

Seat No.

Total No. of Pages : 22

M. Sc Nanoscience and Technology
Entrance Examination, 2026
Subject Code: 71144

Day and Date : Wednesday, 13-05-2026**Total Marks : 100****Time : 01:00 pm to 02:30 pm**

Instructions

- i. All Questions are compulsory
 - ii. Each Question is of One Mark
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Q.1 Multiple Choice Questions

- 1) The susceptibility of magnesium at 300 °K is 1.2×10^{-5} . At what temperature will the susceptibility increase to 2×10^{-5} ?
 - a) 100°K
 - b) 2000°K
 - c) 180°K
 - d) 400°K

- 2) Divergence of magnetic field ($\nabla \cdot \mathbf{B}$) =
 - a) 4π
 - b) $\mu_0 J$
 - c) Zero
 - d) 2π

- 3) Dimensions of gravitational constant (G) =
 - a) $[M^1L^2T^3]$
 - b) $[M^{-1}L^3T^{-2}]$
 - c) $[M^1L^3T^2]$
 - d) $[M^1L^{-3}T^{-2}]$

- 4) The acceleration of a spherical shell, rolling down an inclined plane is a =
 - a) $(3/5) g \sin\theta$
 - b) $(2/5) g \sin\theta$
 - c) $(7/5) g \sin\theta$
 - d) $(9/5) g \sin\theta$

- 5) Unit for mutual inductance in S. I. system is.....
- a) Ampere
 - b) Volt
 - c) Ohm
 - d) Henry
- 6)law states that “The induced emf is always such that it opposes the change that produces it”.
- a) Lenz’s
 - b) Faraday’s
 - c) Newton’s
 - d) Ampere’s
- 7) If the surface tension of a soap bubble is 'T' then the excess pressure inside its bubble of radius ‘r’ is.....
- a) $(4T)/r$
 - b) $(T)/r$
 - c) $(2T)/r$
 - d) $(6T)/r$
- 8) Unit of impedance is
- a) mho
 - b) ohm
 - c) volt
 - d) ampere

9)

The acceleration of a solid cylinder, rolling down an inclined plane is a
=.....

- a) $(3/5) g \sin\theta$
- b) $(2/3) g \sin\theta$
- c) $(2/3) \sin\theta$
- d) $(3/7) \sin\theta$

10)

The reciprocal of the reactance is called

- a) Admittance
- b) Bandwidth
- c) Quality Factor
- d) Susceptance

11)

The Poisson's equation is represented by ...

- a) $\vec{\nabla} \cdot \vec{E} = 0$
- b) $\vec{\nabla} \cdot \vec{V} = \rho/\epsilon_0$
- c) $\nabla^2 V = -\rho/\epsilon_0$
- d) $\nabla^2 E = 0$

12)

The trajectory of a charged particle moving in uniform electric field is.....

- a) straight line
- b) circle
- c) eclipse
- d) parabola

- 13) The quantity $|\Psi|^2$ is called.....
- a) probability density
 - b) probability current density
 - c) probability current
 - d) current density
- 14) Total number of Bravais lattices in three dimensional system is _____.
- a) 7
 - b) 14
 - c) 10
 - d) 23
- 15) Which of the following is used in biomedical instrumentation?
- A) Thermocouple
 - B) LVDT
 - C) ECG Sensor
 - D) IR sensor
- 16) Which one is a non-contact temperature sensor?
- A) Thermistor
 - B) RTD
 - C) Infrared sensor
 - D) Thermocouple
- 17) In analytical instrumentation, a spectrophotometer is used to measure.....
- A) Pressure
 - B) Absorbance of light
 - C) Sound intensity
 - D) Resistance

- 18) pH meters work on the principle of
- A) Thermoelectric effect
 - B) Capacitance change
 - C) Potential difference due to ion concentration
 - D) Strain in the electrode
- 19) A multimeter can measure
- A) Voltage only
 - B) Current only
 - C) Resistance only
 - D) Voltage, current, and resistance
- 20) In powder method, incident X-ray radiation is _____.
- a) polychromatic
 - b) monochromatic
 - c) sunlight
 - d) White light
- 21) A plane in a unit cell is described by its Miller indices (632). The plane intersects X ,Y, Z respectively at a point whose distance from origin are _____.
- a) 6, 3 ,2
 - b) 1, 2, 3
 - c) 1 6 , 1 3 , 1 2
 - d) 1 3 , 1 2 , 1 6
- 22) A primitive cell is a unit cell that contains.....
- a) exactly one and half lattice point
 - b) exactly one lattice point
 - c) exactly two lattice point
 - d) exactly three lattice points

23)

Bravais lattice in 3 dimensions, the following are correct for the Orthorhombic 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) $a_1 = a_2 = a_3, \alpha = \beta = \gamma = 90^\circ$

24)

In a simple cubic unit cell, if Miller indices of the plane are (100) then Intercepts of a plane in crystal is...

