

Roll. No.

Question Booklet Number

O.M.R. Serial No.

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M.Sc. (SEM.-III) (NEP) (SUPPLE.) EXAMINATION, 2024-25

CHEMISTRY

(Analytical Chemistry)

Paper Code							
B	0	2	0	9	0	6	T

(Elective)

Question Booklet
Series

A

Time : 1 : 30 Hours

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

(Remaining instructions on 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 हों या उसमें किसी अन्य प्रकार की कमी हो, उसे तुरन्त बदल लें।
4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर- A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छानना है। उत्तर को OMR उत्तर-पत्रक में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

(शेष निर्देश अन्तिम पृष्ठ पर)

1. What is the primary purpose of a refractometer in food analysis?
 - (A) Measuring pH levels
 - (B) Analyzing protein content
 - (C) Determining sugar content
 - (D) Identifying volatile compounds
2. Which soil is warmed up quickly?
 - (A) Black soil
 - (B) Red soil
 - (C) Sandy soil
 - (D) None of the above
3. Which ion is primarily responsible for soil salinity?
 - (A) Calcium
 - (B) Sodium
 - (C) Magnesium
 - (D) Potassium
4. Which water quality parameter is assessed using a pH meter?
 - (A) Dissolved Oxygen (DO)
 - (B) Hardness
 - (C) pH
 - (D) Total Suspended Solids (TSS)
5. Which technique is most suitable for analyzing fat content in dairy products?
 - (A) Gravimetric analysis
 - (B) Soxhlet Extraction
 - (C) Colorimetric Assay
 - (D) Atomic absorption spectroscopy
6. Which soil component is most critical for water holding capacity?
 - (A) Sand
 - (B) Silt
 - (C) Clay
 - (D) Organic matter
7. In solvent extraction technique when two immiscible liquids move in opposite directions in continuous contact with each other which result in separation of solute is called :
 - (A) Continuous extraction
 - (B) Counter current extraction
 - (C) Batch extraction
 - (D) None of the above
8. Total ash content provides information on:
 - (A) Salt content
 - (B) Mineral content
 - (C) Siliceous matter
 - (D) All of the above
9. Which of the following is not the attribute of a good fuel?
 - (A) Cheap and easily available
 - (B) Safe to handle
 - (C) Low calorific value
 - (D) Moderate rate of combustion

10. Which of the following substances cannot be separated by distillation?
- (A) A mixture of proteins
 - (B) Oxygen and nitrogen in air
 - (C) Crude oil fractions
 - (D) Water in salt solution
11. Identify the test which is not a part of qualitative analysis?
- (A) Litmus test
 - (B) Kastle-Meyer test
 - (C) Iodine test
 - (D) Flame test
12. What type of method is the spectroscopic technique?
- (A) Instrumental methods
 - (B) Radioactive methods
 - (C) Gravimetric methods
 - (D) Titrimetric methods
13. Analytical chemistry is concerned with the:
- (A) Chemical characterization of matter
 - (B) Calibration of glassware
 - (C) Physical characterisation of matter
 - (D) None of the above
14. Which technique is often used to determine the purity of pharmaceutical compounds?
- (A) Chromatography
 - (B) Electrolysis
 - (C) Crystallization
 - (D) Sonication
15. Which of the following types of coal is the best quality of coal?
- (A) Peat
 - (B) Sub-bituminous
 - (C) Lignite
 - (D) Bituminous
16. Systematic errors can be eliminated by:
- (A) Exercising care
 - (B) By calibration
 - (C) By the proper use of standards, blanks and reference materials
 - (D) All of the above
17. In photosynthesis reaction water is oxidized into:
- (A) H_2
 - (B) CO_2
 - (C) $C_6H_{12}O_6$
 - (D) O_2
18. Macro analysis of sample size is concerned with the quantities of:
- (A) 0.3 gm or more
 - (B) 0.2 gm or more
 - (C) 0.1 gm or more
 - (D) 0.4 gm or more

