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
D

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. Centrifuge separates particles using:

   (A) Magnetic force

   (B) Gravitational force

   (C) Centrifugal force

   (D) Electric force

2. Path length is generally:

   (A) 0.1 cm

   (B) 1 cm

   (C) 10 cm

   (D) 100 cm

3. Which factor does NOT affect sedimentation?

   (A) Density

   (B) Shape

   (C) Color

   (D) Size

4. UV absorption in proteins is mainly due to:

   (A) Lipids

   (B) Water

   (C) Sugars

   (D) Aromatic amino acids

5. Spectrophotometer detector converts light into:

   (A) Heat

   (B) Motion

   (C) Sound

   (D) Electrical signal

6. Pellet consists of:

(A) Liquid

(B) Gas

(C) Solid particles

(D) Ions only

7. Relative centrifugal force depends on:

(A) Radius and speed

(B) Temperature

(C) Volume

(D) Color

8. Quartz cuvette is required because it:

(A) Absorbs UV

(B) Transmits UV

(C) Reflects UV

(D) Blocks light

9. Visible light region is used in:

(A) Colorimetry

(B) IR spectroscopy

(C) NMR

(D) X-ray

10. Fluorescence occurs within:

(A) Seconds

(B) Minutes

(C) Nanoseconds

(D) Hours

11. Absorbance is proportional to:

(A) 1/concentration

(B) log concentration

(C) Concentration

(D) Temperature

12. Blank solution is used to:

(A) Increase absorbance

(B) Calibrate instrument

(C) Reduce light

(D) Increase noise

13. Which organelle sediments first?

(A) Ribosome

(B) Mitochondria

(C) Nucleus

(D) Lysosome

14. Rotor speed is measured in:

(A) rpm

(B) m/s

(C) kg

(D) J

15. Supernatant refers to:

(A) Sediment

(B) Solid

(C) Gas

(D) Liquid above sediment

16. In density gradient centrifugation, particles move until:

(A) They stop rotating

(B) Density equals medium

(C) Temperature drops

(D) Pressure increases

17. Differential centrifugation separates particles by:

(A) Charge

(B) Size

(C) Color

(D) Solubility

18. Unit of sedimentation coefficient:

(A) Joule

(B) Pascal

(C) Watt

(D) Svedberg

19. In centrifugation, sedimentation depends on:

(A) Color

(B) Shape only

(C) Mass and density

(D) Temperature only

20. Spectrophotometer primarily measures:

(A) Density

(B) Size

(C) Charge

(D) Absorbance

21. If absorbance is 0, transmittance is:

(A) 0%

(B) 50%

(C) 100%

(D) 10%

22. Beer-Lambert law fails at:

(A) Low concentration

(B) High concentration

(C) Low wavelength

(D) High temperature

23. Which cuvette is used in UV spectroscopy?

(A) Glass

(B) Plastic

(C) Quartz

(D) Metal

24. Fluorimetry is more sensitive because it measures:

(A) Transmitted light

(B) Reflected light

(C) Emitted light

(D) Scattered light

25. Colorimetry is based on measurement of:

(A) Fluorescence

(B) Refraction

(C) Emission

(D) Absorbance in visible region

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

(A) Transmitted electrons

(B) X-rays

(C) Photons

(D) Secondary electrons

27. In absorption spectroscopy, transmitted light intensity:

(A) Increases

(B) Decreases

(C) Remains same

(D) Becomes zero

28. Which instrument measures hydrogen ion activity directly?

(A) Spectrophotometer

(B) Colorimeter

(C) pH meter

(D) Fluorimeter

29. Resolution improves when wavelength:

(A) Increases

(B) Decreases

(C) Remains constant

(D) Becomes zero

30. Visible light range is approximately:

(A) l00-200 nm

(B) 200-400 nm

(C) 400-700 nm

(D) 700-1000 nm

31. Emission spectroscopy is based on:

(A) Absorption of energy

(B) Reflection of energy