- a) $1a, b, c$
- b) $a, 1b, 1c$
- c) $1a, b, 1c$
- d) $1a, 1b, c$

25)

Cyclotron is an accelerator working on the principle of

- a) a) fixed frequency magnetic resonance
- b) b) variable frequency magnetic resonance
- c) c) fixed frequency electric resonance
- d) d) variable frequency electric resonance

26)

..... waves are packed over a small region called a wave packet.

- a) standing
- b) progressive
- c) matter
- d) interfering

27)

De Broglie wavelength (λ) is given by..

a) $\lambda = h/p$

b) $\lambda = p/h$

c) $\lambda = hp$

d) c/v

28)

The parity of the wave function is odd when.....

a) $\Psi(-x) = -\Psi(x)$

b) $\Psi(x) = x^2$

c) $\Psi(-x) = \Psi(x)$

d) $\Psi(x) = x^{-2}$

29)

In Kronig-Penny model, period of one dimensional periodic potential is _____

a) a/b

b) $a+b$

c) $a-b$

d) $a.b$

30)

Bravais lattice in 3 dimensions, the following are correct for the Tetragonal lattice

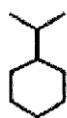
a) $a_1 = a_2 \neq a_3, \alpha = \beta = \gamma = 90^\circ$

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) $a_1 = a_2 \neq a_3, \alpha \neq \beta \neq \gamma$

- 31) The geometry of carbonium ion is
- Tetrahedral
 - Trigonal Planar
 - Linear
 - Pyramidal
- 32) A reaction is a reaction that involves the replacement of one functional group or atom with another negatively charged functional group or atom.
- electrophilic substitution
 - nucleophilic substitution
 - both a and b
 - none of the above
- 33) Polymers are grouped on the basis of their.....
- Nature
 - Origin
 - Composition
 - All of the above
- 34) Coordination number is a characteristic of which of the following?
- Central atom
 - Ligand
 - Coordination entity
 - Coordination compound
- 35) Give the name for the following compound?



- Sec-Butylcyclohexane
 - Isopropylcyclohexane
 - 2-Cyclohexylbutane
 - Cyclohexane
- 36) The chemical name of the bleaching powder is.....
- Calcium oxide
 - Sodium hydrogen carbonate
 - Sodium bicarbonate
 - Calcium oxychloride

- 37) The permanent hardness of water is due to the presence of...
- Calcium
 - Sulphate
 - Magnesium
 - All of these
- 38) The substance that accepts electrons is called.....
- oxidising agent
 - reducing agent
 - catalyst
 - both a and b
- 39) The entropy change involved in the isothermal reversible expansion of 2 moles of an ideal gas from a volume of 10 dm^3 at 27°C is to a volume of 100 dm^3
- 42.3 J/mole / K
 - 38.3 J/mole / K
 - 35.8 J/mole / K
 - 32.3 J/mole / K
- 40) The absolute value of charge on electrons was determined by....
- J.J.Thomson
 - R.A. Millikan
 - Rutherford
 - Chadwick
- 41) The oxidation state of chromium in K_2CrO_4 is
- 5-
 - 5+
 - 6+
 - 4+
- 42) Entropy change in an isothermal irreversible process in an isolated system is
- Less than zero
 - Greater than zero
 - Zero
 - None of these
- 43) The coordination number of nickel in $[\text{Ni}(\text{dmg})_2]$ is
- 2
 - 3
 - 4
 - 6

