMR उत्तर-पत्रक में देना है। प्रत्येक प्रश्न के चार वैकल्पिक उत्तर प्रश्न के नीचे दिये गये हैं। इन चारों में से केवल एक ही उत्तर सही है। जिस उत्तर को आप सही या सबसे उचित समझते हैं, अपने उत्तर-पत्रक (O.M.R. Answer Sheet) में उसके अक्षर वाले वृत्त को काले या नीले बॉल प्वाइंट पेन से पूरा भर दें।

(Remaining instructions on last page)

(शेष निर्देश अन्तिम पृष्ठ पर)

ROUGH WORK

1. Protein may be separated according to size by :
 - (A) Isoelectric focusing
 - (B) Molecular exclusion chromatography
 - (C) Ion-exchange chromatography
 - (D) Reverse phase chromatography
2. Chromatography with solid stationary phase is called :
 - (A) Circle chromatography
 - (B) Square chromatography
 - (C) Solid chromatography
 - (D) Adsorption chromatography
3. The mobile phase can be :
 - (A) Only Gas
 - (B) Liquid
 - (C) Only Solid
 - (D) Both gas and liquid
4. Which technique separates charged particles using electric field ?
 - (A) Hydrolysis
 - (B) Electrophoresis
 - (C) Protein synthesis
 - (D) Protein denaturing
5. Agarose can be extracted from which of the following ?
 - (A) *Lycopersicon esculentum*
 - (B) *Ficus benghalensis*
 - (C) *Gracilaria esculenta*
 - (D) *Agrostis stolonifera*
6. The electrophoretic mobility denoted as μ is mathematically expressed as :
 - (A) \sqrt{VE}
 - (B) $\frac{V}{E}$
 - (C) $\frac{E}{V}$
 - (D) $\frac{1}{EV}$
7. For which molecule, electrophoresis is not used ?
 - (A) Separation of proteins
 - (B) Separation of amino acids
 - (C) Separation of lipids
 - (D) Separation of nucleic acid
8. Pulse field gel electrophoresis was developed by :
 - (A) Collins and John
 - (B) Kary Mullis
 - (C) Patrick O' Farrell
 - (D) Schwartz and Cantor
9. In SDS-PAGE, migration of protein is effected by :
 - (A) Charge of protein
 - (B) Size of protein
 - (C) Net charge of protein
 - (D) All of these

10. We can track any metabolic pathway by using any radioisotopes by which technique ?
- (A) Chromatography
 - (B) Tracer technique
 - (C) Centrifugation
 - (D) None of the above
11. Horizontal electrophoresis is also known as :
- (A) Protein electrophoresis
 - (B) DNA/RNA electrophoresis
 - (C) Amino acid electrophoresis
 - (D) SDS electrophoresis
12. Absorbance spectroscopy is based on :
- (A) Beer-Lambert's law
 - (B) Bragg's law
 - (C) De Broglie equation
 - (D) Newton's law
13. How many monochromators used in fluorescence spectrophotometer ?
- (A) 3
 - (B) 1
 - (C) 2
 - (D) 0
14. Volatile pollutant/organic sample can be separated by :
- (A) TLC
 - (B) HPLC
 - (C) GC
 - (D) Spectrophotometer UV/Visible
15. The principle of pH meter is based on :
- (A) Voltammetry
 - (B) Galvanometer
 - (C) Paleography
 - (D) Potentiometer
16. The term pH is given by :
- (A) Darwin
 - (B) Matnikuff
 - (C) Sorensen
 - (D) Muller
17. In reducing gel electrophoresis, which chemical is used ?
- (A) SDS
 - (B) β -mercaptoethanol
 - (C) Alcohol
 - (D) Acid

18. Monoclonal antibodies are produced by which technique ?

- (A) Myeloma
- (B) Hybridoma
- (C) Monocytes
- (D) Adipocytes

19. The pH at which the total charge of protein is zero is known as :

- (A) Isotachopheresis
- (B) Neutral point
- (C) Isoelectric point
- (D) Zero point

