

Seat No.	
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P.G. Entrance Examination, July - 2023
M.Sc. NANOSCIENCE AND BIOTECHNOLOGY
Sub. Code: 71144

Day and Date : Tuesday, 18 - 07 - 2023
Time : 03.30 p.m. to 05.00 p.m.

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.

1) The resonant frequency of a series LCR circuit is given by a relation, _____.

(A) $f_0 = \frac{1}{\sqrt{LCR}}$

(B) $f_0 = \frac{1}{2\pi\sqrt{LC}}$

(C) $f_0 = \frac{1}{2\pi LCR}$

(D) $f_0 = \frac{1}{4\pi\sqrt{LC}}$

2) The motion of a torsional pendulum is _____.

- (A) uniform linear motion
- (B) accelerated linear motion
- (C) angular simple harmonic motion
- (D) linear simple harmonic motion

- 3) The dimensions of momentum are same as dimensions of _____.
(A) Impulse of force
(B) velocity
(C) acceleration
(D) mass
- 4) Lenz law gives _____ of induced emf.
(A) magnitude
(B) direction
(C) magnitude and direction
(D) capacitance
- 5) The equation of continuity is in accordance with the law of conservation of _____.
(A) energy
(B) momentum
(C) charge
(D) mass
- 6) The ratio of charge to potential of a body is known as _____.
(A) Capacitance
(B) Inductance
(C) Conduction
(D) Resistance
- 7) _____ is an example of paramagnetic material.
(A) Silver
(B) Gold
(C) Mercury
(D) Aluminium

- 8) Surface plasmon resonance is observed in _____ nanoparticles.
(A) Titanium dioxide (B) Zinc oxide
(C) Cadmium Sulphide (D) Gold
- 9) _____ is the quanta of electromagnetic energy and is the basic energy associated with light.
(A) Photon
(B) Phonon
(C) Exciton
(D) Proton
- 10) _____ is the quantized mode of thermal vibrations in the lattice.
(A) Photon
(B) Phonon
(C) Exciton
(D) Proton
- 11) 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
- 12) If you hold the conductor with right hand so that the stretched thumb points in the direction of the current, then encircling fingers will give the direction of magnetic lines of force round the conductor. This is known as
(A) Left hand cork screw rule
(B) Right hand cork screw rule
(C) Left hand rule
(D) Right hand rule

- 13)** Referred to as the specific reluctance of a material
- (A) Resistivity
 - (B) Reluctivity
 - (C) Conductivity
 - (D) Permeability
- 14)** Based on magnetic response super conductors are of _____ types.
- (A) 1
 - (B) 2
 - (C) 3
 - (D) 4
- 15)** The magnetic lines of force cannot penetrate the body of a superconductor, a phenomenon is known as
- (A) Isotopic effect
 - (B) BCS theory
 - (C) Meissner effect
 - (D) London theory
- 16)** Light has _____.
- (A) Wave nature only
 - (B) Particle nature only
 - (C) Both particle and wave nature
 - (D) None of these
- 17)** Davisson & Germer experiment is related to the
- (A) Interference of electron
 - (B) Diffraction of electron
 - (C) Polarization of electron
 - (D) Superposition of electron

- 18) 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) $3N - 2K$
- 19) If constraint relations do not explicitly depend on time then it is _____.
- (A) Scleronomic constraint
 - (B) Rheonomic constraint
 - (C) Holonomic constraint
 - (D) Non-Holonomic constraint
- 20) The Lagrangian ' L ' can be given as
- (A) $L = T - V$
 - (B) $L = T + V$
 - (C) $L = T - 2V$
 - (D) $L = T + 2V$
- 21) _____ is the velocity of an individual (component) progressive wave i.e. the velocity of a point on the wave with a constant phase.
- (A) Phase velocity
 - (B) Group velocity
 - (C) Wave packet velocity
 - (D) Envelop velocity
- 22) _____ is defined as a wave in which the wave amplitude is constant over all points of a plane perpendicular to the direction of propagation.
- (A) Longitudinal wave
 - (B) Spherical wave
 - (C) Cylindrical wave
 - (D) Plane wave