- 44) The stability of the complexes increases with an increase in atomic number within series as atomic size
- a) decreases
 - b) increases
 - c) remains same
 - d) both a and b
- 45) $\text{CoCl}_3 \cdot 6\text{NH}_3$ contains number of ionizable Cl^- ions.
- a) three
 - b) two
 - c) four
 - d) one
- 46) $\text{S} \cdot \text{m}^2 \cdot \text{mol}^{-1}$ is SI unit of
- a) Molar conductance
 - b) Equivalent conductance
 - c) Specific conductance
 - d) Both a and b
- 47) In electrolysis amount of substance deposited or dissolved is proportional to
- a) Quantity of substance taken
 - b) Quantity of electrolyte
 - c) Quantity of electricity passed
 - d) Quantity of electrode
- 48) The cause of lanthanide contraction is
- a) Poor shielding of 4f electrons
 - b) Gradual increase in nuclear charge from La to Lu.
 - c) Both (a) and (b)
 - d) None of these
- 49) Reformatsky reaction is carried out in the presence of
- a) weak base
 - b) metallic zinc
 - c) Na salt of acid
 - d) Pyridine
- 50) HVZ reaction is used to halogenate carboxylic acid at position
- a) beta
 - b) gamma
 - c) alpha
 - d) carboxyl

- 51) In the galvanic cell, electrical energy is generated as a result of _____ reaction.
- Non spontaneous reaction
 - Spontaneous reaction
 - Nuclear reaction
 - None of the above
- 52) Galvanic cell _____ electric current while electrolytic cell _____ electric current.
- Consume, produce
 - Consume, consume
 - Produce, consume
 - Produce, produce
- 53) At cathode _____ reaction occurs and at anode _____ reaction occurs.
- Reduction, oxidation
 - Oxidation, reduction
 - Oxidation, oxidation
 - None of the above
- 54) In which cell electrical energy is converted into chemical energy?
- Galvanic cell
 - Daniel cell
 - Voltaic cell
 - Electrolytic cell

- 55) Radioactivity is due to consequences of..... reaction
- a) Chemical
 - b) Biological
 - c) Nuclear
 - d) All of the above
- 56) Daughter nuclei in nuclear decay reactions are..... than the parent nuclei.
- a) Lower in mass and energy
 - b) Equal in mass and charge
 - c) Lower in energy and charge
 - d) Higher than mass and charge
- 57) In artificial transmutation..... elements are bombarded with projectiles to produce daughter elements.
- a) Non-radioactive
 - b) Radioactive
 - c) metal
 - d) active
- 58) What is conserved in nuclear reaction?
- a) Nucleons
 - b) Charge
 - c) Mass energy relation
 - d) All of the above

- 59) The drugs which are used to produce partial or total loss of consciousness are _____.
- a) Analgesics
 - b) Antipyretics
 - c) Anaesthetics
 - d) Antidiabetics
- 60) Diabetes mellitus (sweet urine) is generally known as _____.
- a) Diabetes
 - b) Common cold
 - c) Mellitus
 - d) Scurvy
- 61) The gas breaks down to conduct electricity when a certain minimum voltage is reached is called as?
- a. Plasma
 - b. Sheets
 - c. Fibers
 - d. QD
- 62) Graphite is the allotrope of?
- a. Silicon
 - b. Electron
 - c. Quantum Dot
 - d. Carbon

- 63) How many types of CNT are present?
- a. 3
 - b. 2
 - c. 1
 - d. None
- 64) Fullerenes are also called as?
- a. CNT
 - b. Buckyballs
 - c. Diamonds
 - d. None of the above
- 65) Which of the following is considered as 2D Nano material?
- a. Nano Sphere
 - b. Nano Films
 - c. QD
 - d. None
- 66) Which type of ZnO particles appear to be white in colour?
- a. Large sized ZnO
 - b. Nano sized ZnO
 - c. Both
 - d. None

- 67) Collective oscillations of free electrons in metals are called?
a. Plasmon's b. Neutrons c. Electrons d. Protons
- 68) Plasmon oscillations occur at a well-defined frequency called as?
a. Plasmon frequency
b. Plasmon velocity
c. Drift velocity
d. None
- 69) Denoting a field whose amplitude decreases with distance is called?
a. Evanescent
b. Velocity
c. Proton
d. Quantum Dot
- 70) Magnetic dipole moment is denoted by?
a. H
b. P
c. M
d. Ms

- 71) Who prepared and explained nanotubes for the first time?
- a) Sumio Tijima
 - b) Richard Smalley
 - c) Eric Drexler
 - d) Richard Feynmann
- 72) The diameter of a bucky ball is ____ nm.
- a) 1,000
 - b) 100
 - c) 10
 - d) 1
- 73) Zig-zag type of a CNT can be represented as
- a) (1,2)
 - b) (2,2)
 - c) (2,0)
 - d) (0,0)
- 74) The sword of Tipu Sultan was made of...
- a) nano gold
 - b) nano aluminium
 - c) Damascus steel
 - d) Nano silver
- 75) For.....nanomaterial, all the dimensions are at nanoscale, an electron confined in all 3D space.
- a) 3D
 - b) 0D
 - c) 2D
 - d) 1D

