

Seat No.

Total No. of Pages : 19

Pg. Re-Entrance Examination 2025-2026
M. Sc Nanoscience and Technology
Subject Code : 71144

Day and Date : Thursday, 10-07-2025**Total Marks : 100****Time : 03.30 pm to 05.00 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.
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Multiple Choice Questions

- 1) The susceptibility of magnesium at 300⁰K is 1.2×10^{-5} . At what temperature will the susceptibility increase to 2×10^{-5} ?

a) 100 ⁰ K	b) 2000 ⁰ K
c) 180 ⁰ K	d) 400 ⁰ K
- 2) Which detector is used in gas chromatography?
A) Photodiode
B) Flame ionization detector (FID)
C) UV-Vis detector
D) Mass filter
- 3) Which of the following is a unidirectional device?

A) Resistor	B) Diode
C) Capacitor	D) Inductor

- 4) The P-N junction diode conducts current when.....
- A) Reverse biased
 - B) Both directions
 - C) No voltage is applied
 - D) Forward biased
- 5) Which of the following is used to convert AC to DC?
- A) Amplifier
 - B) Rectifier
 - C) Oscillator
 - D) Transformer
- 6) Which logic gate gives a high output only when all inputs are high?
- A) OR gate
 - B) AND gate
 - C) NOT gate
 - D) XOR gate
- 7) A Zener diode is primarily used for.....
- A) Voltage regulation
 - B) Amplification
 - C) Current boosting
 - D) Signal generation
- 8) Which device stores energy in a magnetic field?
- A) Capacitor
 - B) Resistor
 - C) Inductor
 - D) Diode
- 9) Unit of susceptance is.....
- a) mho
 - b) ohm
 - c) volt
 - d) ampere

- 10) Torque is the time rate of change of
- a) Linear acceleration
 - b) Angular acceleration
 - c) Force
 - d) Angular momentum
- 11) If the particle moves in a central force field, it's remains constant.
- a) Areal velocity
 - b) Linear velocity
 - c) Angular velocity.
 - d) Linear momentum
- 12) Dimensions of force =
- a) $[M^1L^2T^3]$
 - b) $[M^{-1}L^3T^{-2}]$
 - c) $[M^1L^3T^2]$
 - d) $[M^1L^1T^{-2}]$
- 13)frame of reference is accelerated frame of reference.
- a) Non-inertial
 - b) Inertial
 - c) Both non-inertial and inertial
 - d) Lagrangian
- 14) Within the elastic limit the ratio of the strain to the corresponding strain is called Poisson's ratio.
- a) Lateral, longitudinal
 - b) Longitudinal, lateral.
 - c) Lateral, shearing
 - d) Shearing, longitudinal.
- 15) Newton's first law of motion is known as law of.....
- a) Inertia
 - b) Momentum
 - c) Impulse
 - d) Force

- 16) If the surface tension of a liquid drop is 'T' then the excess pressure inside the drop of radius 'r' is.....
 - a) $(4T) / r$
 - b) $(T) / r$
 - c) $(2T) / r$
 - d) $(6T) / r$
- 17) One of the pseudo force that arise in the case of circular motion is the.....
 - a) Centrifugal force
 - b) Gravitational force
 - c) Electrostatic force
 - d) Magnetic force
- 18) In linear motion inertia is equivalent of
 - a) Torque
 - b) Mass
 - c) Force
 - d) acceleration
- 19) Bravais lattice in 3 dimensions, the following are correct for the Tetragonal lattice
 - a) $a_1 = a_2 \neq a_3, \alpha = \beta = \gamma = 90^\circ$
 - b) $a_1 \neq a_2 \neq a_3, \alpha = \beta = \gamma = 90^\circ$
 - c) $a_1 = a_2 \neq a_3, \alpha = \beta \neq \gamma$
 - d) $a_1 = a_2 \neq a_3, \alpha \neq \beta \neq \gamma$
- 20) In a simple cubical unit cell, if Miller indices of the plane are (220) then intercepts of a plane in a crystal is.....
 - a) $(\frac{1}{2})a, (\frac{1}{2})b, \infty c$
 - b) $2a, 2b, 1c$
 - c) $1a, (\frac{1}{2})b, (\frac{1}{2})c$
 - d) $(\frac{1}{2})a, 1b, (\frac{1}{2})c$