20. Which one of the following is not the part of Centrifuge Machine ?

- (A) Rotor
- (B) Gel casting tray
- (C) Lid
- (D) Axis

21. Distance travelled by solute/Distance travelled by solvent in chromatography is termed as :

- (A) Reference point
- (B) End point
- (C) Retention factor
- (D) Sample point

22. Enzyme linked with the antibody is known as :

- (A) Primary antibody
- (B) Secondary antibody
- (C) Monoclonal antibody
- (D) Enzyme antibody

23. The correct formula for half life detection is :

- (A) $\lambda = 0.693 \times t$
- (B) $t_{1/2} = 0.693 + \lambda$
- (C) $t_{1/2} = \frac{0.693}{\lambda}$
- (D) $k = \frac{\lambda}{0.693}$

24. What is small 's' stands for in centrifugation ?

- (A) Sedimentation coefficient
- (B) Sedimentation
- (C) Svedberg
- (D) None of the above

25. Bond vibration of a molecule can be studied by :

- (A) Circular dichroism
- (B) Absorption spectroscopy
- (C) NMR
- (D) Vibrational spectroscopy

26. Write the extended notation of the GC-MS :
- (A) Geiger Counter - Mass Spectroscopy
 - (B) Gas Chromatography - Mass Spectroscopy
 - (C) Gel Concentrator - Mass Spectroscopy
 - (D) Gradient Chromatography-Mass Chromatography
27. In X-ray tube,_____is used as source of electrons.
- (A) Anode
 - (B) Cathode
 - (C) Grid
 - (D) Lead
28. Time and location of DNA synthesis can be studied by means of :
- (A) Extraction of DNA at regular intervals from different parts
 - (B) Electron microscopy
 - (C) Carbon dating
 - (D) Radioactive DNA precursors
29. Organelles can be separated from cell homogenate through :
- (A) Chromatography
 - (B) X-ray diffraction
 - (C) Differential/density gradient centrifugation
 - (D) Auto radiography
30. Type of chromatography which uses a column of ligand is :
- (A) Affinity chromatography
 - (B) Adsorption chromatography
 - (C) Ion-exchange chromatography
 - (D) Gel-filtration chromatography
31. The base material used in electrophoresis is :
- (A) Polyacrylamids
 - (B) Agarose
 - (C) Carragenin
 - (D) Both (A) and (B)
32. X-ray crystallography was developed by :
- (A) Bragg
 - (B) Kirk Patrick
 - (C) Astbung and Franklin
 - (D) Watson and Crick
33. What will you call to the study of plant and animal tissues outside the body in a glass tube ?
- (A) In vivo
 - (B) In vitro
 - (C) Innate
 - (D) Ecdysis
34. Maximum magnification in an electron microscope is :
- (A) 2,000
 - (B) 20,000
 - (C) 200
 - (D) 2,00,000

35. Which among of the following the wave is not employed in case of remote sensing ?
- (A) X-rays
(B) Visible ray
(C) Thermal IR
(D) Radio waves
36. Electromagnetic waves varies from ____ to ____.
- (A) meters to nanometer
(B) meters to micrometers
(C) nano to micrometers
(D) centimeter to nanometer
37. The formula of energy produced from the body can be given as :
- (A) $Q = \frac{h \times c}{\lambda}$
(B) $Q = \lambda \times h \times c$
(C) $Q = h + \frac{c}{\lambda}$
(D) $Q = h + c \times \lambda$
38. Beer's law state that the intensity of light decreases with respect to :
- (A) Concentration
(B) Distance
(C) Composition
(D) Volume
39. Which is the unit of absorbance which can be delivered from Beer Lambert's law ?
- (A) $L \text{ mol}^{-1} \text{ cm}^{-1}$
(B) $L \text{ gm}^{-1} \text{ cm}^{-1}$
(C) cm
(D) No unit
40. IR spectrum is a plot of :
- (A) % transmittance versus time
(B) % transmittance versus wave number
(C) Peak area versus time
(D) Peak area versus wave number
41. How do UV light microscope use fluorescence to make images ?
- (A) Objects absorb invisible UV light and emit visible light to make image
(B) Objects absorb invisible UV light and emit nothing
(C) Object transmits UV light without absorbing it
(D) Objects scatter all UV light so it never enters the microscope's objective lenses
42. NMR is the study of the absorption of ____ by nuclei in a magnetic field.
- (A) Radioactive radiation
(B) IR radiation
(C) Radio frequency radiation
(D) Microwave radiation

