PART – A

1. _____ John give you those flowers ?
   A) Did B) Have C) Was D) Is

2. To "tell something apart" is to _____
   A) put it aside for later use
   B) correct someone
   C) find the differences
   D) find similarities

3. Women _____ vote in England until 1922.
   A) can B) are able to
   C) managed to D) couldn't

4. The lift is out of _____ so we'll have to walk.
   A) function B) order C) running D) work

5. _____ an empty seat at the back of the bus.
   A) She happened to find
   B) She happened to meet
   C) It happened her that she found
   D) It happened her that she met

6. Many adult students of English wish they _____ their language studies earlier.
   A) would start B) started
   C) would have started D) had started

7. I lived in Delhi _____ several years.
   A) while B) during C) for D) in

8. They'll work on the problem _____ they solve it.
   A) why B) by C) until D) that

9. At first I found learning English very easy, but now I don't think I'm _____ any progress at all.
   A) doing B) making
   C) showing D) getting

10. If we compare the mass of hydrogen in a star with the rate at which energy _____, we can estimate its potential life.
    A) is being emitted
    B) be emitted
    C) was emitted
    D) will be emitted

11. In cricket, the two sets of wickets are
    A) 18 yards apart
    B) 20 yards apart
    C) 22 yards apart
    D) 24 yards apart

12. Dr. Joon Lew of Korea, the recipient of international Gandhi Award is known for his service in the ?
    A) Eradication of Leprosy
    B) Campaigning against AIDS
    C) Against Drugs
    D) Against Child Labour

13. The Bhakti movement was not aimed at
    A) Abolishing idol worship
    B) Eradicating caste system
    C) Popularizing Hinduism
    D) Establishing a new religion

14. What is a scheduled bank ?
    A) A bank having a deposit of Rs. 100 crore
    B) A bank included in the second schedule of RBI
    C) A bank with more than 50 branches
    D) None of these

15. Which among the following States has the highest number of arsenic affected people in the country ?
    A) Assam
    B) Bihar
    C) Jharkhand
    D) West Bengal

16. If $2x + y = 17$; $y + 2z = 15$ and $x + y = 9$, then what is the value of $4x + 3y + z$?
    A) 41 B) 43 C) 45 D) 42

17. Rohit spends 40% of his salary on food, 20% on house rent, 10% on entertainment and 10% on conveyance. If his savings at the end of a month are Rs. 1500, then the his monthly salary is
    A) Rs. 6,000
    B) Rs. 7,500
    C) Rs. 8,000
    D) Rs. 10,000

18. Simple interest on a certain amount is 9/16 of the principal. If the number representing the rate of interest in percent and time in years be equal, then time, for which principal is lent out is

A) 5 ½ years B) 6 ½ years C) 7 years D) 7 ½ years

19. Fresh watermelons contain 90% water by weight whereas dry watermelons contain 20% water by weight. What is the weight of dry watermelon obtained form 20 kgs of fresh watermelon ?

A) 2.4 kg B) 2 kg

C) 2.5 kg D) Cannot be determined

20. A, B and C together earn Rs. 300 per day, whereas A and C together earn Rs. 188 and B and C together earn Rs. 152. The daily earning of C is

A) Rs. 40 B) Rs. 68 C) Rs. 112 D) Rs. 150

21. 1307 x 1307 = ?

A) 1601249 B) 1607249 C) 1701249 D) 1708249

22. If green means red, red means yellow, yellow means blue, blue means orange and orange means green, what is the colour of clear sky ?

A) Blue B) Red C) Yellow D) Green

23. Lakshmi and Meena are Rohan's wives. Shalini is Meena's step-daughter. How is Lakshmi related to Shalini ?

A) Sister B) Mother-in-law C) Mother D) Step-mother

24. Statements :

I. The government has allowed private airline companies in India to operate to overseas destinations.

II. The national air carrier has increased its flights to overseas destinations.

A) Statement I is the cause and statement II is its effect

B) Statement II is the cause and statement I is its effect

C) Both the statements I and II are independent causes

D) Both the statements I and II are effects of independent causes

25. Abduction is related to Kidnapping in the same way as Larceny is related to ?

A) Theft B) Crime C) Blackmail D) Sin

PART – B

26. Burger's vector of an edge dislocation is

A) Parallel to dislocation line

B) Perpendicular to dislocation line

C) At any angle with dislocation line including 0 and 90°

D) All of the above

27. If ϕ represent the angle between the normal to the slip plane and the applied stress direction, and λ the angle between the slip and stress direction, then the resolved shear stress τ_R is

