

Seat No.	
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ENT - 37
Total No. of Pages : 20

M.Sc. Nanoscience and Biotechnology
RE-ENTRANCE EXAMINATION-2026
Subject Code : 71144

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Day and Date : Wednesday, 24-06-2026
Time : 10.30 a.m. to 12.00 p.m.
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Total Marks : 100

Instructions

- 1) All questions are compulsory.
 - 2) Each question carries 1 mark.
 - 3) Answers should be marked in the given OMR answer sheet by darkening the appropriate option.
 - 4) Follow the instructions given on OMR sheet.
 - 5) Rough work shall be done on the sheet provided at the end of question paper.
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Q. 1 Choose correct alternatives

1. Which law of thermodynamics defines the concept of temperature?
 - a. First Law
 - b. Zeroth Law
 - c. Second Law
 - d. Third Law
2. In an isothermal process, which of the following remains constant?
 - a. Temperature
 - b. Pressure
 - c. Volume
 - d. Entropy
3. The first law of thermodynamics is a restatement of the law of conservation of:
 - a. Momentum
 - b. Mass
 - c. Energy
 - d. Charge
4. Internal energy of an ideal gas depends only on:
 - a. Temperature
 - b. Pressure
 - c. Volume
 - d. Density

5. A process in which no heat enters or leaves the system is called:
 - a. Isothermal
 - b. Isobaric
 - c. Adiabatic
 - d. Isenthalpic
6. For a reversible process, the change in entropy of the universe is:
 - a. Zero
 - b. Positive
 - c. Negative
 - d. Infinite
7. The efficiency of a Carnot engine depends only on:
 - a. Nature of working substance
 - b. Size of the engine
 - c. Temperatures of source and sink
 - d. Quantity of fuel used
8. Which law states that the entropy of a perfect crystal at absolute zero is zero?
 - a. Zeroth Law
 - b. First Law
 - c. Second Law
 - d. Third Law
9. A heat engine converts:
 - a. Work into heat
 - b. Heat into work
 - c. Mechanical energy into magnetic energy
 - d. Potential energy into kinetic energy
10. The Kelvin-Planck statement is associated with:
 - a. First Law
 - b. Second Law
 - c. Zeroth Law
 - d. Third Law

11. The resolving power of a prism depends on:
 - a. Material and base width
 - b. Height of prism
 - c. Angle of incidence only
 - d. Light intensity
12. Lateral magnification is the ratio of:
 - a. Image height to object height
 - b. Image distance to object distance
 - c. Wavelength to frequency
 - d. Intensity to area
13. Interference in thin films is due to:
 - a. Reflection only
 - b. Refraction only
 - c. Both reflection and refraction
 - d. Diffraction
14. To see clear diffraction at a straight edge, the source must be:
 - a. Narrow and monochromatic
 - b. Wide and white
 - c. Large and diffuse
 - d. Moving
15. Huygens' theory explains:
 - a. Wave propagation
 - b. Photoelectric effect
 - c. Compton effect
 - d. Gravity

16. A half-period zone plate blocks:
- a. Alternate zones
 - b. All zones
 - c. Central zone only
 - d. Outer zones only
17. Brewster's law relates polarization to:
- a. Refractive index
 - b. Temperature
 - c. Mass
 - d. Speed of sound
18. Malus' law deals with:
- a. Intensity of polarized light
 - b. Colour of light
 - c. Speed of light
 - d. Diffraction pattern
19. Specific rotation depends on:
- a. Temperature
 - b. Wavelength of light
 - c. Concentration of solution
 - d. All of the above
20. If the analyzer is rotated by 90 degrees relative to the polarizer, the transmitted intensity is:
- a. Zero
 - b. Maximum
 - c. Half
 - d. Unchanged
21. Constraints that are independent of time are called:
- a. Scleronomous
 - b. Rheonomous
 - c. Holonomic
 - d. Non-holonomic
22. The number of independent coordinates required to specify the configuration of a system is called:
- a. Constraints
 - b. Degrees of freedom
 - c. Virtual work
 - d. Inertial frames

