

Seat No.	
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ENT - 44

Total No. of Pages : 22

P. G. Re-Entrance Examination, 2024
M.Sc. (Nanoscience and Technology)
Subject Code : 71144

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Day and Date : Friday, 28-06-2024

Total Marks : 100

Time : 10.30 a.m. to 12.00 p.m.
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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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1. Phase space is a

- | | |
|------------------------|------------------------|
| a) 3 Dimensional Space | b) 4 Dimensional Space |
| c) 5 Dimensional Space | d) 6 Dimensional Space |

2. Bose-Einstein statistics is for the

- a) Distinguishable particles
- b) Symmetrical Particles
- c) Particles with half integral spin
- d) Particles with integral spin

3. The Fermi - Dirac law is given by the expression $n_i =$
- $\frac{g_i}{e^{\alpha + \beta E_i}}$
 - $\frac{g_i}{e^{\alpha + \beta E_i} + 1}$
 - $\frac{g_i}{e^{\alpha + \beta E_i} - 1}$
 - $g_i e^{\alpha + \beta E_i}$
4. Thermal conductivity occurs due to
- momentum
 - mass
 - thermal energy
 - none of these
5. Most probable speed of molecules in a gas is given by
- $v_{mp} = \sqrt{\frac{3kT}{m}}$
 - $v_{mp} = \sqrt{\frac{2kT}{m}}$
 - $v_{mp} = \sqrt{\frac{8kT}{m}}$
 - $v_{mp} = \sqrt{\frac{kT}{m}}$
6. Thermodynamic potentials have same role as in mechanics.
- force
 - momentum
 - kinetic energy
 - potential energy
7. The relation between group velocity (v_g) and phase velocity (v) is
- $v_g = v + \lambda \cdot \frac{dv}{d\lambda}$
 - $v_g = v + \lambda \cdot \frac{d\lambda}{dv}$
 - $v_g = v - \lambda \cdot \frac{dv}{d\lambda}$
 - $v_g = v - \lambda \cdot \frac{d\lambda}{dv}$

8. A zone plate behaves like
 - a) Concave lens
 - b) Plane mirror
 - c) Glass plate
 - d) Convex lens
9. When a plane polarized light is passed through a half wave plate, the emergent light is
 - a) Elliptically polarized
 - b) Circularly polarized
 - c) Partially circular and partially elliptically polarized
 - d) Plane polarized
10. The lens is used in Newton's ring experiment, which is placed on glass plate to trap air film is
 - a) Concave lens
 - b) Convex lens
 - c) Plano-convex lens.
 - d) Plano-concave lens.
11. Newton's first law of motion is known as law of.....
 - a) Inertia
 - b) Momentum
 - c) Impulse
 - d) Force
12. Within the elastic limit the ratio of the strain to the correspondingstrain is called Poisson's ratio,
 - a) Lateral, longitudinal
 - b) Longitudinal, lateral
 - c) Lateral, shearing
 - d) Shearing, longitudinal

13.frame of reference is accelerated frame of reference.

- a) Non-inertial
- b) Inertial
- c) Both non-inertial and inertial
- d) Lagrangian

14. Dimensions of force =

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

15. 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

16. Torque is the time rate of change of

- a) Linear acceleration.
- b) Angular acceleration
- c) Force
- d) Angular momentum

17. Unit of susceptance is

- a) mho
- b) ohm
- c) volt
- d) ampere

18. 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) $(3/7) \sin\theta$

19. By Searle's method, modulus of rigidity of material can be determined using relation.....

Where, ' l ' is the length and ' a ' is radius of wire having circular cross section; which connects the middle points of the two similar and equal metal bars.

" T_2 is the time period of oscillation and ' I ' is the moment of inertia of each bar about an axis through its mid point and perpendicular to its length.

a) $Y = \frac{8\pi l l}{T_2^2 a^4}$

b) $Y = \frac{8\pi l l}{T_2^2 a^6}$

c) $Y = \frac{4\pi l l}{T_2^2 a^4}$

d) $Y = \frac{2\pi l l}{T_2^2 a^4}$

20. Unit of impedance is

a) mho

b) ohm

c) volt

d) ampere

21. In semiconductor conductivity increases with

a) decrease in temperature

b) increase in temperature

c) constant temperature

d) not any change in temperature

22. In a simple cubic unit cell, if Miller indices of the plane are (100) then

Intercepts of a plane in crystal is...