A) $\tau_R = \sigma \sin\phi \sin\lambda$

B) $\tau_R = \sigma \cos\phi \sin\lambda$

C) $\tau_R = \sigma \cos\phi \cos\lambda$

D) $\tau_R = \sigma \sin\phi \cos\lambda$

28. The yield strength σ_y, internal frictional stress σ_i, and diameters of grain d are related as

A) $\sigma_y = \sigma_i + Kd^{-1/2}$

B) $\sigma_y = \sigma_i + Kd^{-1}$

C) $\sigma_y = \sigma_i - Kd^2$

D) $\sigma_y = \sigma_i - Kd$

29. Proof stress corresponds to

A) elastic limit

B) lower yield point

C) higher yield point

D) specified strain

30. Which phenomenon is not used in the measurement of hardness ?

A) wear

B) fracture

C) scratch

D) indentation

31. For a tensile test, it can be demonstrated that necking begins at

A) $\frac{d\sigma_T}{d\varepsilon_T} = \sigma_T$

B) $\frac{d\sigma_T}{d\varepsilon_T} = \sigma_T^{\,2} - 1$

C) $\frac{d\sigma_T}{d\varepsilon_T} = \sqrt{\sigma_T} - 1$

D) $\frac{d\sigma_T}{d\varepsilon_T} = \frac{1}{\sigma_T}$

32. The method to increase the yield strength of a crystalline material are
A) grain refinement B) solute additions
C) precipitation hardening D) all of the above

33. The most desirable method of increasing the yield strength of mild steel is
A) grain refinement B) cold working
C) solute additions D) precipitation hardening

34. As compared to engineering stress-strain curve, the true stress-strain curve is
A) above and to the left B) below and to the right
C) crosses the engineering curve D) parallel to the engineering curve

35. Superplastic materials have an index of strain-rate sensitivity m in the range of
A) 0 B) 0.1-0.2 C) 0.4-0.9 D) 1.5-2.0

36. On heating, if one solid phase splits into two solid phases, the reaction is
A) eutectoid B) eutectic C) peritectic D) Peritectoid

37. In which of the following phases of steel cementite is in lamellar form ?
A) ferrite B) bainite C) martensite D) pearlite

38. The degrees of freedom, when FCC iron and BCC iron co-exist in equilibrium, are
A) 2 B) 1 C) 0 D) –1

39. Zone refining will be more efficient if the ratio of impurity in the solid to that in the liquid is
A) 0.01 B) 0.1 C) 0.4 D) –1.0

40. Hardenability of steel is assessed by
A) Impact test B) Jominy end-quench test
C) Hardness test D) Non-destructive test

41. The pearlite content in plain carbon steel
A) increases with carbon content upto 8% and then decreases
B) increases with increasing carbon content upto 1.2%
C) decreases as carbon content increases
D) all of the above

42. In a single component system, the maximum number of phases that can coexist in equilibrium is

A) 2 B) 3 C) 4 D) 5

43. If alpha of 82% B and liquid of 57% B are in equilibrium in an alloy of 73% B, the fraction of liquid is

A) 0.36 B) 0.64 C) 36% B D) 0

44. The fraction of pearlite in a 0.55% C steel is

A) 0.55 B) 0.31 C) 0.69 D) 0

45. Annealing temperature is

A) same as normalizing temperature

B) greater than normalizing temperature

C) less than normalizing temperature

D) sometimes greater and sometimes lesser than normalizing temperature.

46. Microstrain can be measured by X-ray diffraction using peak

A) Area and intensity B) Position and area

C) Broadening and intensity D) Position and broadening

47. Match the characterization techniques in **Column I** with the options in **Column II**

Column I	**Column II**
P. Scanning tunneling microscopy	1. No vacuum required
Q. Scanning electron microscopy	2. Backscattered electrons
R. Transmission electron microscopy	3. Photoelectrons
S. Atomic force microscopy	4. Atomically sharp tip
	5. Sub-Angstrom resolution