23. D'Alembert's principle is based on the concept of:
- a. Real work
 - b. Virtual work
 - c. Friction
 - d. Potential energy
24. Poisson's equation relates the potential to:
- a. Velocity
 - b. Charge density
 - c. Temperature
 - d. Magnetic flux
25. A region where the charge density is zero is governed by:
- a. Poisson's equation
 - b. Laplace's equation
 - c. Newton's law
 - d. Ampere's law
26. The path of a charged particle moving perpendicular to a uniform magnetic field is:
- a. Straight line
 - b. Parabola
 - c. Circle
 - d. Hyperbola
27. The de-Broglie hypothesis suggests that:
- a. Only light has wave properties
 - b. Only particles have momentum
 - c. Moving particles exhibit wave properties
 - d. Waves cannot carry energy
28. Wave-particle duality was experimentally confirmed for electrons by:
- a. Schrodinger
 - b. Davisson and Germer
 - c. Newton
 - d. Bohr
29. The velocity with which the wave envelope moves is called:
- a. Phase velocity
 - b. Group velocity
 - c. Particle velocity
 - d. Light velocity

30. For a non-dispersive medium, phase velocity is:
- a. Equal to group velocity
 - b. Greater than group velocity
 - c. Less than group velocity
 - d. Zero
31. What characteristic of nanoparticles allows them to exhibit unique catalytic properties?
- a. High melting point
 - b. Large surface area to volume ratio
 - c. Electrical conductivity
 - d. Thermal conductivity
32. Which of the following is a common application for titanium dioxide nanoparticles?
- a. Food additives
 - b. Sunscreen
 - c. Fuel additives
 - d. Textile dyes
33. Which application area is known for using silver nanoparticles?
- a. Solar cells
 - b. Antibacterial coatings
 - c. Sensors
 - d. Batteries
34. Which property of nanomaterials is most relevant for enhancing the performance of batteries?
- a. Magnetic properties
 - b. Optical properties
 - c. Electrical conductivity
 - d. Thermal stability

35. What is the purpose of using self-assembled monolayers (SAMs) in nanotechnology?
- a. To increase the size of nanoparticles
 - b. To create uniform thin films on surfaces
 - c. To etch patterns into surfaces
 - d. To measure the mechanical properties of nanoparticles
36. Which of the following nanomaterials is used for water purification?
- a. Gold nanoparticles
 - b. Carbon nanotubes
 - c. Quantum dots.
 - d. Fullerenes
37. In which area are magnetic nanoparticles particularly useful?
- a. Solar energy
 - b. Magnetic resonance imaging (MRI)
 - c. Textile manufacturing
 - d. Food processing
38. What is the primary advantage of using nanotechnology in solar cells?
- a. Lower cost
 - b. Increased efficiency
 - c. Easier installation
 - d. Longer lifespan
39. Which of the following methods is used to synthesize carbon nanotubes?
- a. Chemical vapor deposition (CVD)
 - b. Sol-gel method
 - c. Ball milling
 - d. Spin coating

40. What is the primary feature of a quantum dot that makes it useful in bioimaging?
- a. Electrical conductivity
 - b. Fluorescence
 - c. Magnetism
 - d. Thermal stability
41. Which of the following is a potential environmental risk of nanotechnology?
- a. Increased CO₂ emissions
 - b. Nanoparticle accumulation in ecosystems
 - c. Depletion of natural resources
 - d. Higher energy consumption
42. The unique optical properties of nanoparticles are often due to:
- a. Their density
 - b. Surface plasmon resonance
 - c. Their weight
 - d. Thermal conductivity
43. What is a common application of silicon nanowires?
- a. Drug delivery
 - b. Photovoltaic cells
 - c. Structural reinforcement
 - d. Lubricants
44. What is the major factor affecting the melting point of nanoparticles?
- a. Color
 - b. Shape
 - c. Size
 - d. Electrical conductivity
45. Which of the following can be used as a top-down approach to create nanoscale structures?
- a. Chemical vapor deposition (CVD)
 - b. Photolithography
 - c. Sol-gel synthesis
 - d. Molecular self-assembly