a) $1a, \infty b, \infty c$

b) $\infty a, 1b, 1c$

c) $1a, \infty b, 1c$

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

23. The principle of virtual work is given as

a) $\sum \vec{F}_i \cdot \vec{\delta r}_i = 0$

b) $\sum \vec{F}_i = \vec{\delta r}_i$

c) $\sum (\vec{F}_i / \vec{\delta r}_i) = 0$

d) $\sum (\vec{F}_i - \vec{\delta r}_i) = 0$

24. 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

25. If 'E' is electric field (uniform electric field) which is applied perpendicular to the motion of charged particle (along x axis) then the trajectory (path) is given by...

a) $y = kx^2$

b) $y = k^2x$

c) $y = kx$

d) $y = k/x$

26. The point in a magnet where the intensity of magnetic lines of force is maximum

a) Magnetic pole

b) South pole

c) North pole

d) Unit pole

27. The phenomenon by which a magnetic substance becomes a magnet when it is placed near a magnet

a) Magnetic effect

b) Magnetic phenomenon

c) Magnetic induction

d) Electromagnetic induction

28. 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
29. Repeatable entity of a crystal structure is known as
- a) Crystal
 - b) Lattice
 - c) Unit cell
 - d) Miller indices
30. When the constraints applied on the system.....
- a) Reduce the number of degrees of freedom
 - b) Increase the number of degrees of freedom
 - c) Equal to number of degrees of freedom
 - d) No change in the degrees of freedom
31. In elimination reaction two leaving group leave from the adjacent atoms of the same molecule is called.....
- a) a elimination
 - b) B elimination
 - c) Both a and B
 - d) None of these

32. General formula of Grignard reagent.

- | | |
|-----------|-----------|
| a) R-Na-X | b) R-Ru-X |
| c) R-Co-X | d) R-Mg-X |

33. Which of the following has largest dipole moment?

- | | |
|--------------------|-------------------|
| a) CO_2 | b) CCl_4 |
| c) CHCl_3 | d) CH_4 |

34. K_2S is isomorphic with.....

- | | |
|--------------------|--------------------------|
| a) CaO | b) Na_2S |
| c) CaCl_2 | d) MgCl_2 |

35. Electrophile term implies..... species

- | | |
|--------------------|--------------------|
| a) Electron loving | b) Single electron |
| c) Nucleus loving | d) Nucleus hating |

36. In cyclic process, change in each state function is

- | | |
|---------|----------|
| a) zero | b) one |
| c) two | d) three |

37. Bond energy is also known as bond..... energy

- a) dissociation
- b) formation.
- c) association
- d) none of these

38. Standard enthalpy of formation of a compound is represented as.....

- a) Hf b) Δ Hf
c) Δ H⁰f d) Hs

39. Arenes do not show.....

- a) delocalization of pi-electrons b) greater stability
- c) resonance d) electrophilic additions

40. Chemical equilibria are..... in nature

- a) dynamic b) gaseous
c) liquid d) solid

41. Ammonolysis of alkyl halides is.....

- a) Unselective
- b) inefficient
- c) Aryl amines cannot be prepared
- d) All of these

42. A reducing sugar reacts with thereagents.

- a) Benedicts's b) Fehling's
- c) Tollens's d) Both (a) and (b)

43. Amino acids are mostly synthesised from

- a) fatty acids b) mineral salts
c) α -ketoglutaric acid d) volatile acids

44. Coordinate sphere includes

- a) non-metals b) ligand
- c) metal ion d) metal and ligand

45. The stability of complexes increases with increase in atomic number within the series as atomic size

- a) decreases b) increases
- c) remains same d) both a and b

46. Secondary valency is directed towards.....

- a) fixed position in space
- b) not fixed position in space
- c) ligand
- d) primary valency

47. van der walls equation of state of real gas

- a) $(P + \frac{an^2}{V})(V - nb) = nRT$
b) $n(P + \frac{an^2}{V^2})(V - nb) = RT$
c) $(P + \frac{an^2}{V^2})(nRT) = V - nb$
(d) none of these

48. Frenkel defect is shown by the following crystals except?

- a) KBr b) AgCl
- c) ZnS d) More than one of the above

49. of the following undergoes nucleophilic substitution exclusively by S_NI mechanism?

