Seat No.

Total No. of Pages : 18

P.G. Entrance Examination 2025
M.Sc. Nano Science and Technology
Subject Code : 71144

Day and Date : Wednesday, 14/05/2025 **Total Marks : 100**
Time : 01.00 pm to 02.30 pm

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.

Multiple Choice Questions

1. The susceptibility of magnesium at 300 ^{0}K is 1.2 x10^{-5}. At what temperature will the susceptibility increase to 2 x10^{-5} ?

   a) 100 ^{0}K b) 2000 ^{0}K

   c) 180 ^{0}K d) 400 ^{0}K

2. An LVDT is used to measure.....

   A) Temperature B) Pressure

   C) Linear displacement D) Light intensity.

3. A Wheatstone bridge is used to measure unknown .....

   A) Resistance

   B) Capacitance

   C) Inductance

   D) Frequency

4. A strain gauge converts .....

   A) Electrical energy to mechanical

   B) Mechanical deformation to resistance change

   C) Heat to voltage

   D) Pressure to light

5. In a thermocouple, the voltage generated depends on .....

   A) Resistance B) Temperature difference

   C) Capacitance D) Light intensity

6. The main advantage of digital instruments over analog is.....

   A) High power consumption. B) Low cost

   C) Large size D) Accuracy and readability

7. A Hall effect sensor measures:

   A) Temperature B) Magnetic field

   C) Displacement D) Pressure

8. Which of these is a unipolar transistor?

   A) BJT B) FET

   C) Triac D) SCR

9. Kirchhoff's Voltage Law states that:

   A) Sum of voltages around a loop is zero

   B) Sum of currents at a node is zero

   C) Voltage equals current

   D) Total power is conserved

10. Which of the following is not a passive component?

A) Resistor B) Capacitor

C) Inductor D) Transistor

11. In a system of N particles subjected to "K" independent constraints, the number of degrees of freedom of are.....

a) 3N-K b) 3N + K

c) 3N d) 3N-2K

12. The conditions of constraint can be expressed as equations connecting the coordinates of the particles called as ..... constraint,

a) Holonomic b) Non-holonomic

c) Unilateral and bilateral d) Dissipative

13. Out of all possible paths of a dynamical system between the time instants t0 and t1, the actual path followed by the system is one for which the action has a stationary value; this is called as ..... principle.

a) Hamilton's b) D' Alembert's

c) Lagrangian d) Newton's

14 The reciprocal of reciprocal lattice is ..... lattice.

a) direct b) indirect

c) positive d) negative

15. The Bragg's diffraction condition is .....

a) $\sin\theta = n\lambda$ b) $d\sin\theta = n\lambda$

c) $d\cos\theta = n\lambda$ d) $2d\sin\theta = n\lambda$

16. The first Brillouin zone lies between the values of k .....

a) $-\pi/a$ *to* π/a

b) *zero to* π/a

c) $-\pi/a$ *to zero*

d) $-2\pi/a$ *to* $2\pi/a$

17. The lagging of intensity of magnetization behind the magnetising field is called as .....

a) Hysteresis

b) spontaneous magnetization

c) saturation magnetization

d) Coercivity

18. Non-primitive unit cells contain ..... lattice points, either on a face of the unit cell or within the unit cell.

a) only one

b) more than one

c) more than two

d) more than three

19. Bravais lattice in 2 dimensions, lattice parameters of the hexagonal structure ie, a and b are.....

a) $a=b, \gamma= 120^\circ$

b) $a>b, \gamma= 120^\circ$

c) $a<b, \gamma= 120^\circ$

d) $a \neq b, \gamma = 120^\circ$

20) In semiconductor conductivity increases with .....

