Roll No.----------

प्रश्नपुस्तिका क्रमांक
Question Booklet No.

O.M.R. Serial No. | | | | | | | |

K-1369

B.Sc. (Biotech.) (Fourth Semester) Examination, 2025-26

(NEP)

(BBT4001)

BIOANALYTICAL TOOLS

Paper Code
BBT4001

(To be filled in the OMR Sheet)

प्रश्नपुस्तिका सीरीज
Question Booklet Series
C

Time : 1:30 Hours] **[Maximum Marks-75**

Instructions to the Examinee :

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.
3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

(Remaining instructions on the last page)

परीक्षार्थियों के लिए निर्देश :

1. प्रश्न–पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
2. प्रश्न–पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर–शीट पर ही हल करना है, प्रश्न–पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।
3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न–पुस्तिका तथा OMR आन्सर–शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न–पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हो या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(शेष निर्देश अन्तिम पृष्ठ पर)

1. Western blot uses:

   (A) Antibody

   (B) DNA probe

   (C) RNA probe

   (D) Lipid probe

2. Electrophoresis buffer example is:

   (A) NaC1

   (B) TAE

   (C) HCl

   (D) NaOH

3. Nanoparticles size range is:

   (A) 1-100 nm

   (B) 100-l000nm

   (C) 1-10 μm

   (D) >10 μm

4. Transducer converts:

   (A) Signal

   (B) Energy

   (C) Both

   (D) None

5. Direction of migration depends on:

   (A) Charge

   (B) Color

   (C) Shape

   (D) Density

6. Agarose gel concentration affects:

(A) Charge

(B) Pore size

(C) Voltage

(D) Color

7. Western blot involves transfer to:

(A) Agarose

(B) Nitrocellulose membrane

(C) Glass

(D) Plastic

8. Nanotechnology deals with:

(A) Macro scale

(B) Micro scale

(C) Nano scale

(D) Mega scale

9. Glucose biosensor is used in:

(A) Medicine and health

(B) Agriculture

(C) Industry

(D) Space

10. Biosensor consists of:

(A) Receptor

(B) Transducer

(C) Both

(D) None

11. Which factor does NOT affect electrophoresis?

(A) Voltage

(B) Buffer pH

(C) Molecular size

(D) Color

12. Smaller molecules migrate:

(A) Faster

(B) Slower

(C) Same

(D) Random

13. Polyacrylamide gel is mainly used for:

(A) DNA

(B) Proteins

(C) Lipids

(D) Sugars

14. Migration rate in electrophoresis depends on:

(A) Size

(B) Charge

(C) Shape

(D) All

15. Buffer maintains:

(A) Pressure

(B) pH

(C) Volume

(D) Mass

16. Pulse field gel electrophoresis is used for:

(A) Large DNA

(B) Small DNA

(C) Proteins

(D) Lipids

17. Immunoelectrophoresis uses:

(A) DNA hybridization

(B) Charge only

(C) Size exclusion

(D) Antigen-antibody reaction

18. Western blot detects:

(A) DNA

(B) RNA

(C) Proteins

(D) Lipids

19. Isoelectric focusing separates based on:

(A) Size

(B) Charge

(C) pI

(D) Density

20. Electric field is required for:

(A) Electrophoresis

(B) Diffusion

(C) Osmosis

(D) Filtration

21. Native PAGE differs because it:

(A) Denatures proteins

(B) Maintains native structure

(C) Adds charge

(D) Uses heat

22. SDS-PAGE separates proteins by:

(A) Charge

(B) Size and shape

(C) Color

(D) Density

23. SDS gives proteins:

(A) Positive charge

(B) Negative charge

(C) Neutral

(D) No charge

24. Agarose gel is commonly used for:

(A) Proteins

(B) Sugars

(C) Lipids

(D) DNA

25. Electrophoresis separates molecules based on:

(A) Charge

(B) Color

(C) Density

(D) Temperature

26. TLC stands for:

(A) Thin layer chromatography

(B) Thick layer chromatography

(C) Total layer chromatography

(D) None

27. Column chromatography uses:

(A) Plate

(B) Gel sheet

(C) Paper

(D) Column

28. Which does NOT affect separation?

(A) Flow rate

(B) Temperature

(C) Color of sample

(D) Solvent polarity

29. Detector in HPLC commonly uses:

(A) UV

(B) IR

(C) X-ray

(D) NMR

30. Eluent is:

(A) Detector

(B) Column

(C) Stationary phase

(D) Mobile phase

31. Silica gel is:

(A) Non-polar

(B) Polar

(C) Neutral

(D) Charged

32. Partition chromatography involves:

(A) Solid-solid

(B) Ion exchange

(C) Gas-solid

(D) Liquid-liquid

33. High Rf value indicates:

(A) Strong adsorption

(B) Weak adsorption

(C) No movement

(D) Low solubility

34. Solvent front is:

(A) Starting point

(B) Baseline

(C) Middle

(D) End point of solvent

35. Stationary phase remains:

(A) Fixed

(B) Moving

(C) Liquid

(D) Gas