- 27) Packing fraction for simple cubic crystal structure is
 - a) 0.68
 - b) 0.52
 - c) 0.74
 - d) 0.57
- 28) The wavelength of X-ray is of the order of
 - a) 0.1mm
 - b) 100 nm
 - c) 200 nm
 - d) 500 nm
- 29) Every reciprocal lattice vector is to the lattice plane of the crystal lattice.
 - a) Normal
 - b) parallel
 - c) inclined
 - d) anti- parallel
- 30) Coercivity is the magnitude of reverse magnetizing field
 - a) required to reduce the magnetization to zero.
 - b) required to increase the magnetization to maximum.
 - c) due to applied magnetizing field.
 - d) when applied magnetizing field is zero.
- 31) is a type of substitution reaction that is widely used in the production of aryl halides from aryl diazonium salts.
 - a) Friedel-Crafts reaction
 - b) Wurtz reaction
 - c) Claisen reaction
 - d) Sandmeyer reaction
- 32) A reaction is a reaction that involves the replacement of one functional group or atom with another positively charged functional group or atom.
 - a) electrophilic substitution
 - b) nucleophilic substitution
 - c) both a and b
 - d) none of the above

- 33) The optically inactive compound is.....
- | | |
|-------------------|--------------------|
| a) Glucose | b) Lactic acid |
| c) 2-Chlorobutane | d) 2-Chloropropane |
- 34) The electrochemical cell stops working after some time because.....
- Electrode potential of both the electrodes becomes zero
 - One of electrodes completely vanishes
 - Electrode potential of both electrodes equalizes
 - The reaction reverses its direction
- 35) The entropy change involved in the isothermal reversible expansion of 2 moles of an ideal gas from a volume of 10 dm³ at 27°C is to a volume of 100 dm³.....
- 42.3 J/mole/K
 - 38.3 J/mole/K
 - 35.8 J/mole/K
 - 32.3 J/mole/K
- 36) The process of converting a gas into a liquid is known as.....
- | | |
|----------------|-----------------|
| a) sublimation | b) Condensation |
| c) Evaporation | d) Vaporization |
- 37) The pH of a neutral solution is...
- | | |
|-------|-------|
| a) 0 | b) 7 |
| c) 14 | d) 10 |
- 38) The permanent hardness of water is due to the presence of.....
- | | |
|--------------|-----------------|
| a) Calcium | b) Sulphate |
| c) Magnesium | d) All of these |

- 39) Coordination number is a characteristic of which of the following?
- a) Central atom
 - b) Ligand
 - c) Coordination entity.
 - d) Coordination compound
- 40) In a chemical reaction, what is a substance that speeds up the reaction but is not consumed?
- a) Reactant
 - b) Catalyst
 - c) Product
 - d) Inhibitor
- 41) In chair conformation of cyclohexane, the axial C-H bonds remain in position.
- a) eclipsed
 - b) staggered
 - c) Skew boat
 - d) Any one of these
- 42) The potential energy of cyclohexane is maximum in
- a) boat
 - b) twist boat
 - c) chair
 - d) half chair
- 43) Citric acid, upon dehydration at 150°C, forms
- a) tricarboxylic acid
 - b) aconitic acid
 - c) monoacetyl citric acid
 - d) none of these
- 44) In galvanization, the iron is coated with.....
- a)Cr
 - b) Al
 - c) Ni
 - d) Zn

- 45) What does nanophase electrochemistry primarily focus on?
- a) Studying macroscopic electrochemical reactions
 - b) Studying the properties of bulk materials
 - c) Manipulating and studying electrochemical processes at the nanoscale
 - d) Developing large-scale industrial electrochemical processes
- 46) The electrochemical theory of corrosion was introduced by
- a) Whitney
 - b) Evans
 - c) Keir
 - d) Faraday
- 47) The effective atomic number of Fe^{3+} in $\text{K}_3[\text{Fe}(\text{CN})_6]$ is.....
- a) 34
 - b) 35
 - c) 32
 - d) 37
- 48) EDTA is used for
- a) food preservation
 - b) water softening
 - c) masking
 - d) all of these
- 49) Classification of chelating agents is made based on.....
- a) oxygen atoms
 - b) nitrogen atoms
 - c) number of donor atoms
 - d) number of electrons
- 50) By considering spin only the magnetic moment calculated for the Co^{2+} ion is B.M.
- a) 4.9
 - b) 3.87
 - c) 1.73
 - d) 2.84