43. Feulgen test is specific for :
 (A) RNA
 (B) DNA
 (C) Lipid
 (D) Protein
44. Chromatography cannot be used to purify volatile substances :
 (A) True
 (B) False
 (C) Both (A) and (B)
 (D) None of the above
45. Thin layer chromatography is :
 (A) Partition chromatography
 (B) Electrical mobility of Ionic species
 (C) Adsorption chromatography
 (D) None of the above
46. Which of the following is not a failure in pH meters ?
 (A) Defective electrodes
 (B) Defective input circuitry
 (C) Defective electronic circuit
 (D) Defective calibration
47. The electro phoresis technique that is used in isoelectric focusing is :
 (A) AGE
 (B) 2D-PAGE
 (C) PFGE
 (D) SDS-PAGE
48. In SDS-PAGE, migration of protein is effected by :
 (A) Charge of protein
 (B) Size of protein
 (C) Net charge of protein
 (D) All of the above
49. Western Blalting is a part of :
 (A) Chromatography
 (B) Electrophoresis
 (C) Centrifugation
 (D) Radioactivity
50. ELISA is based on :
 (A) Antigen-antibody interaction
 (B) Antigen-protein interaction
 (C) Lectin-antibody interaction
 (D) All of these
51. The Golden rice variety is rich in :
 (A) Vitamin C
 (B) β -carotene and ferritin
 (C) Biotin
 (D) Lysine
52. PCR technique is invented by :
 (A) Karry Mullie
 (B) Boyer
 (C) Sanger
 (D) Cohn

53. What is the Principle of Centrifugation ?
 (A) Sedimentation principle
 (B) Filtration principle
 (C) Evaporation principle
 (D) Size reduction principle
54. What is the other name of Zonal Centrifugation ?
 (A) Isopycnic centrifugation
 (B) Gradient centrifugation
 (C) Density gradient centrifugation
 (D) Differential centrifugation
55. Is centrifugation used in Beverages Processing ?
 (A) True
 (B) False
 (C) None of the above
 (D) Both (A) and (B)
56. Which is the formula for pH calculation ?
 (A) $\log_{10}[H^+]$
 (B) $-\log_{10}[H^+]$
 (C) $\log_2[H^+]$
 (D) $-\log_2[H^+]$
57. Pure water is known to be which of the following ?
 (A) Weak electrolyte
 (B) Strong electrolyte
 (C) Neither weak nor strong
 (D) Not an electrolyte
58. Which of the following is not a Radioisotope ?
 (A) Carbon - 13
 (B) Carbon - 14
 (C) Tritium
 (D) Sulphur - 35
59. What is detected during Positron Emission Tomography (PET) ?
 (A) Positrons
 (B) Electrons
 (C) Neutrons
 (D) Photons
60. Which part of the compound microscope helps in gathering and focusing light rays on the specimen to be viewed ?
 (A) Eyepiece lens
 (B) Objective lens
 (C) Condenser lens
 (D) Magnifying lens
61. Oil immersion objective lens has an NA value of :
 (A) 0.65
 (B) 0.85
 (C) 1.33
 (D) 1.00