36. Which technique is best for volatile compounds?

(A) TLC

(B) HPLC

(C) GC

(D) Paper chromatography

37. Chromatogram shows:

(A) Spots

(B) Colors

(C) Lines

(D) Peaks

38. Elution refers to:

(A) Binding

(B) Absorption

(C) Adsorption

(D) Washing out

39. Retention time depends on:

(A) Interaction with stationary phase

(B) Color

(C) Shape only

(D) Density

40. HPLC operates at:

(A) High pressure

(B) Low pressure

(C) No pressure

(D) Variable temperature

41. In GC, stationary phase is usually:

(A) Liquid on solid support

(B) Gas

(C) Solid

(D) Plasma

42. Affinity chromatography uses:

(A) Charge interaction

(B) Specific binding

(C) Size difference

(D) Density

43. Gel filtration separates molecules by:

(A) Charge

(B) Density

(C) Polarity

(D) Size

44. Ion exchange chromatography separates based on:

(A) Charge

(B) Size

(C) Density

(D) Shape

45. Paper chromatography is based on:

(A) Partition

(B) Adsorption

(C) Ion exchange

(D) Affinity

46. Lower Rf value indicates:

(A) High mobility

(B) High solubility

(C) Weak interaction

(D) Strong adsorption

47. In TLC, stationary phase is:

(A) Paper

(B) Silica gel

(C) Gas

(D) Liquid

48. Rf value ranges between:

(A) 0-1

(B) 1-2

(C) 2-3

(D) >3

49. Mobile phase in chromatography is:

(A) Stationary

(B) Moving

(C) Solid

(D) Fixed

50. Chromatography is used for:

(A) Heating

(B) Mixing

(C) Cooling

(D) Separation

51. Centrifuge separates particles using:

(A) Magnetic force

(B) Gravitational force

(C) Centrifugal force

(D) Electric force

52. Path length is generally:

(A) 0.1 cm

(B) 1 cm

(C) 10 cm

(D) 100 cm

53. Which factor does NOT affect sedimentation?

(A) Density

(B) Shape

(C) Color

(D) Size

54. UV absorption in proteins is mainly due to:

(A) Lipids

(B) Water

(C) Sugars

(D) Aromatic amino acids

55. Spectrophotometer detector converts light into:

(A) Heat

(B) Motion

(C) Sound

(D) Electrical signal

56. Pellet consists of:

(A) Liquid

(B) Gas

(C) Solid particles

(D) Ions only

57. Relative centrifugal force depends on:

(A) Radius and speed

(B) Temperature

(C) Volume

(D) Color

58. Quartz cuvette is required because it:

(A) Absorbs UV

(B) Transmits UV

(C) Reflects UV

(D) Blocks light

59. Visible light region is used in:

(A) Colorimetry

(B) IR spectroscopy

(C) NMR

(D) X-ray

60. Fluorescence occurs within:

(A) Seconds

(B) Minutes

(C) Nanoseconds

(D) Hours

61. Absorbance is proportional to:

(A) 1/concentration

(B) log concentration

(C) Concentration

(D) Temperature

62. Blank solution is used to:

(A) Increase absorbance

(B) Calibrate instrument

(C) Reduce light

(D) Increase noise

63. Which organelle sediments first?

(A) Ribosome

(B) Mitochondria

(C) Nucleus

(D) Lysosome

64. Rotor speed is measured in:

(A) rpm

(B) m/s

(C) kg

(D) J

65. Supernatant refers to:

(A) Sediment

(B) Solid

(C) Gas

(D) Liquid above sediment

66. In density gradient centrifugation, particles move until:

(A) They stop rotating

(B) Density equals medium

(C) Temperature drops

(D) Pressure increases

67. Differential centrifugation separates particles by:

(A) Charge

(B) Size

(C) Color

(D) Solubility

68. Unit of sedimentation coefficient:

(A) Joule

(B) Pascal

(C) Watt

(D) Svedberg

69. In centrifugation, sedimentation depends on:

(A) Color

(B) Shape only

(C) Mass and density

(D) Temperature only

70. Spectrophotometer primarily measures:

(A) Density

(B) Size

(C) Charge

(D) Absorbance

71. If absorbance is 0, transmittance is:

(A) 0%

(B) 50%

(C) 100%

(D) 10%

72. Beer-Lambert law fails at:

(A) Low concentration

(B) High concentration

(C) Low wavelength

(D) High temperature

73. Which cuvette is used in UV spectroscopy?

(A) Glass

(B) Plastic

(C) Quartz

(D) Metal

74. Fluorimetry is more sensitive because it measures:

(A) Transmitted light

(B) Reflected light

(C) Emitted light

(D) Scattered light

75. Colorimetry is based on measurement of:

(A) Fluorescence

(B) Refraction

(C) Emission

(D) Absorbance in visible region

76. In SEM, image formation is mainly due to:

(A) Transmitted electrons

(B) X-rays

(C) Photons

(D) Secondary electrons

77. In absorption spectroscopy, transmitted light intensity:

(A) Increases

(B) Decreases

(C) Remains same

(D) Becomes zero

78. Which instrument measures hydrogen ion activity directly?

(A) Spectrophotometer

(B) Colorimeter

(C) pH meter