- 51) Salt bridge is a device used to maintainin both half cells.
- a) Electrical stability
 - b) Electrical neutrality
 - c) Thermal stability
 - d) None of the above
- 52) In electrochemical cell, anode is.....
- a) Negative
 - b) Positive
 - c) Neutral
 - d) None of the above
- 53) In electrolytic cell electrons moves from
- a) Ion to ion
 - b) ion to cathode
 - c) Anode to cathode through external circuit
 - d) Cathode to anode through external circuit
- 54) Natural radioactivity is.....
- a) Artificial transmutation
 - b) Spontaneous emission of radiation
 - c) Decay without any emission
 - d) All of the above
- 55) Reaction of hard acid and hard base gives.....
- a) Covalent compounds
 - b) Ionic compounds
 - c) Metallic compounds
 - d) None of the above

- 56) The drugs which are used to lower down the body temperature in condition of fever but not below normal body temperature are.....
- a) Anaesthetics
 - b) Antidiabetics
 - c) Antipyretics
 - d) Antihistamine agent
- 57) What is nuclear fusion?
- a) Splitting of nucleus
 - b) Combination of nuclei
 - c) Production of lighter daughter nuclei
 - d) Both a) and c)
- 58) Paludrin (Proguanil) is a drug.
- a) Antifungal
 - b) Antimalarial
 - c) Antineoplastics
 - d) Antibacterial
- 59) Which of the following is an antitubercular drug?
- a) Paludrin
 - b) Cypermethrin
 - c) Ethambutol
 - d) None of the above
- 60) Phenobarbital is adrug.
- a) Antimalarial
 - b) Central Nervous System (CNS)
 - c) Antitubercular
 - d) Antidiabetics
- 61) Highest point of magnetization is called?
- a. Magnetic saturation
 - b. De-Magnetization
 - c. Coercivity
 - d. Remenance

- 62) Magnetic field is denoted by ?
- a. P
 - b. H
 - c. M
 - d. Hc
- 63) Magnetic saturation is denoted by?
- a. H
 - b. Ms
 - c. Hc
 - d. P
- 64) Magnetic Flux is denoted by?
- a. H
 - b. B
 - c. M
 - d. Ms
- 65) Which type of ZnO particle's appear to be transparent in colour?
- a. Large sized ZnO
 - b. Nano sized ZnO
 - c. Both
 - d. None
- 66) What is the charge of an electron?
- a. Negative
 - b. Positive
 - c. Neutral
 - d. None
- 67) When Chemical energy is converted into photons it's called?
- a. Chemiluminescence
 - b. Bioluminescence
 - c. Electroluminescence
 - d. Photovoltaic effect
 - d. none
- 68) Which of the following are considered to be optoelectronic device?
- a. Solar cells
 - b. GMR
 - c. TMR
 - d. Spin valve

- 69) Which of the following invention has won the Nobel prize in Physics in 2014?
- a. LED
 - b. Solar cells
 - c. GMR
 - d. TMR
- 70) Soft magnets have?
- a. Narrow hysteresis
 - b. Broad hysteresis
 - c. both
 - d. None
- 71) If the band gap is 1.7 eV, then LED emits..... colored light.
- a) Blue
 - b) Red
 - c) Green.
 - d) Yellow
- 72) The sword of Tipu Sultan was made of...
- a) nano gold
 - b) nano aluminium
 - c) Damascus steel
 - d) Nano silver
- 73) Who prepared and explained nanotubes for the first time?
- a) Sumio Tjima
 - b) Richard Smalley
 - c) Eric Drexler
 - d) Richard Feynmann
- 74) Zig-zag type of a CNT can be represented as.....
- a) (1,2)
 - b) (2,2)
 - c) (2,0)
 - d) (0,0)
- 75) For Zig-Zag configuration of CNT which of the following condition is suitable.
- a) $n=0, m=0, \theta=30^\circ$
 - b) $n \neq 0, m=0, \theta=0^\circ$
 - c) $n=0, m=0, \theta=0^\circ$
 - d) $n \neq 0, m=0, \theta=30^\circ$