A) P-4, Q-2, R-5, S-1 B) P-1, Q-3, R-4, S-5

C) P-2, Q-4, R-1, S-5 D) P-5, Q-1, R-2, S-4

48. The atomic diameter of an FCC crystal (Lattice parameter is a) is

A) $a\sqrt{2}/2$ B) $a\sqrt{2}/4$

C) $a\sqrt{3}/4$ D) $a/2$

49. The angle between [111] and $[11\bar{2}]$ directions in a cubic crystal
A) 0° B) 45° C) 90° D) 180°

50. The number of members in the family $\langle 123 \rangle$ in a cubic crystal are
A) 8 B) 12 C) 24 D) 48

51. Hydrogen bonds are stronger than
A) ionic bonds B) metallic bonds
C) covalent bonds D) Vander Waals bonds

52. Which of the following relation represent the potential energy of a diatomic molecule ?
A) $Ar^m + Br^n$ B) $Ar^m - Br^n$ C) $\frac{A}{r^m} - \frac{B}{r^n}$ D) $\frac{-A}{r^m} + \frac{b}{r^n}$

53. Thermal expansion of materials arises from
A) thermal vibrations
B) weak bonds
C) strong bonds
D) asymmetry of potential energy curve

54. Which one of the following pairs of crystal structures can have the same packing fraction of 0.74 ?
A) FCC and BCC B) HCP and BCC
C) FCC and HCP D) BCC and BCT

55. The unit of the diffusion coefficient D is
A) ms^{-2} B) $m^{-2}s^{-1}$ C) m^2s^{-1} D) m^2s

56. The temperature of the antiferromagnetic to paramagnetic transition is called
A) Curie temperature B) Curie-Weiss temperature
C) Neel temperature D) Debye temperature

57. The average drift velocity ν of electrons in a metal is related to the electric field E and collision time τ as
A) $\nu = \frac{eE\tau}{m}$ B) $\nu = \frac{m}{\sqrt{eE\tau}}$ C) $\nu = \sqrt{\frac{eE\tau}{m}}$ D) $\nu = \left[\frac{eE\tau}{m}\right]^{2/3}$

58. Davisson and Germer experiment relates to
A) Interference
B) Electron diffraction
C) Polarisation
D) Fluorescence

59. The energy of a one dimensional harmonic oscillator in the ground state is
A) 0 B) $\frac{1}{2}\hbar\omega$ C) $\frac{3}{2}\hbar\omega$ D) $\frac{5}{2}\hbar\omega$

60. Matter waves
A) are longitudinal
B) are electromagnetic
C) always travel with speed of light
D) show diffraction

61. According to Schrodinger a particle is equivalent to a
A) single wave
B) wave packet
C) light wave
D) cannot behave as wave

62. The uncertainty relation holds for
A) Microscopic particles only
B) Macroscopic particles only
C) Microscopic and Macroscopic particle both
D) Neither Microscopic nor macroscopic particle

63. A system of electrons is described by a wave function which should be
A) antisymmetric
B) symmetric
C) both A and B
D) none of the above

64. Schrodinger's wave equation for a moving particle contains
A) first order time derivative
B) second order time derivative
C) third order time derivative
D) no time derivative

65. On which of the following levels of hydrogen the spin-orbit interaction has no effect ?
A) *s*-level B) *p*-level C) *d*-level D) *f*-level

66. The number of nodes in the ground state wave function of a particle in an infinite square well is

A) 1 B) 2 C) 3 D) 4

67. The energy of a particle in a one dimensional closed box is

A) directly proportional to quantum number n

B) directly proportional to n^2

C) inversely proportional to n

D) inversely proportional to n^2

68. The selection rules for the allowed transitions between energy levels of hydrogen atom are

A) $\Delta l = 0 \Delta m = \pm 1$ B) $\Delta l = 0 \Delta m = 0$

C) $\Delta l = \pm 1 \Delta m = \pm 1$ D) $\Delta l = \pm 1 \Delta m = 0$

69. Stokes or anti-Stokes line in Raman spectrum are

A) equally spaced B) unequally spaced

C) mixture of both D) none of the above

70. The yellow *D*-lines of Sodium spectrum corresponds to

A) Sharp series B) Fundamental series

C) Principal series D) Diffuse series

71. In the transistor action which of the following junctions are having highest impedance ?

A) Base-collector B) Collector-emitter

C) Base-emitter D) Emitter-emitter

72. For a transistor amplifier, the voltage gain

A) remains constant for all frequencies

B) is low at high and low frequencies and constant in mid-frequency range

C) is high at high and low frequencies and constant in mid-frequency range

D) none of the above

73. In an unbiased p-n junction, holes diffuse from p-region to n-region because

A) free electrons in the n-region attract them

B) they move across the junction by a potential difference

C) hole concentration in the p-region is more in p-region as compared to the n-region