19. Which water quality test assesses the amount of calcium and magnesium in water?
- (A) pH test
(B) Hardness test
(C) Turbidity test
(D) Nitrate test
20. Which type of spectrometry is used to identify the amino acid profile in food proteins?
- (A) Mass spectrometry
(B) Ultraviolet-Visible spectroscopy
(C) Nuclear-Magnetic resonance spectroscopy
(D) Inductively coupled plasma spectroscopy
21. The main purpose of drug analysis is to:
- (A) Identify the active ingredients
(B) Determine the dosage
(C) Check for impurities
(D) All of the above
22. What is the mean of the following set of number 4, 8, 6, 5, 9 ?
- (A) 8.4
(B) 7.5
(C) 6.4
(D) 9.3
23. The fuel may be in the form of :
- (A) Solid
(B) Liquid
(C) Gas
(D) All of the above
24. Which of the following is a common method for detecting the presence of heavy metals in food?
- (A) Fluorescence spectroscopy
(B) Atomic absorption spectroscopy
(C) Thin-layer chromatography
(D) Infrared spectroscopy
25. Which of the following is not one of the seven essential trace elements required by the human body?
- (A) Iron
(B) Zinc
(C) Potassium
(D) Selenium
26. Decomposition of Organic matter in soil results in:
- (A) Increase of soil pH
(B) Decrease of soil pH
(C) Does not effect soil pH
(D) None of the above

27. Which compound is typically used as an internal standard in gas chromatography for food analysis?
- (A) Acetonitrile
(B) Toluene
(C) Methanol
(D) Ethanol
28. Chromic acid cleaning mixture is made up of:
- (A) Potassium dichromate + Conc. H_2SO_4
(B) Sodium dichromate + Conc. H_2SO_4
(C) Potassium dichromate + Dil. H_2SO_4
(D) Sodium dichromate + Cons. HCl
29. Out of these which method comes in classical analytical method:
- (A) Neutron activation
(B) Atomic and Emission Spectrometry
(C) Coulometry
(D) Gravimetry and Titrimetry
30. Which technique is commonly used for separating components in a mixture?
- (A) Mass spectrometry
(B) Gas chromatography
(C) Infrared spectroscopy
(D) Ultraviolet spectroscopy
31. Cold test of fat is measure of :
- (A) Freezing point of oil
(B) Viscosity of oil at temp. just above it's freezing point
(C) Resistance of oil to crystallization
(D) Total saturated fat
32. Which classification of drugs includes medications that reduce fever?
- (A) Antipyretics
(B) Analgesics
(C) Antibiotics
(D) Anticonvulsants
33. In food analysis, what is the principle behind the use of High Performance Liquid Chromatography (HPLC) :
- (A) Separation based on solubility
(B) Separation based on size exclusion
(C) Separation based on adsorption
(D) Separation based on boiling point
34. Micronutrient flow is generally a _____ process in soil.
- (A) Mass flow
(B) Diffusion
(C) Interception
(D) None of the above

35. Which of the following are covered under proximate analysis of foods?
- (A) Proteins, Carbohydrates, Vitamins
 - (B) Proteins, Carbohydrates, Fats
 - (C) Proteins, Sugars, Minerals
 - (D) Fats, Vitamins, Minerals
36. Which of the following methods is commonly used for determining moisture content in food samples?
- (A) Atomic absorption spectroscopy
 - (B) Gas Chromatography
 - (C) Karl Fischer Titration
 - (D) High-Performance Liquid Chromatography
37. What type of fuel is charcoal?
- (A) Industrial solid fuel
 - (B) Natural solid fuel
 - (C) Artificial solid fuel
 - (D) Liquid fuel
38. Which parameter is commonly used to measure the level of organic pollution in water?
- (A) Total Dissolved Solids (TDS)
 - (B) Biological Oxygen Demand (BOD)
 - (C) Chemical Oxygen Demand (COD)
 - (D) Total Coliform Count
39. Which of the following separation techniques is dependent on the difference in volatility?
- (A) Distillation
 - (B) Crystallisation
 - (C) Magnetic separation
 - (D) Fractional crystallisation
40. What is the colour post extraction of iodine?
- (A) Blue
 - (B) Indigo
 - (C) Purple
 - (D) Red
41. Smoke is produced maximum in:
- (A) Solid fuel
 - (B) Liquid fuel
 - (C) Gaseous fuel
 - (D) Coal Gas
42. Which is purified by steam distillation?
- (A) Aniline
 - (B) Petroleum
 - (C) Benzoic Acid
 - (D) Naphthalene
43. What is the correct statement for reducing agent?
- (A) It has a higher oxidation state
 - (B) It withdraws electrons
 - (C) It reduces oxidizing agents by donating electrons
 - (D) It gets reduced itself in the redox reaction