- 23) The phase difference between electric field vector and magnetic field vector of electromagnetic waves is _____.
- (A) 0 (B) $\pi/4$
(C) $\pi/2$ (D) π
- 24) In the Electromagnetic waves, which of the following has minimum wavelength?
- (A) Blue light (B) γ -rays (gamma rays)
(C) Infrared rays (D) Microwave
- 25) The velocity of the EM waves in free space (vacuum) is equal to (approximately) _____.
- (A) 3×10^8 m/s
(B) 3×10^5 m/s
(C) 3×10^8 km/s
(D) 3×10^5 km/s
- 26) Which of the following do not require any material medium for their propagation?
- (A) Sound waves
(B) Microwaves
(C) Earthquake waves
(D) Water surface waves
- 27) The electric field vector and magnetic field vector in electromagnetic waves are oriented
- (A) parallel to the wave's direction of travel, as well as to each other.
(B) perpendicular to the wave's direction of travel, and also perpendicular to each other.
(C) parallel to the waves direction of travel, and perpendicular to each other.
(D) perpendicular to the wave's direction of travel, and parallel to each other.

- 28) The locus of all particles of the medium, which at any instant are vibrating in the same phase is called the _____.
- (A) wavefront (B) wavelet
(C) wavepacket (D) wavelength
- 29) The techniques used for creating coherent sources of light for interference can be divided into the following two broad classes are _____.
- (A) Wavelets splitting and Amplitude splitting
(B) Wave front splitting and wavelength splitting
(C) Wave front splitting and Amplitude splitting
(D) Wave length splitting and Amplitude splitting
- 30) The condition for constructive interference is _____
(symbols having their usual meanings)
- (A) $d \sin\theta = m\lambda$
(B) $d \sin\theta = m\lambda + \lambda/2$
(C) $d \sin\theta = m/\lambda$
(D) $d \sin\theta = m/2\lambda$
- 31) The site of oxidation in an electrochemical cell is
- (A) the anode
(B) the cathode
(C) the electrode
(D) the salt bridge
- 32) Which statement below is not true for the reaction? $\text{Fe}^{3+} + \text{e}^{-} \rightarrow \text{Fe}^{2+}$
- (A) Fe^{3+} is being reduced
(B) the oxidation state of Fe has changed
(C) Fe^{3+} could be referred to as an oxidizing agent in this reaction
(D) both Fe^{3+} and Fe^{2+} are called anions

- 33) Which of the following is a half-reaction?
- (A) $\text{Zn}^+ + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}$
- (B) $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$
- (C) $\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$
- (D) $\text{Ag}^+ + \text{Cl}^- \rightarrow \text{AgCl}$
- 34) In any electrochemical cell, the cathode is always _____.
- (A) A nonmetal
- (B) Attached to a battery
- (C) The electrode at which some species gain electrons
- (D) The electrode at which some species lose electrons
- 35) The chemical effects produced by light radiations chiefly in the visible and ultraviolet regions is
- (A) Thermochemistry
- (B) Electrochemistry
- (C) Photochemistry
- (D) Nanochemistry
- 36) The common applications of semiconductors in photochemistry are
- (A) Photovoltaic cells
- (B) Photocatalysts
- (C) Sensitizers for water splitting
- (D) All of the above
- 37) Mercaptans can be produced by the photochemical addition of _____ to alpha olefins.
- (A) Hydrogen sulphide
- (B) Sulphur
- (C) Hydrogen
- (D) Paraffin

- 38) Fireflies are an example of
- (A) Bioluminescence
 - (B) Photolysis
 - (C) Photosynthesis
 - (D) Photoisomerization
- 39) _____ is used as a photosensitizer in plants.
- (A) Light
 - (B) Chlorophyll
 - (C) Sunlight
 - (D) Both (A) and (B)
- 40) A key aspect of catalysts is
- (A) catalyst degrades
 - (B) takes part in the reaction
 - (C) engulf reactant
 - (D) remains as it is
- 41) Phenol is acidic because of
- (A) Resonance
 - (B) Electrometric effect
 - (C) Inductive effect
 - (D) Peroxide effect
- 42) Ethers are
- (A) Lewis's acids
 - (B) Neutral
 - (C) Lewis's base
 - (D) None of these

- 43)** The spin quantum number refers to the _____ of the electron.
- (A) Shape
 - (B) Spin
 - (C) Position
 - (D) Size
- 44)** The electron can absorb or release energy in the form of small _____.
- (A) Packets
 - (B) Mass
 - (C) Gas
 - (D) Both (A) and (C)
- 45)** Which of the following compound is soluble in polar solvent?
- (A) HF
 - (B) NaCl
 - (C) CCl_4
 - (D) KI
- 46)** The wave nature of an electron was first given by
- (A) de Broglie
 - (B) Heisenberg
 - (C) Bohr
 - (D) Stark
- 47)** According to the Aufbau principle electrons are filled in an orbital in the _____ order of orbital energy level.
- (A) Increasing
 - (B) Decreasing
 - (C) Same
 - (D) None of these