(C) Emission after excitation

(D) Refraction

32. Which factor does NOT affect absorbance?

(A) Concentration

(B) Path length

(C) Wavelength

(D) Density of solvent

33. Oil immersion lens improves resolution by:

(A) Increasing wavelength

(B) Decreasing refractive index

(C) Increasing refractive index

(D) Reducing light

34. 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

35. Which region is used for studying molecular vibrations?

(A) UV

(B) Visible

(C) X-ray

(D) Infrared

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

(A) Amplitude of light

(B) Phase of light waves

(C) Frequency

(D) Intensity only

37. Numerical aperture depends on:

(A) Refractive index and angle

(B) Lens thickness

(C) Magnification

(D) Tube length

38. In fluorescence, emitted light has:

(A) Shorter wavelength

(B) Same wavelength

(C) Longer wavelength

(D) No wavelength

39. Why do electron microscopes require vacuum?

(A) To prevent electron scattering

(B) To cool sample

(C) To increase magnification

(D) To increase contrast

40. Electron microscopes use:

(A) Photons

(B) Protons

(C) Neutrons

(D) Electrons

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

(A) Halve

(B) Double

(C) Remain same

(D) Become zero

42. Beer-Lambert law is valid only when:

(A) Light is monochromatic

(B) Concentration is very high

(C) Solution is opaque

(D) Temperature is zero

43. Absorbance is defined as:

(A) $\log I_0/I$

(B) $\log I/I_0$

(C) I_0/I

(D) I/I_0

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

(A) Na^+ ions

(B) Cl^- ions

(C) H^+ ions

(D) OH^- ions

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

(A) 5

(B) 6

(C) 7

(D) 8

46. 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

47. In fluorescence microscopy, excitation light is usually:

(A) Infrared

(B) Visible red

(C) Microwave

(D) Ultraviolet

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

(A) Numerical aperture

(B) Wavelength

(C) Refractive index

(D) Magnification

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

(A) Bright field microscope

(B) Phase contrast microscope

(C) Electron microscope

(D) Fluorescence microscope

50. 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

51. Western blot uses:

(A) Antibody

(B) DNA probe

(C) RNA probe

(D) Lipid probe

52. Electrophoresis buffer example is:

(A) NaC1

(B) TAE

(C) HCl

(D) NaOH

53. Nanoparticles size range is:

(A) 1-100 nm

(B) 100-l000nm

(C) 1-10 μm

(D) >10 μm

54. Transducer converts:

(A) Signal

(B) Energy

(C) Both

(D) None

55. Direction of migration depends on:

(A) Charge

(B) Color

(C) Shape

(D) Density

56. Agarose gel concentration affects:

(A) Charge

(B) Pore size

(C) Voltage

(D) Color

57. Western blot involves transfer to:

(A) Agarose

(B) Nitrocellulose membrane

(C) Glass

(D) Plastic

58. Nanotechnology deals with:

(A) Macro scale

(B) Micro scale

(C) Nano scale

(D) Mega scale

59. Glucose biosensor is used in:

(A) Medicine and health

(B) Agriculture

(C) Industry

(D) Space

60. Biosensor consists of:

(A) Receptor

(B) Transducer

(C) Both

(D) None

61. Which factor does NOT affect electrophoresis?

(A) Voltage

(B) Buffer pH

(C) Molecular size

(D) Color

62. Smaller molecules migrate:

(A) Faster

(B) Slower

(C) Same

(D) Random

63. Polyacrylamide gel is mainly used for:

(A) DNA

(B) Proteins

(C) Lipids

(D) Sugars

64. Migration rate in electrophoresis depends on:

(A) Size

(B) Charge

(C) Shape

(D) All