44. When do we use Buffer solution?
- (A) To make the solution basic
 - (B) To make the solution acidic
 - (C) To prevent solution pH change
 - (D) None of the above
45. In which soil zinc availability to crop is higher?
- (A) Acidic soil
 - (B) Alkaline soil
 - (C) Waterlogged soil
 - (D) None of the the above
46. Which of the following act as a solvent transporting agent?
- (A) Air
 - (B) Water
 - (C) Light
 - (D) None of the above
47. Out of the following which one is related to analytical chemistry?
- (A) Partial analysis
 - (B) Trace constituents analysis
 - (C) Proximate analysis
 - (D) All of the above
48. Which of the following is a qualitative analysis method?
- (A) Colorimetric test
 - (B) High-Performance Liquid Chromatography (HPLC)
 - (C) Gravimetric analysis
 - (D) Polarimetry
49. Which of the following is not a spectroscopic technique?
- (A) NMR spectroscopy
 - (B) IR spectroscopy
 - (C) TLC
 - (D) UV-Vis spectroscopy
50. What does the term titration generally refer to the food analysis?
- (A) A method to measure the total carbohydrate content
 - (B) A procedure to quantify the concentration of a substance by adding a reagent of known concentration
 - (C) An approach to assess the colour and appearance of food sample
 - (D) None of the above
51. Which of the following is an example of a methodic error?
- (A) Miscalibrating an instrument before use
 - (B) Variations in temperature affecting the sample
 - (C) Random fluctuations in measurements
 - (D) Contamination of reagents

52. Water pollution means:
- (A) Presence of any substance in water which affect it's usefulness
 - (B) The presence of any foreign material which is undesirable either solid, liquid or gas
 - (C) When it's basic properties are changed and it becomes harmful for health
 - (D) All of the above
53. In a chemical analysis, which statistical measure is commonly used to determine the average concentration of a substance in a series of measurement:
- (A) Median
 - (B) Mode
 - (C) Mean
 - (D) Range
54. What is the primary use of Enzymelinked Immunosorbent Assay (ELISA) in food analysis?
- (A) Determining water content
 - (B) Measuring fat content
 - (C) Detecting allergens and contaminants
 - (D) Analyzing flavor compounds
55. How is absolute error calculated if the true value is known to be 50 units and the measured value is 47 units?
- (A) 3 units
 - (B) 47 units
 - (C) 50 units
 - (D) None of the above
56. The alkalinity in water is caused due to presence of:
- (A) Carbonates (CO_3^{--})
 - (B) Bicarbonates (HCO_3^-)
 - (C) Hydroxides (OH^-)
 - (D) All of the above
57. When organic matter is added into the soil, effect on the bulk density is:
- (A) Increased
 - (B) Decreased
 - (C) No effect
 - (D) Both (A) and (B)
58. Which of the following heavy metal is commonly tested for due to it's role in causing kidney damage?
- (A) Arsenic
 - (B) Zinc
 - (C) Chromium
 - (D) Iron