- 48) Luca's reagent is _____.
- (A) HCl/NaNO_2
 (B) H_2/Pd
 (C) HCl/ZnCl_2
 (D) $\text{H}_2/\text{Pd}/\text{BaSO}_4$
- 49) MOT was proposed by _____.
- (A) Pauling-Slater
 (B) Hund, Mulliken, Huckels
 (C) Gillespie and Nyholm
 (D) Sidgwick and Powell
- 50) Atoms or ions are held together in molecules or compounds by _____ bond.
- (A) Mechanical
 (B) Physical
 (C) Chemical
 (D) None of these
- 51) Which of the following element is not present in an Actinide series?
- (A) Thorium
 (B) Uranium
 (C) Nobelium
 (D) Cerium
- 52) In electrophilic substitution reaction substitution of hydrogen by _____ in aromatic hydrocarbon is called Sulphonation
- (A) HBr (B) SO_3H
 (C) SO_4 (D) H_2SO_4

- 53) Which one of the last elements is present in the Lanthanide series?
 (A) Ytterbium
 (B) Lutetium
 (C) Thulium
 (D) Erbium
- 54) The general electronic configuration of an actinide series is _____.
 (A) $[\text{Rn}] 5f^{1-14}, 6d^{0-1}, 7s^2$
 (B) $[\text{Xe}] 4f^{1-14}, 5d^{0-1}, 6s^2$
 (C) $[\text{Ar}] 5f^{1-14}, 6d^{0-2}, 7s^2$
 (D) $[\text{Ar}] 4f^{1-14}, 5d^{0-1}, 6s^1$
- 55) Which of the following catalyst is used in an electrophilic substitution reaction?
 (A) AlCl_3
 (B) FeCl_3
 (C) Both (A) and (B)
 (D) None of the above
- 56) An aromatic compound follows _____ Rule
 (A) Boyles law
 (B) Dalton's law
 (C) Huckel's rule
 (D) Saytzeff rule
- 57) Coordination number is a characteristic of which of the following?
 (A) Central atom
 (B) Ligand
 (C) Coordination entity
 (D) Coordination compound

- 58) 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
- 59) Primary armines on treatment with chloroform (CHCl_3) and ethanolic solution of KOH yield isocyanides or carbylamines is known as _____.
(A) Hinseberg test
(B) Carbylamine test
(C) Iodoform test
(D) All the above
- 60) 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
- 61) Fullerene or bucky ball is made up of _____ carbon atoms.
(A) 100
(B) 75
(C) 20
(D) 60
- 62) 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

- 63) Which one of the following technology is used in making memory chips?
(A) Nano design (B) Nanofabrication
(C) Microassay (D) Tissue engineering
- 64) Vesicle is a type of _____.
(A) Nanostructure (B) Nanoparticle
(C) Nanocrystal (D) Supramolecular system
- 65) The synthesized magnetic nano particles from _____ Have been found to self-arrange automatically
(A) Zinc
(B) Copper
(C) Iron
(D) Zirconium
- 66) Coating the nano crystals with the ceramics is carried that leads to _____.
(A) Corrosion
(B) Corrosion resistant
(C) Wear and tear
(D) Soft
- 67) Nanopores are made up of _____.
(A) Carbon
(B) Gold
(C) Titanium
(D) Silicon
- 68) Tiny semiconductor nanoparticles with fascinating light- emitting properties are called as _____.
(A) Nanoparticles (B) Nanopores
(C) Buckyballs (D) Quantum dots
- 69) Nano crystalline materials synthesized by sol-gel technique results in a foam like structure called _____.
(A) Gel (B) Aerosol
(C) Emulsion (D) Aerogel

- 70) The size of quantum dots _____ nm?
(A) 5 nm (B) 10 nm
(C) 50 nm (D) 100 nm
- 71) Nanomaterials are the materials with at least one dimension measuring less than _____.
(A) 1 nm (B) 10 nm
(C) 100 nm (D) 1000 nm
- 72) A material with one dimension in Nano range and the other two dimensions are large is called _____.
(A) Micro-material (B) Quantum wire
(C) Quantum well (D) Quantum dot
- 73) The colour of the nano gold particles is _____.
(A) Yellow
(B) Orange
(C) Red
(D) Variable
- 74) The melting point of particles in nano form _____.
(A) Increases
(B) Decreases
(C) Remains same
(D) Increases then decreases
- 75) The first talk about nano-technology was given by _____.
(A) Albert Einstein (B) Newton
(C) Gordon E. Moore (D) Richard Feynman