46. Which of the following is an advantage of nanoscale drug delivery systems?
- a. Increased dosage
 - b. Targeted delivery to specific cells
 - c. Lower cost of production
 - d. Longer patent protection
47. The phenomenon where properties of materials change significantly at the nanoscale is called:
- a. Quantum confinement.
 - b. Surface effect
 - c. Size-dependent effect
 - d. All of the above
48. Nanotechnology can improve the performance of sensors by:
- a. Increasing their size
 - b. Decreasing their sensitivity
 - c. Enhancing their selectivity and sensitivity
 - d. Making them more expensive
49. Which property of carbon nanotubes makes them suitable for use in nanoelectronics?
- a. High thermal conductivity
 - b. Flexibility
 - c. Electrical conductivity
 - d. Biocompatibility
50. Which of the following techniques is used to separate nanoparticles based on their size?
- a. Centrifugation
 - b. X-ray diffraction
 - c. UV-Vis spectroscopy
 - d. TEM

51. What is a potential benefit of using nanoparticles in cancer treatment?
- a. Reduced side effects
 - b. Lower treatment costs
 - c. Simpler treatment protocols
 - d. Increased treatment time
52. Nanoclays are often used to:
- a. Increase the strength of polymers
 - b. Improve the taste of food
 - c. Enhance electrical conductivity
 - d. Reduce the weight of metals
53. Which property of nanoparticles is utilized in targeted drug delivery?
- a. Magnetic properties
 - b. Electrical conductivity
 - c. Surface functionalization
 - d. Thermal conductivity
54. The process of designing and synthesizing nanomaterials with precise shapes and sizes is known as:
- a. Nanofabrication
 - b. Nanomanipulation
 - c. Nanomorphology
 - d. Nanolithography
55. Which technique is used to study the surface structure of nanoparticles?
- a. NMR spectroscopy
 - b. TEM
 - c. SEM
 - d. X-ray diffraction
56. Nanocomposites are materials that:
- a. Are composed entirely of nanoparticles
 - b. Incorporate nanoparticles into a matrix
 - c. Are used exclusively in electronics
 - d. Have uniform chemical composition

57. Which of the following is an example of a nanostructured material?
- a. Polyethylene
 - b. Silicon wafer
 - c. Aerogel
 - d. Aluminum foil
58. The study of the interaction between light and nanoparticles is called:
- a. Nanoelectronics
 - b. Nanophotonics
 - c. Nanomechanics
 - d. Nanobiotechnology
59. Which property of nanoparticles is crucial for their use in catalysis?
- a. Size
 - b. Electrical conductivity
 - c. Surface area
 - d. Melting point
60. What is the significance of "quantum confinement" in nanoparticles?
- a. It enhances electrical conductivity.
 - b. It alters the optical and electronic properties.
 - c. It increases the melting point.
 - d. It improves thermal stability.
61. Which nanomaterial is known for its use in flexible electronic devices?
- a. Gold nanoparticles
 - b. Silicon nanowires
 - c. Graphene
 - d. Zinc oxide nanoparticles
62. What is the role of surfactants in the synthesis of nanoparticles?
- a. To reduce the size of nanoparticles
 - b. To stabilize nanoparticles and prevent aggregation
 - c. To increase the reaction rate
 - d. To enhance the magnetic properties

