



PART – A

1. Fill one appropriate article in the following:

It was _____ honour for people to be the part of the freedom Movement.

- A) an B) on C) the D) a

2. A Compound word is

- A) two words joined together B) two words separate from each other
C) two words contrary in meaning D) two words similar in meaning

3. A symbol is

- A) an object that stands for other than itself
B) that stands for itself
C) that stands for nothing
D) that stands for everything

4. Choose correct expression from the following

- A) My mother was very young when my father marry her
B) My mother was very young when my father married her
C) My mother was very young when my father did marry her
D) My mother was very young when my father got married her

5. Which of the given spellings is correct ?

- A) Mississippi B) Misissippi
C) Missisippi D) Mississipi

6. What is meant by 'to do away' ?

- A) to send away B) to abolish
C) to cut off D) to make up

7. The play Tuglaq was written by

- A) Mahesh Dattani B) Anita Desai
C) Chaman Nahal D) Girish Karnad

8. The heroine in R.K. Narayan's Guide is a

- A) Musician B) Painter C) Dancer D) Teacher

9. Who authored the novel A Salt Doll ?

- A) A.K. Ramanujan B) Kamala Das
C) Molly Ramanujan D) Nayantara Sehgal



10. The epical poem Savitri was written by
A) Gorakshnath
B) Dayanand Saraswati
C) Aurobindo Ghosh
D) Swami Vivekananda
11. The playground of baseball is known as
A) court
B) diamond
C) ring
D) pitch
12. The Indian to beat the computers in mathematical wizardry is
A) Ramanujam
B) Ran Panigrahi
C) Raja Ramanna
D) Shakunthala Devi
13. Which of the following temple was built by the Cholas ?
A) Shore Temple, Mahabalipuram
B) Brihadeeswara Temple, Tanjavur
C) Sun Temple, Konark
D) Meenakshi Temple, Madurai
14. The Export Import (EXIM) Bank was set up in
A) 1980
B) 1982
C) 1981
D) 1989
15. The Chairman of Bank Board Bureau is
A) Shri Vinod Dua
B) Shri Vinod Khanna
C) Shri Vinod Rai
D) Shri Vinod Shastri
16. If a,b,c are integers; $a^2 + b^2 = 45$ and $b^2 + c^2 = 40$, then the values of a,b and c respectively are
A) 2,6,3
B) 3,6,2
C) 5,4,3
D) None of these
17. A student secures 90%, 60% and 54% marks in test papers with 100,150 and 200 respectively as maximum marks. The percentage of his aggregate is
A) 64
B) 68
C) 70
D) 72
18. A sum was put at simple interest at a certain rate for 3 years. Had it been put at 2% higher rate, it would have fetched Rs. 360 more. Find the sum.
A) Rs. 8,000
B) Rs. 7,000
C) Rs. 6,000
D) Rs. 5,000



PART – B

26. Electron sea exists in materials with
A) Polar bonds B) Ionic bond C) Covalent bond D) Metallic bond
27. Which one of the following is a weak bond ?
A) van der Waals bond B) Covalent bond
C) Metallic bond D) Ionic bond
28. The band theory of solids explains satisfactorily the nature of
A) Electrical insulators alone B) Electrical conductors alone
C) Electrical semiconductors alone D) All of the above
29. Repeatable entity of a crystal structure is known as
A) Crystal B) Lattice C) Unit cell D) Miller indices
30. Schottky-defect in ceramic material is
A) Interstitial impurity
B) Vacancy- interstitial pair of cations
C) Pair of nearby cation and anion vacancies
D) Substitutional impurity
31. A type of enthalpy cycle which is used to calculate lattice energy is
A) Hess's Law B) Born-Haber cycle C) Haber process D) Contact process
32. The Madelung constant is used in determining the electrostatic potential of a single ion in a crystal by approximating the ions by
A) point charges B) born effective charges
C) anisotropic charges D) collective charges
33. Which of the following is a crystalline solid ?
A) Tar B) Butter C) Glass D) Common salt
34. Graphite, diamond and fullerene are the polymorphic forms of
A) sulphur B) carbon C) calcium D) nitrogen
35. Among solids, the highest melting point is established by _____ solids.
A) covalent B) van der Waal's
C) hydrogen bonded D) molecular
36. In graphite, carbon atoms within the layers are joined together due to
A) ionic bonding B) van der Waal's forces
C) metallic bonding D) covalent bonding