a) decrease in temperature

b) increase in temperature

c) constant temperature

d) not any change in temperature

21 Vector product of parallel or antiparallel vectors is equal to.....

a) Zero b) Infinite

c) l d) 8

22 What is the source of energy of an artificial satellite?

a) Solar b) Wind

c) Hydro d) kinetic

23 Calculate the acceleration produced when a force of 400 N acts on a body of mass 2000 kg.

a) $0.2\ m/s^2$ b) $0.4\ m/s^2$

c) $0.6\ m/s^2$ d) $4\ m/s^2$

24 Dimensions of Impulse are.....

a) $[M^1L^2T^3]$ b) $[M^{-1}L^3T^{-2}]$

c) $[M^1L^3T^2]$ d) $[M^1L^1T^{-1}]$

25. Equation which gives mutual inductance of two coils is also known as.....

a) Newton formula b) Newmann formula

c) Kepler's law d) Law of inertia

26. The current varying at the rate of 6A/s in one coil. induces an emf of 2V in neighbouring coil. Calculate the mutual inductance of pair of coils.

a) 0.78 H b) 0.66 H

c) 0.24 H d) 0.33 H

27 A series LCR circuit at high frequency behaves like .....circuit

a) Capacitive b) Resistive

c) Inductive d) Capacitive and resistive

28 .....is an application of spintronics.

a) Photocatalysis b) X ray diffraction

c) Refraction d) Giant magnetoresistance

29 Divergence of magnetic field () = ...

3) 4π 6) μo J

c) Zero d) 2π

30 Equation which gives mutual inductance of two coils is also known as. .....

a) Newton formula b) Newmann formula

c) Kepler's law d) Law of inertia

31. The element most common to all acids is.

a) Hydrogen b) carbon

c) sulphur d) oxygen.

32 The substance that loses electrons is called.....

a) oxidising agent b) reducing agent

c) catalyst d) both a and b

33. Air is a/an .....

a) Compound b) Element

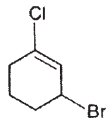
c) Mixture d) Electrolyte

34. In an organic compound, which element is generally present in addition to hydrogen?

a) Phosphorus b) Sulfur

c) Nitrogen d) Carbon

35. What is the IUPAC name for the compound shown below?



a) 1-Bromo-3-chlorocyclohexene

b) 2-Bromo-6-chlorocyclohex-1-ene

c) 6-Bromo-2-chlorocyclohexene

d) 3-Bromo-1-chlorocyclohex-1-ene

36. ..... involves the alkylation of an aromatic ring.

a) Friedel-Crafts reaction

b) Wurtz reaction

c) Claisen reaction

d) Aldol reaction

37. Complex and giant molecule of high molecular weight formed by linking together a large number of similar or dissimilar monomer is called as .....

a) Polymer

b) Monomer

c) Rubber

d) Resin

38. The absolute value of charge on electrons was determined by.....

a) J.J.Thomson

b) R.A. Millikan

c) Rutherford

d) Chadwick

39. Catalyst is used in the manufacturing of ammonia.

a) Fe

b) Mg

c) Ni

d) Co & Cu

40. The electrochemical cell stops working after some time because.....

a) Electrode potential of both the electrodes becomes zero

b) One of electrodes completely vanishes

c) Electrode potential of both electrodes equalizes

d) The reaction reverses its direction

41 The equation $\lambda^{o} = \lambda_{+}^{o} + \lambda_{-}^{o}$ represents .....

a) Ohm's law

b) Hittorf's rule

c) Kolhrausch's law.