- a) Benzyl Chloride b) Ethyl chloride
- c) Chlorobenzene d) Isopropyl chloride

50. The half life time of 3rd order reaction isof initial concentration of reactant A

- a) directly proportional to the square
- b) inversely proportional to the Cube
- c) inversely proportional to the square
- d) none of these

51. Reaction of hard acid and hard base gives.....

- a) Covalent compounds b) Ionic compounds
- c) Metallic compounds d) None of the above

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

- a) Tranquillizers b) Hypnotics
- c) Sedatives d) Antiviral

53. Tranquillizers are also called as

- a) Hypnotics b) Psycholeptics
- c) Sedatives d) Anaesthetics

54. Central Nervous System (CNS)-depressants which produces sleep is
- a) Hypnotics
 - b) Sedatives
 - c) Antipyretics
 - d) Analgesics
55. The drugs which are used to produce partial or total loss of consciousness are
- a) Analgesics
 - b) Antipyretics
 - c) Anaesthetics
 - d) Antidiabetics
56. Diabetes mellitus (sweet urine) is generally known as
- a) Diabetes
 - b) Common cold.
 - c) Beriberi
 - d) Scurvy
57. The drugs which are used to lower down the body temperature in condition of fever but not below of normal body temperature are
- a) Anaesthetics
 - b) Antidiabetics
 - c) Antipyretics
 - d) Antihistamine agent
58. Paludrin (Proguanil) is a drug
- a) Antifungal
 - b) Antimalarial
 - c) Antineoplastic
 - d) Antibacterial
59. Which of the following is antitubercular drug?
- a) Paludrin
 - b) Isoniazide
 - c) Ethambutol
 - d) b and c

60. Phenobarbital is a drug.

- | | |
|-------------------|---------------------------------|
| a) Antimalarial | b) Central Nervous System (CNS) |
| c) Antitubercular | d) Antidiabetics |

61. immunoglobulin is the principal one found in secretions such as milk.

- | | |
|--------|--------|
| a) IgG | b) IgM |
| c) IgA | d) Igl |

62. CAAT box is present in many

- a) Prokaryotic promoters upstream of TATA box.
- b) Prokaryotic promoters are downstream of the TATA box
- c) Eukaryotic promoters are upstream of the TATA box
- d) Eukaryotic promoters are downstream of the TATA box

63. In prokaryotes, RNA polymerase recognizes a consensus nucleotide sequence (promoter region) upstream of the transcription start site that consists of 5-TATAAT-3' that is also known as.....

- | | |
|-----------------------|----------------------|
| a) Enhancer box | b) Pribnow box |
| c) Transcription unit | d) None of the above |

64. technique is used for separation and identification of RNA

- | | |
|------------------|------------------|
| a) Western blot | b) Southern blot |
| c) Northern blot | d) Dot blot |

65. Plant cell wall is generally made up of

- a) Cellulose and pectin b) Chitin
- c) murine d) Cellulose

66. Formation of peptide bond is catalysed by

- a) Aminoacylt RNA synthetase
- b) Peptidyl transferase
- c) RNA polymerase
- d) DNA polymerase

67. Which one of the following is not characteristic of genetic code

- a) Degenerate b) Comma less
- c) Nonambiguous d) Overlapping

68. Which of the following enzyme is involved in DNA repair

- a) DNA Polymerase I
- b) DNA Polymerase II
- c) DNA Polymerase III
- d) DNA polymerase I and II

69. Biological self-assembly can also be used as template for nanoparticle synthesis

- a) Surface (S) layer b) Phospholipid
- c) Polymer d) Saccharides

70. Liposomes that are used as drug delivery vehicles are derived from

- a) Surface (S) layer
- b) Phospholipid
- c) Lipoproteins
- d) Nucleic acids

71.is the process by which nanotopographical etchings are artificially produced on a surface.