(D) Fluorimeter

79. Resolution improves when wavelength:

(A) Increases

(B) Decreases

(C) Remains constant

(D) Becomes zero

80. Visible light range is approximately:

(A) l00-200 nm

(B) 200-400 nm

(C) 400-700 nm

(D) 700-1000 nm

81. Emission spectroscopy is based on:

(A) Absorption of energy

(B) Reflection of energy

(C) Emission after excitation

(D) Refraction

82. Which factor does NOT affect absorbance?

(A) Concentration

(B) Path length

(C) Wavelength

(D) Density of solvent

83. Oil immersion lens improves resolution by:

(A) Increasing wavelength

(B) Decreasing refractive index

(C) Increasing refractive index

(D) Reducing light

84. A fluorophore absorbs energy and then:

(A) Stores it permanently

(B) Emits lower energy light

(C) Emits same energy light

(D) Emits higher energy light

85. Which region is used for studying molecular vibrations?

(A) UV

(B) Visible

(C) X-ray

(D) Infrared

86. Phase contrast microscope enhances contrast due to differences in:

(A) Amplitude of light

(B) Phase of light waves

(C) Frequency

(D) Intensity only

87. Numerical aperture depends on:

(A) Refractive index and angle

(B) Lens thickness

(C) Magnification

(D) Tube length

88. In fluorescence, emitted light has:

(A) Shorter wavelength

(B) Same wavelength

(C) Longer wavelength

(D) No wavelength

89. Why do electron microscopes require vacuum?

(A) To prevent electron scattering

(B) To cool sample

(C) To increase magnification

(D) To increase contrast

90. Electron microscopes use:

(A) Photons

(B) Protons

(C) Neutrons

(D) Electrons

91. If path length doubles and concentration remain same, absorbance will:

(A) Halve

(B) Double

(C) Remain same

(D) Become zero

92. Beer-Lambert law is valid only when:

(A) Light is monochromatic

(B) Concentration is very high

(C) Solution is opaque

(D) Temperature is zero

93. Absorbance is defined as:

(A) $\log I_0/I$

(B) $\log I/I_0$

(C) I_0/I

(D) I/I_0

94. The glass electrode in pH meter is selective for:

(A) Na^+ ions

(B) Cl^- ions

(C) H^+ ions

(D) OH^- ions

95. pH of a solution with $[H^+] = 10^{-7}M$ is:

(A) 5

(B) 6

(C) 7

(D) 8

96. The main difference between TEM and SEM is that:

(A) TEM shows surface, SEM shows internal structure

(B) SEM uses light, TEM uses electrons

(C) Both give same images

(D) TEM shows internal structure, SEM shows surface

97. In fluorescence microscopy, excitation light is usually:

(A) Infrared

(B) Visible red

(C) Microwave

(D) Ultraviolet

98. The limit of resolution (d) is inversely proportional to:

(A) Numerical aperture

(B) Wavelength

(C) Refractive index

(D) Magnification

99. Which microscope is best suited to observe living, unstained cells?

(A) Bright field microscope

(B) Phase contrast microscope

(C) Electron microscope

(D) Fluorescence microscope

100. The resolving power of a microscope increases with:

(A) Increase in wavelength

(B) Decrease in numerical aperture

(C) Increase in numerical aperture

(D) Decrease in magnification

******

Rough Work / रफ कार्य

4. Four alternative answers are mentioned for each question as – A, B, C & D in the question booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

Example :

Question :

Q. 1 (A) ● (C) (D)

Q. 2 (A) (B) ● (D)

Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. 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.
7. Before writing anything on the OMR Answer Sheet, all the Instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. 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.

4. प्रश्न–पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर– A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से एक सही उत्तर छाँटना है। उत्तर को OMR आन्सर–शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)

प्रश्न 2 (A) (B) ● (D)

प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उत्तर निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. 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।
7. ओ. एम. आर. उत्तर–पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न–पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न–पुस्तिका के अन्त में, रफ–कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा–कक्ष में लॉग–बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. 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 प्रश्न–पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न–पुस्तिका प्राप्त कर लें।