37. Body centered cubic lattice has a coordination number of
A) 4 B) 8 C) 12 D) 6
38. If we know the ionic radius ratio in a crystal of ionic solid, then _____ be known.
A) Magnetic property B) Nature of chemical bond
C) Type of defect D) Geometrical shape of crystal
39. Which of the following statements is NOT true in relation to the triple point on a single component phase diagram ?
A) The point at which the solid, liquid and gaseous phases for a substance co-exist
B) The triple point exists for a substance occurs at a specific temperature and pressure
C) The triple point exists at a single temperature and is independent of pressure
D) The system must be enclosed so that no vapour can escape
40. The upper critical solution temperature is defined as
A) The maximum temperature at which two components will remain immiscible as two distinct liquids
B) The minimum temperature at which two components will remain immiscible as two distinct liquids
C) The maximum temperature at which two components remain miscible
D) The minimum temperature at which two components remain miscible
41. Which of the following statements are true about the Eutectic point on a two component (compounds A and B) phase diagram ?
A) Both compounds are solid
B) The melting point of the mixture is lower than the melting points of either of the individual compounds
C) One compound is in the liquid phase while the other is in the solid phase
D) It always occurs when the ratio of compound A to compound B is 50:50
42. Which of the following cannot be obtained from an X-ray crystallography study ?
A) A bond angle Si-O-Si in a mineral.
B) The absolute configuration of a chiral natural product.
C) The vibration frequency of a carbonyl group.
D) The spacing between two parallel aromatic rings.
43. Considering the Bragg equation, if the value of the wavelength is doubled, which of the following is NOT true ?
A) Bragg angles of reflections increase.
B) The d spacings become smaller.
C) The diffraction pattern expands.
D) Some previously accessible reflections can no longer be measured.



44. The calculated value of Z is half what is expected for the probable space group of a crystal structure. On which of the following symmetry elements could the molecules lie to satisfy this result ?
- A) Inversion centres
B) Twofold screw axes
C) Glide planes
D) Fourfold rotation axes
45. Which of the following objectives cannot be achieved unless indices can be assigned to the lines in a powder diffraction pattern ?
- A) Identification of a single pure crystalline material.
B) Qualitative analysis of a mixture of crystalline materials (identification of the compounds present).
C) Quantitative analysis of a mixture of crystalline materials (relative amounts of the compounds present).
D) Determination of the crystal structure.
46. Another name for rhombohedral system is
- A) trigonal system
B) monoclinic system
C) orthorhombic system
D) hexagonal system
47. The temperature of the system decreases in an
- A) Adiabatic Compression
B) Adiabatic Expansion
C) Isothermal Compression
D) Isothermal Expansion
48. Workdone in a free expansion process is
- A) zero
B) minimum
C) maximum
D) positive
49. The entropy _____ in an irreversible cyclic process.
- A) remains constant
B) decreases
C) increases
D) none of the above.
50. The ratio of specific heat at constant pressure (C_p) and specific heat at constant volume (C_v) is
- A) equal to one
B) less than one
C) greater than one
D) half
51. The most probable velocity of the gas molecules is given by
- A) $\sqrt{\frac{kT}{m}}$
B) $\sqrt{\frac{2kT}{m}}$
C) $\sqrt{\frac{3kT}{m}}$
D) $\sqrt{\frac{5kT}{m}}$
52. An adiabatic process is one in which
- A) no heat enters or leaves the gas
B) the temperature of the gas changes
C) the change in internal energy is equal to the mechanical workdone
D) all of the above



