

Seat No.	
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P.G Entrance Examination, June - 2022**M.Sc. Nano Science and Technology****Sub. Code : 71144****Day and Date : Saturday, 11- 06 - 2022****Total Marks : 100****Time : 1.00 p.m. to 02.30 p.m.**

- Instructions :**
- 1) All questions are compulsory.
 - 2) Each question carries one 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.

- 1) The equation $(dy/dx) = \sin x$ is _____
A) homogeneous
B) Non-linear
C) Linear
D) First-order non-linear
- 2) Liposomes are made of
A) Proteins
B) Phospholipids
C) Cellulose
D) Ribosomes
- 3) Types of addition reactions are _____
A) Halogenation
B) Hydration
C) Hydrogenation
D) All of above
- 4) A Nano biological recognition component, which is involved in interacting with the analyte molecule is called as:
A) Biosensor
B) Probe
C) Nanobiosensor
D) Quantum Dots
- 5) The size of nanoparticles is between _____ nm?
A) 100 - 1000nm
B) 0.1 - 10nm
C) 1 - 100nm
D) 0.1 - 1nm

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- 6) The wavelength of visible light is _____ nm?
A) 40-70nm
B) 400-700nm
C) 4000-7000nm
D) 40000-70000nm
- 7) Which one of the following is not related to Dendrimers?
A) core
B) generation
C) branching
D) tube
- 8) Which ratio decides the efficiency of Nanoparticles?
A) Weight/Volume Ratio
B) Surface Area/Volume Ratio
C) Volume/Weight Ratio
D) Pressure/Volume Ratio
- 9) In which year and by whom the famous speech “There is plenty of room at the bottom” was delivered
A) Eric Drexler, 1986
B) Sumio Iijima, 1991
C) Norio Taniguchi, 1974
D) Richard Feynman, 1959
- 10) In air pollution PM10 stands for Particulate Matter up to -
A) 10 micrometer
B) 10 nm
C) 10 cm
D) None of the above
- 11) What are the two most abundant elements by mass found in Earth’s crust.
A) Al & Fe
B) Na & Cl
C) Ca & Mg
D) O₂ & Si
- 12) In Quantum Dots Nanostructure, the colour changing phenomenon is due to _____?
A) Quantum Mechanics
B) Quantum Confinement
C) Plasmic Resonance
D) Quantum Tunnelling

- 13) An electron spin ($s = \frac{1}{2}$) can take only _____ orientation with respect to a specified axis.
A) One
B) Two
C) Three
D) Four
- 14) The surface area to Volume Ratio of cube with side 1 unit is R_1 and that of a cube with side 10 units is R_2 . Then $R_2 =$ _____ R_1 ?
A) $1/10$
B) 10
C) $1/100$
D) 100
- 15) The bonding present in Carbon Nanotubes is _____?
A) sp^3 hybridization
B) sp^2 hybridization
C) p^3 covalent bond
D) s^4 bond
- 16) _____ are allotrope of carbon with a cylindrical nanostructure.
A) Graphene
B) Carbon nanotube
C) Carbon dot
D) Fullerene
- 17) Green synthesis of nanoparticles means
A) Synthesis from green metals
B) Synthesis from biological contents
C) Synthesis from physical force
D) None of the above
- 18) Carbon nanotubes are categorized as _____
A) SWNT
B) MWNT
C) Both (A) and (B)
D) None of these
- 19) Nanoparticles can enter through human body by _____
A) Inhalation
B) Ingestion
C) Dermal
D) All of the above
- 20) Which of the following are allotropes of carbon?
A) Fullerene
B) Carbon naotube
C) Graphene
D) All of the above

- 21) _____ nanoparticle and its application as a photo-catalyst in water treatment are good.
A) Silver
B) Magnesium
C) TiO_2
D) Lead
- 22) Following technique is use in water pollution treatment.
A) Membrane filters
B) Sand filters
C) Reverse osmosis
D) All of the above
- 23) $10 \text{ nm} = \text{m}$
A) 10^{-8}
B) 10^{-9}
C) 10^{-7}
D) 10^{-10}
- 24) Schottky defect in a crystal is observed when
A) The ion leaves its normal position and occupies an interstitial location.
B) The unequal number of cations and anions are missing from the lattice.
C) The density of the crystal increases.
D) An equal number of cations and anions are missing from the lattice.
- 25) The genetic code, consists of group of three nucleotides called _____?
A) Codons
B) Introns
C) Anticodons
D) triplets
- 26) Which of the following Methods can be categorized as “Top-Down Approach”
A) Self Assembly Process
B) High Energy Ball Milling
C) Sol-Gel
D) Micro - Emulsion Process
- 27) What are the advantages of nano-composite packages?
A) Lighter and biodegradable
B) Enhanced thermal stability, conductivity and mechanical strength
C) Gas barrier properties
D) All of the mentioned