63. Which method is commonly used for the biological synthesis of nanoparticles?
- a. Chemical vapor deposition
 - b. Sol-gel method
 - c. Biosynthesis using microorganisms
 - d. Ball milling
64. Nanofibers are used in:
- a. Food packaging
 - b. Filtration systems
 - c. Cosmetics
 - d. Fuel additives.
65. Which of the following is an application of nanoscale sensors?
- a. Measuring temperature in industrial processes
 - b. Monitoring glucose levels in diabetics
 - c. Detecting earthquakes
 - d. Measuring ocean depths
66. Which property of gold nanoparticles makes them suitable for use in photothermal therapy?
- a. Electrical conductivity
 - b. High surface area
 - c. Ability to absorb and convert light into heat
 - d. Magnetic properties

67. Which of the following is a potential application of nanotechnology in energy storage?
- a. More efficient solar panels.
 - b. Faster-charging batteries
 - c. Longer-lasting fuel cells
 - d. All of the above
68. Which nanomaterial is often used as a lubricant additive to reduce friction?
- a. Graphene
 - b. Titanium dioxide
 - c. Zinc oxide
 - d. Silver nanoparticles
69. The ability of nanoparticles to penetrate biological membranes makes them useful for:
- a. Structural reinforcement
 - b. Drug delivery
 - c. Photovoltaics
 - d. Textiles
70. In the context of nanotechnology, what does the term "nanocarrier" refer to?
- a. A device that measures nanoscale particles
 - b. A nanoscale vehicle for drug delivery
 - c. A type of nanoparticle used in electronics
 - d. A method for synthesizing nanoparticles
71. Conductometric titration is mainly used for:
- a) Redox reactions
 - b) Complexometric reactions
 - c) Acid-base reactions
 - d) Precipitation reactions
72. Deviation of real gases is expressed by:
- a) Boyle's law
 - b) Compressibility factor
 - c) Charles law
 - d) Dalton's law

73. Adsorption occurs at:
- | | |
|---------|------------|
| a) Bulk | b) Surface |
| c) Gas | d) Liquid |
74. Freundlich isotherm is:
- | | |
|--------------------------|----------------|
| a) Linear | b) Exponential |
| c) Empirical logarithmic | d) Quadratic |
75. Werner theory explains:
- | | |
|---------------------------|------------------|
| a) Coordination compounds | b) Covalent bond |
| c) Ionic bond | d) Metallic bond |
76. 3d elements belong to:
- | | |
|------------|------------|
| a) s-block | b) p-block |
| c) d-block | d) f-block |
77. Nickel detection uses:
- | | |
|---------|--------|
| a) EDTA | b) HCl |
| c) NaCl | d) DMG |
78. Primary amine test:
- | | |
|------------|----------------|
| a) Tollens | b) Carbylamine |
| c) Fehling | d) Benedict |
79. Sucrose is:
- | | |
|---------|-----------|
| a) Mono | b) Di |
| c) Poly | d) Ketone |
80. Non-reducing sugar:
- | | |
|------------|-------------|
| a) Glucose | b) Fructose |
| c) Sucrose | d) Maltose |

81. Endothermic reactions are.....
- a) heat-absorbing b) heat-releasing
 c) both a & b d) none of these
82. In fermentation, pH of wort (sugary liquid) must be
- a) 7.0 b) 9.8 - 10
 c) 5 - 5.5 d) 12 - 15
83. is used as a catalyst in the contact process for the manufacture of Sulphuric acid
- a) V_2O_{10} b) V_5O_2
 c) V_2O_5 d) V_3O_5
84. The molecular weight of polymers can be determined by this technique
- a) Transmission electron microscopy
 b) Size exclusion chromatography
 c) Molecular weight chromatography
 d) High performance liquid chromatography
85. Dispersity in polymer sample is
- a) M_w/M_n b) M_n/M_w
 c) $M_w - M_n$ d) $M_w + M_n$
86. Reaction of hard acid and hard base gives.....
- a) Covalent compounds
 b) Ionic compounds
 c) Metallic compounds
 d) None of the above

100. Reported bond angle of H₂O is

a) 109°28'

b) 107°28'

c) 104°28'

d) 106°28'

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- Rough Work -

- Rough Work -