- a) Photolithography
- b) Electron beam lithography
- c) X ray lithography
- d) all of the above

72. Nanochemistry is the combination of

- a) Chemistry and Nanoscience
- b) Chemistry and engineering
- c) Chemistry and Physics
- d) All of the above

73. $10\text{ nm} = \text{m}$

- a) 10^{-8}
- b) 10^{-9}
- c) 10^{-7}
- d) 10^{-10}

74. Which ratio decides the efficiency of nanomaterials?

- a) weight/volume
- b) surface area/volume
- c) volume/weight
- d) pressure/volume

75. Quantum confinement results in

- a) Energy gap in semiconductor is proportional to the inverse of the square root of size
- b) Energy gap in semiconductor is proportional to the inverse of the size
- c) Energy gap in semiconductor is proportional to the square of size
- d) Energy gap in semiconductor is proportional to the inverse of the square of size

76. 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

77. Incomplete burning of petrol or diesel in vehicles creates..... gas which is very poisonous

- a) CO
- b) CO₂
- c) CH₄
- d) O₃

78. In Air pollution PM 2.5 stands for

- a) Particulate Matter 2.5 micrometre
- b) Particulate Matter 25 nm
- c) Particulate Mass 2.5 cm
- d) Particulate Mass 2.5 m

79. In pollution, sources those which can not be easily find or seen direct its origin are called

- a) Chemical sources b) Point sources
- c) Biological sources d) Non-point sources

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

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

81. Quantum dots are usually regarded as semiconductor nanocrystals with diameters in the range of.....

- a) 0.1-0.5 nm b) 8-10 nm
- c) 90-100 nm d) 900-1000 nm

82. In transmitted light Lycurgus cup looks like.....

- a) Blue b) Green
- c) Yellow d) Red

83. The melting temperature of gold nanoparticle is.....

- a) 1190 °C b) 810 °C
- c) 940 °C d) 1080 °C

84. In reflected light Lycurgus cup looks like...

- a) Blue b) Green
- c) Yellow d) Red

85. In Esaki diode, with increase in temperature, tunneling current

- a) Increases
- b) Decreases
- c) Remains same
- d) become infinite

86. Extinction observed for metal nanoparticles is a combination of

- a) Absorption and reflection
- b) Reflection and scattering
- c) Absorption and scattering
- d) Transmission and absorption

87. Magnetic nanoparticles are..... in nature.

- a) superparamagnetic
- b) paramagnetic
- c) ferromagnetic
- d) anti-ferromagnetic

88. In a Tunnel diode, the tunneling involves

- a) Acceleration of electron in p side
- b) Movement of electrons from the n-side of the conduction band to the p-side of the valance band
- c) Charge distribution management in both the bands
- d) Positive slope characteristic of the diode

89. Ballistic transport is observed when.....

- a) $\text{MFP} \ll \text{dimension of nanomaterial}$
- b) $\text{MFP} = \text{dimension of nanomaterial}$
- c) $\text{MFP} \gg \text{dimension of nanomaterial}$
- d) $\text{MFP} = 0$

90. 5 nm =

- a) $0.5 \text{ \AA}^0$
- b) $5 \text{ \AA}^0$
- c) $50 \text{ \AA}^0$
- d) $500 \text{ \AA}^0$

91. Gels in which swelling agent is organic solvents is called?

- a) Organogels
- b) Aerogel
- c) Sol Gel
- d) Xero gel

92. What is Quanta of an electromagnetic energy and is the basic energy associated with light?

- a) Carbon
- b) Graphite
- c) Photon
- d) Gold

93. A bound state of electron and hole, pair is called?

- a) Electron
- b) Photon
- c) Magnetron
- d) Exciton

94. What is full form of GMR?

- a) Nano Sphere
- b) Nano Rods
- c) Nano circles
- d) Giant Magneto resistance

95. The reverse field strength at which magnetization is zero is called?
- a) Coercivity
 - b) Magnetic saturation
 - c) Reflection
 - d) None of the above
96. The ballistic type of transport of electrons is seen in?
- a) SWCNT
 - b) MWCNT
 - c) Magnets
 - d) Quantum Dot
97. Who won the Nobel Prize for the discovery of electron tunnelling effect?
- a) Richard Feynman
 - b) Leo Esaki
 - c) Albert Einstein
 - d) Newton
98. What do you mean by PVD?
- a) Physical vapour deposition
 - b) Pro vapour density
 - c) Promiximal Varity deposition
 - d) None of the above
99. is allotrope of carbon with cylindrical nanostructure
- a) Graphene
 - b) Carbon nanotube
 - c) Carbon dot
 - d) Fullerene

100. Following material is currently widely used as an adsorbent material in both for water purification and water plant treatment

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



- Rough Work -

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