- 28) The growth of small nuclei clusters to nanoparticles is referred to as
 - A) Condensation
 - B) Nucleation
 - C) Supersaturation
 - D) Agglomeration
- 29) The full form of BET Method is _____
 - A) Basic Emulator Tool
 - B) Broad Nanometer Tool
 - C) Brunauer-Emmett - Teller
 - D) None of the above
- 30) Which of the following are Electron Probe Methods?
 - A) Atomic Force Microscope
 - B) Dynamic Light Scattering
 - C) Scanning Probe Microscope
 - D) Energy Dispersive X-Ray Analysis (EDAX)
- 31) Which of the following is the principal factor which causes the properties of nanomaterials to differ significantly from other materials?
 - A) Size distribution
 - B) Specific surface feature
 - C) Quantum size effects
 - D) All the mentioned
- 32) The nucleation process where surface of some different substance, such as a dust particle or the wall of the container, acts as the centre upon which the first atoms, ions, or molecules of the crystal become properly oriented.
 - A) Homogenous Nucleation
 - B) Heterogenous Nucleation
 - C) Hybrid Nucleation
 - D) None of the above
- 33) Biological Nanomoter are made up of
 - A) DNA
 - B) RNA
 - C) Protein
 - D) None

- 34) Biological synthesis of nanomaterials is a
 A) Top down approach B) Bottom up approach
 C) both D) none
- 35) Frenkal and Schottky defects are _____
 A) Crystal defects B) Nucleus defects
 C) Non-crystal defects D) Nuclear defects
- 36) Which one of the following characterization is used to know the charge on biomolecules
 A) XRD B) FTIR
 C) Zeta potential D) TEM
- 37) Process that uses electrical current to reduce cations of a desired material from a solution and coat that material as a thin film onto a conductive substrate surface is known as _____
 A) Template Synthesis
 B) Chemical Mechanical Polishing
 C) Electrodeposition
 D) Electropolishing
- 38) _____ process is used by semiconductor chipmakers to polish a silicon wafer to achieve a near-perfect flat and smooth surface, upon which layers of integrated circuitry are built
 A) Chemical Etching
 B) Chemical Mechanical Polishing
 C) Lithography Techniques
 D) Electroplating
- 39) Which of the following is an example of top-down approach for the preparation of nanomaterials?
 A) Gas phase agglomeration B) Molecular self-assembly
 C) Mechanical grinding D) Molecular beam epitaxy

- 40) Particle size of nanomaterials can be determined using _____
A) Scanning Electron Microscope B) UV-Visible Spectrometer
C) Dynamic Light Scattering D) X-ray Diffraction
- 41) Smallest object that can be seen is _____ wavelength of visible light
A) 300nm B) 500 A
C) 200nm D) 700 A
- 42) Sol-Gel process can be controlled through relative rate between _____
A) Nucleation, Supersaturation
B) Hydrolysis, polycondensation
C) Polymerization
D) Metal oxo and Metal Hydroxo Polymers
- 43) Lithography Techniques is derived from word
A) Latin word lithos “drawf” graphein “pattern”
B) Greek word lithos, means stone “and graphein, means to write”.
C) Greek word meaning “Tiny writing on stone”
D) None of the above
- 44) _____ take into account the polarization characteristics of a large number of nearby particles and the effects they have on each other.
A) Intramolecular Forces B) Intermolecular Forces
C) Hamaker interactions D) Van der Waals Interaction
- 45) According to the work-energy theorem. The work done by the resultant force acting on the particle is equal to change in _____ of the particle.
A) Kinetic energy B) Potential energy
C) Only velocity D) Only mass
- 46) An equal number of atoms or ions missing from the normal lattice point creates a vacancy due to the _____
A) Frenkel defects B) Schottky defects
C) Interstitial defects D) Mass defects