59. Which of the following is a common source of operational error in laboratory analysis?
- (A) Contaminated reagents
 - (B) Calibration drift of instruments
 - (C) Incorrect sample preparation
 - (D) Environmental factors like humidity
60. Sulphates generally found in hard water, can be determined:
- (A) Gravimetrically
 - (B) Colorimetrically
 - (C) Turbidimetrically
 - (D) All of the above
61. Super saturation plays important part in determining :
- (A) Concentration of solute
 - (B) Molarity of solution
 - (C) Particle size of ppt
 - (D) None of the above
62. Which property of a fuel is measured to determine it's energy content?
- (A) Flash point
 - (B) Calorific value
 - (C) Viscosity
 - (D) Specific gravity
63. What is a primary source of domestic water pollution?
- (A) Industrial water
 - (B) Agricultural runoff
 - (C) Sewage and waste water
 - (D) Radio-active waste
64. Instrumental and Reagent errors are:
- (A) Faulty construction of balances
 - (B) Use of improper calibrated weights
 - (C) Use of reagents containing impurities
 - (D) All of the above
65. HPLC requires detectors with high:
- (A) Length
 - (B) Weight
 - (C) Sensitivity
 - (D) None of the above
66. Which parameter measures the amount of suspended particles in water?
- (A) Turbidity
 - (B) Hardness
 - (C) Acidity
 - (D) Colours
67. Which analytical technique is commonly used to detect pesticide residues in water?
- (A) Gas Chromatography (GC)
 - (B) Spectrophotometry
 - (C) Turbidity meter
 - (D) pH meter

68. Solvent extraction is more effective when the extraction is separated with :
- (A) Extra solvent
 - (B) Large solvent
 - (C) Small solvent
 - (D) No solvent
69. Which heavy metal is commonly tested for in drinking water due to its toxicity?
- (A) Sodium
 - (B) Lead
 - (C) Magnesium
 - (D) Calcium
70. What is the use of ether layer?
- (A) To separate organic impurities
 - (B) To separate inorganic impurities
 - (C) To separate fibres
 - (D) To separate solvent
71. What is the main objective of the Safe Drinking Water Act (SDWA)?
- (A) To regulate air emissions
 - (B) To ensure the safety of drinking water
 - (C) To manage hazardous waste
 - (D) To control noise pollution
72. Which blood component is responsible for the immune response?
- (A) Platelets
 - (B) Plasma
 - (C) Red blood cells
 - (D) White blood cells
73. What is the purpose of water quality standards set by regulatory agencies?
- (A) To regulate the amount of industrial waste
 - (B) To ensure water is safe for human consumption and supports aquatic life
 - (C) To monitor air quality
 - (D) To manage energy consumption
74. What is the primary function of red blood cells?
- (A) Immune response
 - (B) Oxygen transport
 - (C) Blood clotting
 - (D) Hormone regulation
75. Which of the following option involves material and component control?
- (A) Quality control
 - (B) Feedback
 - (C) Development of standards
 - (D) Development of specification

76. To preserve a blood sample for glucose analysis, which of the following is most commonly used?
- (A) EDTA
 - (B) Sodium citrate
 - (C) Heparin
 - (D) Sodium fluoride
77. Which parameter indicates the water capacity to neutralize acids?
- (A) Alkalinity
 - (B) Acidity
 - (C) Hardness
 - (D) Colour
78. What is the purpose of using EDTA in blood collection tubes?
- (A) To prevent clotting by binding calcium
 - (B) To prevent glucose levels
 - (C) To stabilize hormones
 - (D) To prevent bacterial growth
79. Thin Layer Chromatography (TLC) is used primarily for:
- (A) Quantitative analysis
 - (B) Qualitative analysis
 - (C) Both qualitative and quantitative
 - (D) None of the above
80. Infrared (IR) spectroscopy is used to identify:
- (A) The molecular weight of a compound
 - (B) The functional group in a molecule
 - (C) The isotope composition of a substance
 - (D) The charge of an ion
81. What does 'Hardness' in water indicates?
- (A) The presence of dissolved salts, primarily calcium and magnesium
 - (B) The level of acidity
 - (C) The presence of organic matter
 - (D) The amount of suspended particles
82. Which component of blood is primarily responsible for clotting?
- (A) Plasma
 - (B) White blood cells
 - (C) Platelets
 - (D) Red blood cells
83. The availability of P in the soil increases during the:
- (A) Spring
 - (B) Summer
 - (C) Autumn
 - (D) Both (A) and (B)