d) None of these

42. Which of the following can be considered as a strong electrolyte?

a) HCOOH

b) NH_4OH

c) KCl

d) $C_6H_5NH_2$

43 Severe corrosion takes place when the percentage of humidity is.....

a) Below 50%

b) About 50-80%

c) Above 80%

d) All of these

44 During corrosion at anode a metal goes into conducting medium as its .....

a) Anion

b) Cation

c) Neutral atom

d) H_2

45. The common oxidation state shown by lanthanide is .....

a) 3+

b) 2+

c) 4+

d) 1+

46. In EDTA molecules .....acidic groups are present.

a) four b) three

c) two d) six

47. The degree of dissociation of NH_4OH is suppressed by adding a strong electrolyte with a common ion.

a) KCl b) KBr

c) NH_4Cl d) Na_2CO_3

48 Compounds of ..... ions are colorless.

a) Cu^+ b) Ni^{2+}

c) Cu^{2+} d) Fe^{2+}

49. Aldehyde is one of the reactants used in ..... reaction

a) Aldol condensation b) Perkins

c) Cannizzaro's d) All of these

50 The carbonyl carbon of aldehydes and ketones is.... hybridized.

a) sp^3 b) sp

c) sp^2 d) ps^3

51. Electrochemistry is the study of the interchange of .....

a) Chemical energy and photon

b) Chemical energy and electrical energy

c) Electrical energy and photon

d) None of the above

52. Electrochemical cell is a device capable of .....

a) Generating electrical energy from chemical reaction

b) Producing heat energy

c) Producing mechanical energy

d) None of the above

53 Oxidation is the .....of electrons and reduction is the .....of electrons.

a) Loss, gain

b) Giain, loss

c) Loss, loss.

d) Gain, gain

54. What is nuclear chemistry?

a) Study of electronic reactions

b) Study of nuclear reactions

c) Study of Biochemical reactions

d) Study of light-driven reactions

55. The spontaneous immersion of radiations by an element is .....

a) Radioactivity

b) Chemical activity

c) Bioactivity

d) None of the above

56 Radioactivity involves emission of...

a) Alpha, Beta, Gamma radiations

b) heat

c) Radio Waves

d) photons

57. According to Bronsted Lowry theory base is...

a) Proton acceptor b) Proton donor

c) Electron donor d) Electron acceptor

58. Which of the following types of drugs are not functional drugs?

a) Tranquillizers b) Hypnotics

c) Sedetives d) Antiviral

59 Tranquilisers are also called as .....

a) Hypnotics b) Psycholeptics

c) Sedetives d) Anaestheties

60 Central Nervous System (CNS)-depressants which produce sleep are .....

a) Hypnotics b) Sedetives

c) Antipyretics d) Analgesics

61 Hard magnets have?

a. Narrow hysteresis b. Broad hysteresis

c. both d. None

62 Which of the following shows weak magnetization?

a. Ferrimagnetism b. Ferromagnetism

c. Diamagnetism d. Paramagnetism

63 Quantum dots are?

a. OD b. 2D

c. 3D d. none

64 When Electrical energy can be converted into photons its called as?

a. Chemiluminescence
b. Bioluminescence
c. Electroluminescence
d. Photovoltaic effect
d. none

65 When Photon energy gets converted into chemical reactions its called as ?

a. Chemiluminescence
b. Bioluminescence
c. Electroluminescence
d. Photovoltaic effect
d. Photo catalysis

66. A device that generates voltage when exposed to light is called?

a. Solar cells.
b. LED
c. PEC
d. Photocatalysis

67. When Atoms and molecules are removed from a bulk material so as to obtain desired nanostructure, this process is called?

a. Top Down
b. Bottom Up
c. Electroluminescence
d. None

68 When atoms and molecules are assembled so as to have nanomaterials of required size and shape by controlled deposition or reaction parameters, this process is called as?

a. Top Down
b. Bottom Up
c. Electroluminescence
d. None

69 The synthesis of materials by high energy ball milling of powders was first developed in the year

a. 1999
b. 1970
c. 1995
d. 2000

70. Permanent magnets are a type of?

a. Hard magnets. b. CNT

c. Soft magnets d. All of the above

71. The sword of Tipu Sultan was made of...

a) nano gold b) nano aluminium

c) Damascus steel d) Nano silver

72. For ..... nanomaterial, all the dimensions are at nanoscale, an electron confined in all 3D space

a) 3D b) 0D

c) 2D d) 1D

73 Due to quantum confinement the energy difference between energy bands ..... with decreasing particle size.

a) increases b) decreases

c) nearly constant d) do not change

74. Which of the following is an example of bottom-up approach for the preparation of nanomaterials?

a) Sol-gel

b) Dip pen nano-lithography

c) Lithography

d) Pulsed laser deposition

75. In case of Esaki diode the width of the depletion region must be.....

a) 100 nm b) 50 nm

c) 10 nm d) 0 nm

76. For Zig-Zag configuration of CNT which of the following condition is suitable.

a) $n=O, m=O, \theta=30°$

b) $n\neq O, m=O, \theta=0°$

c) $n=O, m=O, \theta=0°$

d) $n\neq O, m=O, \theta=30°$

77. If the band gap is 1.7 eV. then LED emittes..... colored light.

a) Blue b) Red

c) Green d) Yellow

78 Zig-zag type of a CNT can be represented as .....

a) (1,2) b) (2,2)

c) (2,0) d) (0,0)