D) all of the above

74. Carbon, Silicon and Germanium have four valence electrons each. Their energy band gaps are given by $(E_g)_C$, $(E_g)_{Si}$ and $(E_g)_{Ge}$ respectively; which of the following statements is true

A) $(E_g)_C > (E_g)_{Si} > (E_g)_{Ge}$ B) $(E_g)_C < (E_g)_{Si} < (E_g)_{Ge}$

C) $(E_g)_C < (E_g)_{Si} > (E_g)_{Ge}$ D) $(E_g)_C = (E_g)_{Si} = (E_g)_{Ge}$

75. Dynamic resistance across the diode is given by

A) $\Delta I / \Delta V$ B) $\Delta V / I$ C) V/I D) $\Delta V / \Delta I$

76. Quality factor of a resonant AC circuit is given by

A) $\omega_0 R / L$ B) $1/(\omega_0 RC)$ C) $\omega_0 RC$ D) $\omega_0 C / R$

77. If the transformer turn ratio of a transformer is less than unity then it is

A) step-down transformer B) step up transformer

C) it is not a transformer at all D) all of the above

78. Primary and secondary of a transformer are _____ coupled.

A) electrically B) magnetically

C) magnetically and electrically D) all of the above

79. Eddy current loss will depend on

A) Frequency B) Flux density

C) Thickness D) All of the above

80. Thin laminations are used in a machine in order to reduce

A) Eddy current loss B) Hysteresis loss

C) Both A and B D) Copper loss

81. Maximum efficiency will occur, when copper loss is _____ to iron loss.

A) greater than B) less than

C) equal to D) any of the above

82. Autotransformer makes effective saving on copper and copper losses, when its transformation ratio is equal to

A) Very low B) Less than one

C) Greater than one D) Approximately equal to one

83. The logic gate that will have HIGH or "1" at its output when any one of its inputs is HIGH is

A) OR B) AND C) NOT D) NOR

84. Exclusive-OR (XOR) logic gates can be constructed from what other logic gates?

A) OR gates only
B) AND gates and NOT gates
C) AND gates, OR gates, and NOT gates
D) OR gates and NOT gates

85. Buna-S is a _____ material.

A) fibrous
B) plastic
C) resinous
D) rubbery

86. Neoprene is chemically known as

A) polyurethane
B) styrene butadiene rubber (SBR)
C) polychloprene
D) polybutadiene

87. The monomer of Poly Vinyl Chloride (PVC) is

A) ethyl chloride
B) ethylene dichloride
C) chloroform
D) chloroethane

88. _____ resins are produced by the condensation polymerization of formaldehyde with urea or melamine.

A) Amino
B) Epoxy
C) Alkyd
D) Phenolic

89. The estimation of the molecular weight of a polymer by Gel Permeation Chromatography (GPC) is based on its

A) polarity
B) size
C) adsorption to a stationary phase
D) crystallinity

90. Which one of the following is not a condensation polymer ?

A) Dacron
B) Glyptal
C) Melamine
D) Neoprene

91. pH of an aqueous solution of acetic acid is 2. It would increase on the addition of

A) hydrochloric acid
B) common salt
C) aqueous ammonia
D) cane sugar

92. The substance that is a Lewis acid is
A) NaOH B) $AlCl_3$ C) K_2CO_3 D) KOH

93. Milk is an example of
A) a suspension B) a gel
C) an emulsion D) a foam

94. Consider the following statements
a. Nanotechnology deals with devices having sizes of the order of 10^{-9} m.
b. Nanodevices are useful in drug delivery.
The correct statement(s) is/are
A) a only B) b only
C) a and b both D) none of the above

95. Process used in the desalination of sea water is
A) osmosis B) distillation
C) electrophoresis D) reverse osmosis

96. Which one of the following is incombustible ?
A) H_2 B) CCl_4 C) C_2H_2 D) S

97. An electrolytic cell uses electrical energy to drive
A) chemical reaction B) physical reaction
C) nuclear reaction D) none of the above

98. Equilibrium constant can be used to
A) predict direction of chemical reaction
B) predict extent of chemical reaction
C) determine the equilibrium concentration of mixture
D) all of above

99. pH of buffer solution depends upon concentration of
A) acidic concentration B) conjugate base concentration
C) both A and B D) salt

100. In an unsaturated solution, concentration of each ion of sparingly soluble salt at 298K tells us the
A) solubility product B) solubility reactant
C) dynamic equilibrium D) solubility equilibrium

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