65. Buffer maintains:

(A) Pressure

(B) pH

(C) Volume

(D) Mass

66. Pulse field gel electrophoresis is used for:

(A) Large DNA

(B) Small DNA

(C) Proteins

(D) Lipids

67. Immunoelectrophoresis uses:

(A) DNA hybridization

(B) Charge only

(C) Size exclusion

(D) Antigen-antibody reaction

68. Western blot detects:

(A) DNA

(B) RNA

(C) Proteins

(D) Lipids

69. Isoelectric focusing separates based on:

(A) Size

(B) Charge

(C) pI

(D) Density

70. Electric field is required for:

(A) Electrophoresis

(B) Diffusion

(C) Osmosis

(D) Filtration

71. Native PAGE differs because it:

(A) Denatures proteins

(B) Maintains native structure

(C) Adds charge

(D) Uses heat

72. SDS-PAGE separates proteins by:

(A) Charge

(B) Size and shape

(C) Color

(D) Density

73. SDS gives proteins:

(A) Positive charge

(B) Negative charge

(C) Neutral

(D) No charge

74. Agarose gel is commonly used for:

(A) Proteins

(B) Sugars

(C) Lipids

(D) DNA

75. Electrophoresis separates molecules based on:

(A) Charge

(B) Color

(C) Density

(D) Temperature

76. TLC stands for:

(A) Thin layer chromatography

(B) Thick layer chromatography

(C) Total layer chromatography

(D) None

77. Column chromatography uses:

(A) Plate

(B) Gel sheet

(C) Paper

(D) Column

78. Which does NOT affect separation?

(A) Flow rate

(B) Temperature

(C) Color of sample

(D) Solvent polarity

79. Detector in HPLC commonly uses:

(A) UV

(B) IR

(C) X-ray

(D) NMR

80. Eluent is:

(A) Detector

(B) Column

(C) Stationary phase

(D) Mobile phase

81. Silica gel is:

(A) Non-polar

(B) Polar

(C) Neutral

(D) Charged

82. Partition chromatography involves:

(A) Solid-solid

(B) Ion exchange

(C) Gas-solid

(D) Liquid-liquid

83. High Rf value indicates:

(A) Strong adsorption

(B) Weak adsorption

(C) No movement

(D) Low solubility

84. Solvent front is:

(A) Starting point

(B) Baseline

(C) Middle

(D) End point of solvent

85. Stationary phase remains:

(A) Fixed

(B) Moving

(C) Liquid

(D) Gas

86. Which technique is best for volatile compounds?

(A) TLC

(B) HPLC

(C) GC

(D) Paper chromatography

87. Chromatogram shows:

(A) Spots

(B) Colors

(C) Lines

(D) Peaks

88. Elution refers to:

(A) Binding

(B) Absorption

(C) Adsorption

(D) Washing out

89. Retention time depends on:

(A) Interaction with stationary phase

(B) Color

(C) Shape only

(D) Density

90. HPLC operates at:

(A) High pressure

(B) Low pressure

(C) No pressure

(D) Variable temperature

91. In GC, stationary phase is usually:

(A) Liquid on solid support

(B) Gas

(C) Solid

(D) Plasma

92. Affinity chromatography uses:

(A) Charge interaction

(B) Specific binding

(C) Size difference

(D) Density

93. Gel filtration separates molecules by:

(A) Charge

(B) Density

(C) Polarity

(D) Size

94. Ion exchange chromatography separates based on:

(A) Charge

(B) Size

(C) Density

(D) Shape

95. Paper chromatography is based on:

(A) Partition

(B) Adsorption

(C) Ion exchange

(D) Affinity

96. Lower Rf value indicates:

(A) High mobility

(B) High solubility

(C) Weak interaction

(D) Strong adsorption

97. In TLC, stationary phase is:

(A) Paper

(B) Silica gel

(C) Gas

(D) Liquid

98. Rf value ranges between:

(A) 0-1

(B) 1-2

(C) 2-3

(D) >3

99. Mobile phase in chromatography is:

(A) Stationary

(B) Moving

(C) Solid

(D) Fixed

100. Chromatography is used for:

(A) Heating

(B) Mixing

(C) Cooling

(D) Separation

******

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।