- 47) For a spherical shell rolling down an inclined plane, the value of acceleration is _____
- A) $(3/5) g \sin \theta$
- B) $(3/4) g \sin \theta$
- C) $(3/8) g \sin \theta$
- D) $(3/2) g \sin \theta$
- 48) If the frame of reference is changed then _____
- A) the physical laws are changed
- B) the conservation laws are not obeyed
- C) the conservation laws are obeyed
- D) the value of physical quantity is not changed
- 49) Torsional oscillations of a wire are due to its _____
- A) high density
- B) Young's modulus
- C) the bulk modulus of elasticity
- D) modulus of rigidity
- 50) Thermal conductivity occurs due to _____
- A) momentum
- B) mass
- C) thermal energy
- D) none of these
- 51) For a reversible process
- A) $dS = dQ/T$
- B) $dS > dQ/T$
- C) $dS < dQ/T$
- D) none of the mentioned
- 52) Helmholtz free energy remains constant in _____ process.
- A) Isothermal - Isochoric
- B) Isothermal - adiabatic
- C) Isothermal - Isobaric
- D) Isothermal - isentropic
- 53) For a di - atomic gases, ratio of specific heats is _____
- A) 1.67
- B) 1.40
- C) 2.67
- D) 2.40

- 54) Zeroth law of thermodynamics helped in the creation of which scale?
- A) Temperature
B) Pressure
C) Heat energy
D) Internal energy
- 55) Which law is stated here, “It is impossible to reduce any system to the absolute zero of temperature in a finite number of operations”.
- A) first law of thermodynamics
B) second law of thermodynamics
C) third law of thermodynamics
D) none of the mentioned
- 56) Thermodynamic potentials have same role as _____ in mechanics.
- A) force
B) momentum
C) kinetic energy
D) potential energy
- 57) In which of the following acid/base titrations, can we NOT determine the equivalence point accurately?
- A) Strong acid / strong base
B) Strong acid / weak base
C) Weak acid / strong base
D) Weak acid / weak base
- 58) Phase space is a _____
- A) 3 Dimensional Space
B) 4 Dimensional Space
C) 5 Dimensional Space
D) 6 Dimensional Space
- 59) Bose-Einstein statistics is for the _____
- A) Distinguishable particles
B) Symmetrical Particles
C) Particles with half integral spin
D) Particles with integral spin

- 60) Two simple harmonic oscillations travelling along same line and have slightly different frequencies produce _____
- A) Lissajous figures
 - B) beats
 - C) both Lissajous figures and beats
 - D) neither Lissajous figures nor beats
- 61) Total number of atoms in unit cell of simple cubic crystal.
- A) 1
 - B) 4
 - C) 6
 - D) 8
- 62) Atomic packing fraction (%) of the Face Centered Cubic crystal is _____
- A) 74%
 - B) 84%
 - C) 52%
 - D) 68%
- 63) X-ray diffractometers are not used to identify the physical properties of which of the following?
- A) Metals
 - B) Liquids
 - C) Polymeric materials
 - D) Solids
- 64) The magnetism of a magnet is due to
- A) Earth
 - B) Cosmic rays
 - C) Due to pressure of big magnet inside the earth
 - D) Spin motion of electrons
- 65) The correct expression for Bragg's law is $n\lambda =$ _____
- A) $d\sin\theta$
 - B) $d\cos\theta$
 - C) $2d\sin\theta$
 - D) $2d\cos\theta$
- 66) Example for dia-magnetic materials
- A) Super conductors
 - B) Alkali metals
 - C) Transition metals
 - D) Ferrites

- 67) Materials that have very high permeabilities (hundreds and even thousands times of that of free space)
 - A) Paramagnetic
 - B) Non - magnetic
 - C) Ferromagnetic
 - D) Diamagnetic
- 68) The functional groups are present in carbohydrates are
 - A) Aldehydes
 - B) Ketones
 - C) Hydroxy groups
 - D) All the above
- 69) The trajectory of charged particle entering a constant, uniform magnetic field (B) is _____
 - A) Cycloid
 - B) Circle
 - C) Parabola
 - D) Straight line
- 70) Mass energy equation was proposed by _____
 - A) Einstein
 - B) Newton
 - C) Lorenz
 - D) Galileo
- 71) The special theory of relativity was developed by _____
 - A) Einstein
 - B) Newton
 - C) Galileo
 - D) Rutherford
- 72) How many unpaired electron are present in lithium.
 - A) 1
 - B) 2
 - C) 3
 - D) 4
- 73) 'sp' hybrid orbital are _____ disposed.
 - A) Trigonal
 - B) Diagonally
 - C) Irregularly
 - D) Periodically
- 74) Which of the following compound is soluble in polar solvent?
 - A) HF
 - B) NaCl
 - C) CCl₄
 - D) KI