62. When placed in a magnetic field, all the random spins of the nuclei :
- (A) Misalign
 - (B) Reverse direction
 - (C) Align with magnetic field
 - (D) Rotate to 90° away from the induced field
63. The amount of energy available in radio frequency is sufficient for which of the following ?
- (A) Excite an atom
 - (B) Affect the nuclear spin of an atom
 - (C) Vibrate an atom
 - (D) Vibrate a molecule
64. Which of the following are used as source in fluorometry ?
- (A) Deuterium discharge lamp
 - (B) Incandescent wire
 - (C) Hydrogen lamp
 - (D) Mercury vapour lamp
65. The purpose of secondary filter in fluorescence spectroscopy is :
- (A) Allows only excitation radiation
 - (B) Allows only emission radiation
 - (C) Allows both excitation and emission radiations
 - (D) Allows transmitted radiation
66. Which of the following is commonly used in Gram staining ?
- (A) Brarzilin
 - (B) Carmine
 - (C) Safranin
 - (D) Hematoxylin
67. Which of the following is a common nuclear stain ?
- (A) Safranin
 - (B) Fast green
 - (C) Hematoxylin
 - (D) Erythrosine
68. Lipid are commonly stained using :
- (A) Fast green
 - (B) Orange G
 - (C) Suda stain
 - (D) Aceto carmine
69. Which of the following is not a fluorescent stain ?
- (A) Aniline blue
 - (B) Acridine orange
 - (C) Propidium Iodide
 - (D) Rhodamine
70. To study the 3-D structure of a molecule, which technique is useful ?
- (A) Chromatography
 - (B) X-ray crystallography
 - (C) Electrophoresis
 - (D) Centrifugation

71. Total magnification is obtained by :
 (A) Magnifying power of the objective lens
 (B) Magnifying power of eyepiece
 (C) Magnifying power of condenser lens
 (D) Magnifying power of both the objective lens and eyepiece
72. Why are thin sections of specimens necessary in TEM ?
 (A) Electrons are very charged
 (B) Electrons have a wave nature
 (C) Electrons have no mass
 (D) Electrons have a poor penetrating power
73. Osmium tetroxide is used in electron microscopy as a :
 (A) Precipitator
 (B) Mordant
 (C) Staining agent
 (D) Fixing agent
74. Which instrument is more useful to study the surface details of a specimen ?
 (A) Phase Contrast Microscope
 (B) Scanning Electron Microscop (SEM)
 (C) Light Microscope
 (D) Transmission Electron Microscope (TEM)
75. Geiger-Muller counter is a :
 (A) Gas filled detector
 (B) Scintillation detector
 (C) Liquid scintillation detector
 (D) Well counter
76. Secondary floor is :
 (A) OP
 (B) POP
 (C) POPOP
 (D) P
77. Radioactivity discovered by :
 (A) Darwin
 (B) Muller
 (C) Mendel
 (D) Becquerel
78. Which of the following is used as a carrier gas in gas chromatography ?
 (A) CO₂
 (B) Oxygen
 (C) Helium
 (D) Methane
79. Ion-exchange chromatography is based on :
 (A) Electrostatic attraction
 (B) Electrical mobility of ionic species
 (C) Partition chromatography
 (D) Adsorption chromatography
80. In size exclusion chromatography, solute molecules are separated based on :
 (A) Molecular geometry and size
 (B) Molecular composition
 (C) Molecular phase
 (D) Molecular formula

81. The 'tracking dye' used in SDS-PAGE will be :

- (A) Anionic detergent
- (B) Cationic detergent
- (C) Anion exchanger
- (D) Non-ionic detergent

82. In SDS-PAGE, migration of protein is effected by :

- (A) Charge of protein
- (B) Size of protein
- (C) Net charge of protein
- (D) All of these

83. Proteins can be visualized directly in gels by :

- (A) Staining them with the dye
- (B) Using electron microscope only
- (C) Measuring their molecular weight
- (D) None of these

84. In an SDS-PAGE :

- (A) Proteins are denatured by the SDS
- (B) Proteins have the same charge to mass ratio
- (C) Smaller proteins migrate more rapidly through the gel
- (D) All of the above

85. The most common type of gel used for DNA separation is :

- (A) Agar
- (B) Polyacrylamide
- (C) Agarose
- (D) All of the above

86. Which is the technique suited for the separation of large DNA fragments ?

- (A) AGE
- (B) PAGE
- (C) PFGE
- (D) SDS-PAGE

87. In a Gel Filtration column :

- (A) Smaller proteins enter the beads more readily
- (B) Large proteins elute first
- (C) Both (A) and (B)
- (D) Large proteins enter the beads more readily