- 76) Which of the processes of materials was not described as Nanotechnology?
- (A) Separation
 - (B) Creation
 - (C) Processing
 - (D) Consolidation
- 77) The initial tools used to help launch the nanoscience revolution were _____.
- (A) Binoculars
 - (B) Microscope
 - (C) Scanning probe instruments
 - (D) Interferometer
- 78) The size of atoms is nearly _____.
- (A) 0.01 nm
 - (B) 0.1 nm
 - (C) 1 nm
 - (D) 10 nm
- 79) Which property of nanoparticles provides a driving force for diffusion?
- (A) Optical Properties
 - (B) High surface area to volume ratio
 - (C) Sintering
 - (D) There is no such property
- 80) On both ends of the CNTs, which carbon nanostructure is placed?
- (A) Graphite
 - (B) Diamond
 - (C) C₆₀
 - (D) Benzene

- 81)** The biological molecule secreted by virally infected cells and which disallows the infection of the viruses to new adjacent cells is called _____.
- (A) Antibodies
 - (B) Interferons
 - (C) Antigens
 - (D) Interleukins
- 82)** While sterilization of metallic instruments, it is dipped in 75 % alcohol followed by flaming and cooling is called _____.
- (A) Disinfection
 - (B) Cleaning
 - (C) Incineration
 - (D) Incubation
- 83)** The microorganisms which can grow with equal rate in presence of O₂ are called _____.
- (A) Anaerobes
 - (B) Facultative anaerobes
 - (C) Aerotolerant anaerobe
 - (D) None of these
- 84)** How many types of antibodies are there?
- (A) Five
 - (B) Three
 - (C) Two
 - (D) Four
- 85)** Which of the following cells is involved in cell-mediated immunity?
- (A) Leukemia
 - (B) T-cells
 - (C) Mast cells
 - (D) Thrombocytes
- 86)** Which of the following statements is true about the IgM of humans?
- (A) IgM can cross the placenta
 - (B) IgM can protect the mucosal surface
 - (C) IgM is produced by high-affinity plasma cells
 - (D) IgM is primarily restricted in the circulation

- 87)** Which organelle is called the “powerhouse of the cell?”
(A) Nucleus (B) Endoplasmic reticulum
(C) Mitochondria (D) Golgi apparatus
- 88)** Which of the following instruments can be used to observe cells?
(A) Barometer (B) Microscope
(C) Periscope (D) Telescope
- 89)** Which organelle is called the “suicide bag” of the cell?
(A) Golgi apparatus (B) Plastids
(C) Lysosomes (D) Mitochondria
- 90)** _____ refers to the series of events that results in the duplication of the cell along with the DNA
(A) Cell cycle (B) Cell adhesion
(C) Cell recognition (D) All of these
- 91)** _____ is the functional unit of the kidney.
(A) Hilum (B) Neurons
(C) Nephrons (D) Medulla
- 92)** Which of these is not a property of muscles?
(A) Extensibility (B) Excitability
(C) Degradability (D) Elasticity
- 93)** A network or circuit of biological neurons is called as _____.
(A) Neuron (B) Neuron Network
(C) Neural Network (D) Biological Network
- 94)** The toxicity of nanoparticles depends on various factors like _____.
(A) Crystallinity (B) Aggregation and composition
(C) Surface fictionalization (D) All of the above

- 95)** The Endonucleases, a group of enzymes that cleave DNA molecule _____.
(A) Externally (B) Internally
(C) Both (A) and (B) (D) Neither (A) nor (B)
- 96)** The extra chromosomal, self-replicating, double stranded, closed, circular DNA molecules are called _____.
(A) Plasmids (B) Phages
(C) Viruses (D) Chloroplasts
- 97)** The diameter of human hair is _____ nm.
(A) 50,000 (B) 75,000
(C) 90,000 (D) 1,00,000
- 98)** A plasmid consisting of its own DNA with a foreign DNA inserted into it is called _____.
(A) Recombinant DNA (B) Non-coding DNA
(C) Junk DNA (D) None of the above
- 99)** Insulin, a protein, consisting of _____.
(A) 2 Polypeptide chains
(B) 3 Polypeptide chains
(C) 4 Polypeptide chains
(D) more than 4 Polypeptides chains
- 100)** Restriction endonucleases have the ability of cutting _____.
(A) DNA at random sites
(B) DNA at specific sites
(C) Both (A) and (B)
(D) DNA and RNA at random sites



Rough Work