- 76) Due to quantum confinement the energy difference between energy bands is..... with decreasing particle size.
- increases
 - decreases
 - nearly constant
 - do not change
- 77) Which of the following is an example of bottom-up approach for the preparation of nanomaterials?
- Sol-gel
 - Dip pen nano-lithography
 - Lithography
 - Pulsed laser deposition
- 78) In case of Esaki diode the width of the depletion region must be
- 100 nm
 - 50 nm
 - 10 nm
 - 0 nm
- 79) For Zig-Zag configuration of CNT which of the following condition is suitable.
- $n=O, m=O, \theta=30^\circ$
 - $n \neq O, m=O, \theta=0^\circ$
 - $n=O, m=O, \theta=0^\circ$
 - $n \neq O, m=O, \theta=30^\circ$
- 80) If the band gap is 1.7 eV, then LED emits colored light.
- Blue
 - Red
 - Green
 - Yellow
- 81) Sol-gel method is chemical process
- Dry
 - Semi-liquid
 - Semi-solid
 - Wet

- 82) The and citrate solution are used as reducing agents in the chemical reduction method
- a) Hydrazine hydrate
 - b) Hydrazine
 - c) Hydrazone
 - d) Semi carbazene
- 83) Metal nanoparticles particularly nanoparticles are prepared by the chemical reduction method
- a) Platinum
 - b) Silver
 - c) Gold
 - d) Tungsten
- 84) Fabrics are extensively made out of nanomaterials like
- a) Carbon nanotubes
 - b) Fullerenes
 - c) Mega tubes
 - d) Polymers
- 85) Which ratio decides the efficiency of Nanoparticles?
- a) Weight/Volume Ratio
 - b) Surface Area/Volume Ratio
 - c) Volume/Weight Ratio
 - d) Pressure/Volume Ratio

- 86) The process used to create topographical features on a surface by selective removal of material by physical or chemical means is called
- a) etching
 - b) bonding
 - c) lithography
 - d) writing
- 87) Which one of the following technique is used in the formation of nano-emulsion
- a) Co-precipitation
 - b) Sol-gel
 - c) Hot Plate method
 - d) High-Pressure homogenization
- 88) The bulk nanomaterial comes under dimensional nanomaterials.
- a) Zero
 - b) One
 - c) Two
 - d) Three
- 89) Which of the following is an example of nanowires of semiconductors?
- a) Silicon dioxide
 - b) Titanium dioxide
 - c) Silicon
 - d) None of the above

- 90) On both ends of the CNTs, which carbon nanostructure is placed?
- a) Graphite
 - b) Diamond
 - c) C₆₀
 - d) Benzene
- 91) Sol-gel method is chemical process
- a) Dry
 - b) Semi-liquid
 - c) Semi-solid
 - d) Wet
- 92) Which one of the following molecular processes require energy?
- a) Ligation
 - b) Transformation
 - c) Hybridization
 - d) Restriction digestion
- 93) Which of these bacteria lack a cell wall?
- a) *Escherichia*
 - b) *Pseudomonas*
 - c) *Mycoplasma*
 - d) *Mycobacterium*
- 94) Deoxyribonucleic acid (DNA) does not contain _____
- a) Urasil
 - b) Thymine
 - c) Cytosine
 - d) Guanine
- 95) Which of the following is an example of biopolymer
- a) Polyethylene
 - b) Polyethylglycol
 - c) Cellulose
 - d) Epoxy

- 96) The toxicity of nanoparticles depends on various factors like....
- a) crystallinity
 - b) aggregation and composition
 - c) surface fictionalization
 - d) all of the above
- 97) The common methods used for disinfection in wastewater treatment plants are
- a) Chlorination
 - b) UV light
 - c) both (a) and (b)
 - d) Phenolic solvent
- 98) Engineered Nanodevices and nanostructures that deal with their effects in living organisms.....
- a) Nanoecotoxicology
 - b) Phyto-toxicology
 - c) Eco-toxicology
 - d) None of the above
- 99) A surface process wherein pollutants are attached on a solid surface by physical forces or chemical bond called
- a) Adsorption
 - b) Absorption
 - c) Filtration
 - d) All of the above
- 100) Toxic nanoparticles entry by cosmetics through the skin route is called.....
- a) Dermal
 - b) Inhalation
 - c) Ingestion
 - d) Injection

□□□