79 The diameter of a bucky ball is .....nm

a) 1,000 b) 100

c) 10 d) 1

80 Who prepared and explained nanotubes for the first time?

a) Sumio Tijima b) Richard Smalley

c) Eric Drexler d) Richard Feynmann

81 Fullerene or bucky ball is made up of .....carbon atoms.

a) 100 b) 75

c)20 d) 60

82 A circular array of iron atoms on a copper surface is called as a.....

a) Quantum dots b) Quantum corral

c) Both a and b d) None of the above

83 Which one of the following technology is used in making memory chips?

a) Nano design
b) Nanofabrication
c) Microassaay
d) Tissue engineering

84 Vesicle is a type of .....

a) Nanostructure
b) Nanoparticle
c) Nanocrystal
d) Supramolecular system

85. The synthesized magnetic nano particles from..... Have been found to self-arrange automatically

a) Zinc
b) Copper
c) Iron
d) Zirconium

86 Coating the nano crystals with the ceramics is carried that leads to .....

a) Corrosion
b) Corrosion resistant
c) Wear and tear
d) Soft

87 Nanopores are made up of.....

a) Carbon
b) Gold
c) Titanium
d) Silicon

88 Tiny semiconductor nanoparticles with fascinating light-emitting properties are called as .....

a) Nanoparticles
b) Nanopores
c) Buckyballs
d) Quantum dots

89 Nano crystalline materials synthesized by sol-gel technique results in a foam like structure called.....

a) Gel
b) Aerosol
c) emulsion
d) aerogel

90 The size of quantum dots ..... nm?

a) 5 nm b) 10 nm

c) 50 nm d) 100 nm

91. In recombinant DNA technology, the term vector refers to .....

a) The enzyme that cuts DNA into restriction fragments

b) The sticky end of DNA fragments

c) A plasmid used to transfer DNA into living cells

d) A DNA probe used to identify a particular gene

92 Steam sterilization by autoclave is carried out at .....

a) 160 °C for 1 h b) 121 °C for 15-20 min

c) 180 °C d) 121 °C for overnight

93 ..... is a part of the cell envelope made up of proteins found in almost all archaea and in many types of bacteria.

a) Lipids b) Flagella

c) Cilia d) S-layer (surface layer)

94 Separation of protein in 2-D gel electrophoresis is dependent on

a) Mass of protein alone

b) Charge of protein alone

c) Mass and hydrophobicity of the protein

d) Charge and mass of the protein

95. ..... is the study of interaction between an antigen and an antibody.

a) Serology b) Cytology

c) Mycology d) Neurology

96 The following material is currently widely used as an adsorbent material in both water treatment plants and for water purification

a) Zinc nitrate
b) Silver particles
c) Iron mix
d) Activated carbon

97. Which of the following is mostly used for the preparation of Mesoporous material?

a) Triton-X
b) Polyvinyl alcohol
c) Silica
d) Iron

98. In Air pollution PM 2.5 stands for.....

a) Particulate Matter 2.5 micrometer

b) Particulate Matter 25 nanometer

c) Particulate Mass 2.5 centimeter

d) Particulate Mass 2.5 meter

99 A Mesoporous material is a material containing pores with diameters between .....

a) 2 and 50 nm
b) 1 to 10 nm
c) 100 to 150 nm
d) None of the above

100 Toxic nanoparticles entry by food route is called.....

a) Dermal
b) Inhalation
c) Ingestion
d) Injection

◆◆◆

-- ROUGH WORK --