- 75) Heisenberg uncertainty principle could be applied to _____ Particles.
 A) Macro B) Fundamentals
 C) Microscopic D) Both (A) and (C)
- 76) The reaction equation $2R - X + 2Na \rightarrow R - R + 2Na + X -$.
 A) Kolbe B) Grignard
 C) Wurtz D) None of these
- 77) How many steps in Radical Chain Mechanism.
 A) 1 B) 2
 C) 3 D) 4
- 78) In elimination reaction two leaving group leave from the adjacent atoms of the same molecule is called _____.
 A) α elimination B) β elimination
 C) Both α and β D) None of these
- 79) Mathematically representation of the reduced phase rule is?
 A) $F = C - P + 2$ B) $F = C - P + 1$
 C) $F = E - P + 2$ D) $F = C - P + 1$
- 80) The Azimuthal quantum number helps in defining the _____ of the orbitals.
 A) Shape B) Size
 C) Energy D) Orientation
- 81) Atomic orbitals are _____ functions that describe the wave nature of electrons in an atom.
 A) Chemical B) Physical
 C) Mathematical D) None of these
- 82) Lactose (milk sugar) is formed by the combination of _____.
 A) Glucose and galactose B) Glucose and fructose
 C) Galactose and fructose D) All the above

- 83) Condensation of carbonyl compounds such as aldehydes or ketones with α -halo esters using metallic zinc to form β -hydroxy-esters is known?
- A) Reformatsky reaction B) Schotten - Baumann Reaction
C) Gabriel's Phthalimide synthesis D) Hofmann Bromamide reaction
- 84) Primary amines on treatment with chloroform (CHCl_3) and ethanolic solution of KOH yield isocyanides of carbylamines is known as _____
- A) Hinseberg test B) Carbylamine test
C) Iodoform test D) All the above
- 85) The central atom/ion of a coordination complex is also referred to as _____
- A) Lewis acid B) Lewis base
C) Bronsted - Lowry acid D) Bronsted-Lowry base
- 86) Types of addition reactions are _____
- A) Halogenation B) Hydration
C) Hydrogenation D) All of above
- 87) According to Markovnikov's Rule, Hydration of 1-Propane to form 2-propanol (.....) and 1-propanol (.....)
- A) Major, Minor B) Minor, Major
C) Both Major D) Both Minor
- 88) Carbon carbon double bonds have _____
- A) One sigma, One Pi B) Both Sigma
C) Both Pi D) None of these
- 89) Soft acid and soft base interaction is generally _____ nature.
- A) Interstitial B) Covalent
C) Ionic D) Metallic

- 90) Which of the following is a first biosensor
- A) Glucose biosensor B) Cholesterol biosensor
C) Both D) None
- 91) Diels-Alder reaction involves the _____ addition of an alkene to a conjugated diene.
- A) 4, 1 B) 1, 4
C) 4, 4 D) 1, 1
- 92) According to HSAB concept _____ is soft acid.
- A) Li^+ B) Ni^{2+}
C) Hg^{2+} D) Mg^{2+}
- 93) _____ method is used to calculate the surface tension of liquids.
- A) Jaegers B) Newtons
C) Kepler's D) Youngs
- 94) The ordinary differential equation involves _____
- A) Total derivatives B) Only dependent variables
C) Partial derivatives D) Only independent variables
- 95) The lotus leaf is an example of _____
- A) Hydrophilic surface B) Hydrophobic surface
C) Superhydrophilic surface D) Superhydrophobic surface
- 96) The weightlessness condition is also known as _____
- A) Surface tension B) Zero gravity condition
C) Momentum D) Lotus effect

- 97) The oscillatory motion of a body about its mean position only under the action of restoring force developed is called _____ oscillatory motion.
- A) damped B) forced
C) free D) overdamped
- 98) Osmium tetroxide always give _____
- A) Geminal diols B) Vicinal diols
C) Triols D) Poluhydroxy compounds
- 99) HSAB concept was introduced by _____
- A) Lewis B) Usanovich
C) Pearson D) Lorry
- 100) The solvents which have strong tendency to accept protons are _____ solvents.
- A) Acidic B) Protophilic
C) Amphoteric D) None of the above



Rough Work