53. The molecular mass expressed in gram (i.e. 1 g - mole) of all gases, at N. T. P., occupies a volume of
A) 0.224 litres B) 2.24 litres C) 22.4 litres D) 224 litres
54. The amount of heat required to raise the temperature of _____ water through one degree is called kilo Joule.
A) 1 g B) 10 g C) 100 g D) 1000 g
55. The Curie temperature is that at which
A) Semi-conductor becomes conductors
B) Ferromagnetic becomes paramagnetic
C) Paramagnetic becomes diamagnetic
D) Metals become super conductor
56. Following are the basic types of stress except
A) Tensile stress B) Compressive stress
C) Shear stress D) Volumetric stress
57. Hooke's law is applicable within
A) Elastic limit B) Plastic limit C) Fracture point D) Ultimate strength
58. The relationship between Young's modulus (E), Bulk modulus (K) and Poisson's ratio (μ) is given by
A) $E=2K(1-2\mu)$ B) $E=3K(1-2\mu)$ C) $E=K(1-2\mu)$ D) $E=2K(1-3\mu)$
59. Visible light's wavelength range
A) 0.39 – 0.77 mm B) 0.39 – 0.77 μ m
C) 0.39 – 0.77 nm D) 0.39 – 0.77 cm
60. Sum of these is unity
A) Reflectivity + Absorptivity
B) Transmissivity + Refractivity
C) Reflectivity + Absorptivity + Transmissivity
D) Reflectivity + Transmissivity
61. Luminescence is because of
A) Photons emitted while excited electrons drops down
B) Knocking out of electrons by photons
C) Photons stimulated by photons
D) Electron phonon coupling



62. Optical fibre operates on the principle of
- A) Total internal reflectance
 - B) Tyndall effect
 - C) Photo-electric effect
 - D) Laser technology
63. Which of the following is a ferromagnetic material ?
- A) Nickel
 - B) Tungsten
 - C) Aluminium
 - D) Copper
64. With rise in temperature the resistance of pure metals
- A) Decreases
 - B) Increases
 - C) First Increases and Decreases
 - D) Remains Constant
65. “There is a plenty of room at the bottom.” This was stated by
- A) Issac Newton
 - B) Albert Einstein
 - C) Richard Feynman
 - D) Eric Drexler
66. The prefix “nano” comes from a
- A) French word meaning billion
 - B) Greek word meaning dwarf
 - C) Spanish word meaning particle
 - D) Latin word meaning invisible
67. How many oxygen atoms lined up in a row would fit in a one nanometer space ?
- A) None; an oxygen atom is bigger than 1 nm
 - B) One
 - C) Seven
 - D) Seventy
68. Which one of these statements is NOT true ?
- A) Gold at the nanoscale is red
 - B) Copper at the nanoscale is transparent
 - C) Silicon at the nanoscale is an insulator
 - D) Aluminium at the nanoscale is highly combustible
69. What is graphene ?
- A) A new material made from carbon nanotubes
 - B) A one-atom thick sheet of carbon
 - C) Thin film made from fullerenes
 - D) A software tool to measure and graphically represent nanoparticles



70. n-type semiconducting silicon is obtained by doping silicon with
A) Germanium B) Aluminum C) Boron D) Phosphorous
71. The surface area to volume ratio of a sphere with radius 1 cm is R1 and that of a sphere with radius 5 cm is R2. Then $R1 = \frac{1}{5} R2$.
A) 3 B) 1/3 C) 5 D) 1/5
72. In the structure of fullerene each carbon atom forms covalent bonds with ____ other carbon atoms.
A) one B) two C) three D) four
73. Quantum dots exhibit properties that are.
A) similar to bulk material
B) similar to atoms
C) similar to molecules
D) intermediate between bulk materials and molecules
74. Which of the following statement is false ?
A) Volume to surface area ratio is very large for nanomaterials.
B) The cut-off limit of human eye is 10^{-5} m.
C) Hardness of a SWNT is about 63×10^9 Pa.
D) Carbon nanotubes are cylindrical fullerenes.
75. The size of RBC is ____ nm.
A) 50 B) 90 C) 2,000 D) 5,000
76. Which type of nanofabrication is the fastest and therefore the cheapest (also the least reliable) ?
A) Bottom up fabrication B) Nanolithography
C) Top down fabrication D) Micro-Contact Printing
77. Which of the following are currently or might soon be possible with nanotechnology ?
A) Location and destruction of cancerous cells
B) Antibacterial food containers
C) Rigid, lightweight building materials
D) All of the above