84. Solvent extraction is governed by which law? (C) 10
 (A) Boyle's law (D) -1.44
 (B) Ostwald dilution law
 (C) Nernst distribution law
 (D) Beer's law
85. What does high alkalinity in water indicate?
 (A) Low pH
 (B) High pH
 (C) High level of dissolved salts
 (D) High level of organic matter
86. Which among the following is not a membrane separation technique?
 (A) Ultrafiltration
 (B) Microfiltration
 (C) Reverse osmosis
 (D) Solvent extraction
87. The best method for the separation of naphthalene and benzoic acid from their mixture is:
 (A) Crystallization
 (B) Solvent extraction
 (C) Chromatography
 (D) Distillation
88. What is the potential value of Standard Hydrogen Electrode (SHE) at 298K?
 (A) 0
 (B) 2
89. What unit is commonly used to measure turbidity?
 (A) PPm
 (B) NTU
 (C) mg/L
 (D) pH
90. Which analysis technique is used to measure the hardness of water?
 (A) Titration with EDTA
 (B) Spectrophotometry
 (C) Chromatography
 (D) Electrochemical analysis
91. What is the colour of the phenol sulfo-naphthalene indicator at pH-7.0?
 (A) Red
 (B) Violet
 (C) Green
 (D) Yellow
92. GC-MS is best suited for the identification of low level of:
 (A) Hydrocarbons
 (B) NH_3
 (C) O_3
 (D) SO_2

93. Which of the following is a common source of water pollution?
- (A) Soil erosion
 - (B) Radioactive waste
 - (C) Domestic sewage
 - (D) Heavy metal from mining
94. Which method is commonly used for measuring soil moisture content in the field?
- (A) Tensiometer
 - (B) pH meter
 - (C) Spectrophotometer
 - (D) None of the above
95. Which of the following is not a common method used to detect adulteration in oil?
- (A) Gas chromatography
 - (B) High performance liquid chromatography
 - (C) Fourier-Transform Infrared Spectroscopy (FTIR)
 - (D) Microscopic analysis
96. Which of the following is a common detection limit for heavy metals in water analysis?
- (A) Parts Per million (PPm)
 - (B) Parts Per billion (PPb)
 - (C) Parts Per trillion (PPT)
 - (D) Percentage (%)
97. What is the main purpose of using TLC (Thin Layer Chromatography) in food analysis?
- (A) To identify the presence of pesticides
 - (B) To determine fat content
 - (C) To detect the presence of artificial colour
 - (D) To measure water content
98. West-Gaeke spectrophotometric method is used for the analysis of:
- (A) SO_2
 - (B) NO_2
 - (C) PAH_s
 - (D) Aerosols
99. Which of the following method is commonly used to detect the adulteration of milk with water?
- (A) Refractometry
 - (B) Chromatography
 - (C) Spectrophotometry
 - (D) Microscopy
100. To assess water acidity, which of the following method is commonly used?
- (A) pH meter
 - (B) Turbidity meter
 - (C) Conductivity meter
 - (D) Colorimeter

Rough Work / रफ कार्य

Example :

Question :

Q.1 (A) ● (C) (D)

Q.2 (A) (B) ● (D)

Q.3 (A) ● (C) (D)

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 & 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.

उदाहरण :

प्रश्न :

प्रश्न 1 (A) ● (C) (D)

प्रश्न 2 (A) (B) ● (D)

प्रश्न 3 (A) ● (C) (D)

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. 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।
7. ओ०एम०आर० 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 में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैल्कुलेटर, 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 प्रश्नपुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरिज की दूसरी प्रश्नपुस्तिका प्राप्त कर लें।