88. What is the wavelength range for UV spectrum of light ?

- (A) 400 nm - 700 nm
- (B) 700 nm to 1 mm
- (C) 0.01 nm to 10 nm
- (D) 10 nm to 400 nm

89. Energy of the discrete particles can be given by :

- (A) Photons
- (B) Protoplasm
- (C) Electrons
- (D) Neutrons

90. Which of the following is having more wavelength ?

- (A) X-rays
- (B) Cosmic waves
- (C) Radio waves
- (D) Gamma rays

91. The Base Peak in mass spectrum is :
- The lowest mass peak
 - The peak corresponding to the parent ion
 - The highest mass peak
 - The peak set to 100% relative humidity
92. ^1H nuclei located near electronegative atoms tends to be _____ relative to ^1H nuclei.
- Shielded
 - Deshielded
 - Resonanced
 - Split
93. In reverse-phase HPLC, there is a :
- Non-polar solvent / Polar column
 - Polar solvent / Non-polar column
 - Polar solvent / Polar column
 - Non-polar solvent / Non-polar column
94. HPLC is an abbreviation for :
- High Profit Liquid Chromatography
 - High Pressure Liquid Chromatography
 - Higher Performance Low Chromatography
 - Higher Profit Low Chromatography
95. In mass spectrometry, fragmentation of ions is achieved through :
- Ionization
 - Splitting
 - Solubilization
 - Coupling
96. Which of the following techniques would be most useful to identify as well as quantify the presence of a known impurity in a drug substance ?
- NMR
 - MS
 - IR
 - HPLC
97. In IR spectroscopy, the wave number of Nitrile group is observed in the range of :
- 3500 - 3300 cm^{-1}
 - 2200 - 2100 cm^{-1}
 - 1740 - 1650 cm^{-1}
 - 3000 - 2800 cm^{-1}
98. Which of the following is used as a spraying reagent in paper chromatography ?
- Cone HCl
 - NaCl solution
 - Minhydrin solution
 - CuSO_4 solution
99. Silica gel G is used in :
- Column chromatography
 - Gas chromatography
 - Thin layer chromatography
 - HPLC
100. Chromatography that involves the separation of Isomers :
- Thin layer chromatography
 - Counter current chromatography
 - Chiral chromatography
 - Paper chromatography

ROUGH WORK

ROUGH WORK

Example :

Question :

- Q.1 (A) ● (C) (D)
Q.2 (A) (B) ● (D)
Q.3 (A) ● (C) (D)

If more than 75 questions are attempted by candidate, then the first attempted 75 questions will be considered for evaluation.

4. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
5. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
6. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
7. After the completion of the examination, candidates should leave the examination hall only after providing their question booklet and OMR Answer Sheet separately to the invigilator.
8. There will be no negative marking.
9. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
10. To bring and use of log-book, calculator, pager & cellular phone in examination hall is prohibited.
11. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

Impt. On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

उदाहरण :

प्रश्न :

- प्रश्न 1 (A) ● (C) (D)
प्रश्न 2 (A) (B) ● (D)
प्रश्न 3 (A) ● (C) (D)

यदि परीक्षार्थी द्वारा 75 से अधिक प्रश्नों को हल किया जाता है तो प्रारम्भिक हल किये हुए 75 उत्तरों को ही मूल्यांकन हेतु सम्मिलित किया जाएगा।

4. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
5. सभी उत्तर केवल ओ०एम०आर० उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
6. ओ०एम०आर० उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
7. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी प्रश्नपुस्तिका बुकलेट एवं ओ०एम०आर० शीट पृथक-पृथक उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें।
8. निगेटिव मार्किंग नहीं है।
9. कोई भी रफ कार्य, प्रश्न-पुस्तिका में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
10. परीक्षा-कक्ष में लॉग-बुक, कैल्कुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
11. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

महत्वपूर्ण: प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्नपुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्नपुस्तिका प्राप्त कर लें।