- 76) 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.
- 77) 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
- 78) The diameter of a bucky ball is nm.
- a) 1,000
 - b) 100
 - c) 10
 - d) 1
- 79) For..... nanomaterial, all the dimensions are at nanoscale, an electron confined in all 3D space.
- a) 3D
 - b) 0D
 - c) 2D
 - d) 1D
- 80) Due to quantum confinement the energy difference between energy bands is..... with decreasing particle size.
- a) increases
 - b) decreases
 - c) nearly constant
 - d) do not change
- 81) A piezoelectric generator uses
- a) principle of the converse piezoelectric effect
 - b) an electronic oscillator
 - c) the idea of electronic vibration
 - d) all the above

- 82) Ultrasonics are
- a) sound waves with a frequency greater than 20,000 Hz
 - b) sound waves with a frequency less than 20,000 Hz
 - c) waves traveling with a velocity greater than that of sound waves
 - d) waves traveling with a velocity less than that of sound waves
- 83) The semiconductor has an energy band gap of the order of
- a) 1 eV
 - b) 10 eV
 - c) Zero
 - d) 5 eV
- 84) The most important property of nanomaterials is
- a) Force
 - b) Friction
 - c) Pressure
 - d) Temperature
- 85) Which of these historical works of art contains nanotechnology?
- a) Lycurgus cup
 - b) Medieval stained-glass windows in churches
 - c) Damascus steel swords.
 - d) All of the above
- 86) Particles (material) having a size between..... are called nanoparticles or nanomaterials.
- a) 1 to 10 nm
 - b) 1 to 1000 nm
 - c) 1 to 100 nm
 - d) 1 to 10000 nm
- 87) The hole-electron pair in the lattice is called.....
- a) Lone-pair
 - b) Exciton
 - c) Positron
 - d) Ion-pair

- 88) The solution of gold nanoparticles shows different colors due to
- a) Different concentration
 - b) Different particle size
 - c) Different molecular condition
 - d) Different energy
- 89) In scanning electron microscopy (SEM) electron beam is focused by.....
- a) Optical lenses
 - b) Electronic lenses
 - c) Magnetic lenses
 - d) Electric lenses
- 90) Zero-valent iron nanoparticles widely use as remediation applications in..... pollution
- a) Air pollution
 - b) Marine pollution.
 - c) Groundwater pollution
 - d) Noise pollution
- 91) 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
- 92) The extra chromosomal, self-replicating, double stranded, closed, circular DNA molecules are called.....
- a) Plasmids
 - b) Phages
 - c) Viruses
 - d) Chloroplasts

- 93) Self-assembled closed colloidal amphipathic structures composed of lipid bilayers are called as
- a) Micelles.
 - b) Liposomes
 - c) Polymers.
 - d) Dendrimers
- 94) 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) The highest concentration of the calcium is present in
- a) Cytosol
 - b) Mitochondria
 - c) Lysosomes.
 - d) Endoplasmic reticulum
- 96) Titanium dioxide (TiO_2) is an importantsemiconducting
- a) n-type
 - b) p-type
 - c) combined
 - d) Hybrid type
- 97) Photo-catalysis is an advanced process that is employed in the field of water and wastewater treatment.
- a) Oxidation
 - b) Neutralizing
 - c) Catalytic
 - d) Neutral

- 98) The Following are anthropogenic Nano-sized chemical particles that are known to accumulate in the food chain
- a) Diesel particulate matter
 - b) Gravels.
 - c) Pollen grains
 - d) Tar
- 99) Nanoparticles may enter into the plants via cells.
- a) Lignin cells
 - b) Vascular cells
 - c) Kitin cells
 - d) Stomata cells
- 100) In water treatment Mesoporous silica is good to the adsorption of
- a) Oil
 - b) Toxic anions
 - c) Plastic fragments
 - d) None of the above

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-- ROUGH WORK --