78. In an intrinsic semiconductor, the free electron concentration depends on
- A) Effective mass of electrons only
 - B) Effective mass of holes only
 - C) Temperature of the semiconductor
 - D) Width of the forbidden energy band of the semiconductor
79. Arm chair and Zig-Zag type carbon nanotubes are _____ respectively.
- A) Metallic and semiconducting
 - B) Semiconducting and Metallic
 - C) Semiconducting and Insulator
 - D) Insulator and semiconducting
80. In the nanomaterials synthesis, “bottom-up” approach means
- A) Preparing nanomaterials from atoms/molecules
 - B) Preparing nanomaterials from bulk materials
 - C) Both A and B
 - D) Neither A nor B
81. At the nanoscale, the melting point of nanomaterial
- A) Decreases with decrease in the particle size
 - B) Increases with decrease in the particle size
 - C) Remains constant
 - D) Increases first and then decreases
82. The absorption maximum of gold nanoparticles will
- A) Havered shift with decrease in the particle size
 - B) Havered shift with increase in the particle size
 - C) Remain constant with either increase or decrease in particle size
 - D) Have blue shift with increase in the particle size
83. The catalytic property of nanomaterials
- A) increases with decrease in particle size
 - B) decreases with decrease in particle size
 - C) remain constant with change in the particle size
 - D) increases first and then decreases with increase in the particle size
84. Lotus leaf has superhydrophobic surface due to its
- A) nanotubule structures
 - B) micro-buds structures
 - C) nanotubule as well as micro-buds structures
 - D) hair like structure



93. The Primitive cell formed in reciprocal lattice is called
A) Wigner-Cells B) Brillouin zone C) Fermi Sphere D) Ewald Sphere
94. Due to illumination by light, the electron and hole concentrations in a heavily doped N-type semiconductor increases by Δn and Δp respectively, if n_i is the intrinsic carrier concentration then
A) $\Delta n < \Delta p$ B) $\Delta n > \Delta p$ C) $\Delta n = \Delta p$ D) $\Delta n \times \Delta p = n_i^2$
95. The electron and hole concentrations in an intrinsic semiconductor are n_i and p_i respectively. When doped with a P-type material, these changes to n and p respectively. Then
A) $n + P = n_i + P_i$ B) $n + n_i = p + p_i$
C) $np_i = n_i p$ D) $np = n_i p_i$
96. Which of the following relation gives Wiedemann-Franz law ?
A) $K/\sigma = LT$ B) $K - \sigma = LT$
C) $K/\sigma = L/T$ D) $K\sigma = L/T$
97. The general expression for Fermi energy of metal at 0 K is (n is concentration of electron)
A) $E_{F_0} \propto n^{3/2}$ B) $E_{F_0} \propto n^{2/3}$
C) $E_{F_0} \propto n^{1/3}$ D) $E_{F_0} \propto n^3$
98. The quantum mechanical expression for Lorentz number is
A) $\frac{\pi}{3} \left(\frac{k_B}{e} \right)^2$ B) $\frac{\pi^2}{3} \left(\frac{k_B}{e} \right)^2$
C) $\frac{\pi}{3} \left(\frac{e}{k_B} \right)^2$ D) $\frac{\pi^2}{3} \left(\frac{e}{k_B} \right)^2$
99. According to Bloch theorem, the solution of the Schrodinger wave equation for an electron moving in periodic potential is of the form
A) $\psi_k(r) = e^{ikr} U_k(r)$ B) $\psi_k(r) = e^{ikr}$
C) $\psi_k(r) = \frac{e^{ikr}}{U_k(r)}$ D) $\psi_k(r) = e^{ikr} U(kr)$
100. In Kronig-Penney model if there is no potential barrier, then
A) There are forbidden energy regions
B) There are no forbidden energy regions
C) All values of energy are not allowed
D) There is a periodic dependence of E on k
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SPACE FOR ROUGH WORK