A SET

Booklet No. :

NT - 15

Nano Technology

Duration of Test : 2 Hours **Max. Marks : 120**

Hall Ticket No. | | | | | | | | |

Name of the Candidate :____

Date of Examination :__________________ **OMR Answer Sheet No. :** __________________

____________________________ ____________________________

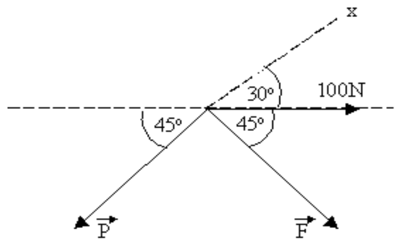
Signature of the Candidate **Signature of the Invigilator**

INSTRUCTIONS

1. This Question Booklet consists of **120** multiple choice objective type questions to be answered in **120** minutes.
2. Every question in this booklet has 4 choices marked (A), (B), (C) and (D) for its answer.
3. Each question carries **one** mark. There are no negative marks for wrong answers.
4. This Booklet consists of **16** pages. Any discrepancy or any defect is found, the same may be informed to the Invigilator for replacement of Booklet.
5. Answer all the questions on the OMR Answer Sheet using **Blue/Black ball point pen only.**
6. Before answering the questions on the OMR Answer Sheet, please read the instructions printed on the OMR sheet carefully.
7. OMR Answer Sheet should be handed over to the Invigilator before leaving the Examination Hall.
8. Calculators, Pagers, Mobile Phones, etc., are not allowed into the Examination Hall.
9. No part of the Booklet should be detached under any circumstances.
10. The seal of the Booklet should be opened only after signal/bell is given.

NANO TECHNOLOGY (NT)

1. Select the equation that represents the equation of force equilibrium in the x direction.



(A) P cos45 – F cos 45 + 100 cos 30 = 0
(B) 100 cos30 + F cos 75 – P cos 15 = 0
(C) F cos 75 + 100 cos 30 – P cos 45 = 0
(D) – P cos 45 + F cos 75 + 100 = 0

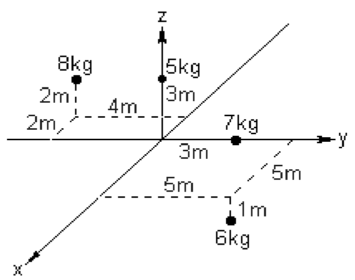
2. A coplanar parallel system of forces will be in equilibrium, if………

I. the resultant of the coplanar parallel force system is equal to zero.

II. the system reduces to a couple equal to zero.

(A) **I** alone is correct (B) **II** alone is correct
(C) both **I** and **II** are correct (D) Neither **I** nor **II** is correct.

3. Determine the x-coordinate of the location of the center of mass for the masses shown in Figure.



(A) 0.45m (B) 0.73m (C) 0.96m (D) 0.54m

4. Find the polar moment of inertia of a square of length 'a' with respect to its centroid.

(A) $a^4/6$ (B) $a^4/12$ (C) $a^4/3$ (D) $a^4/9$

5. If a force $\bar{E}$ acts in space at a point A whose position vector is $\bar{a}$, the moment of the force $\bar{E}$ about the origin is given by

(A) $\bar{E} \times \bar{a}$ (B) $\bar{E}.\bar{a}$ (C) $\bar{a} \times \bar{E}$ (D) $\bar{a} . \bar{E}$

6. A particle moving along a circle with variable angular speed will have
(A) tangential component of acceleration only
(B) normal component of acceleration only
(C) no acceleration
(D) both tangential and normal components of acceleration

7. Centrifugal force is
(A) real force (B) fictitious force
(C) not an inertial force (D) an inertial force

8. A thin ring of mass M and radius R rolls down an incline from a height H without slipping, the maximum attainable velocity V of its center will be_________
(A) $V = (gH)^{1/2}$ (B) $V = (2gH)^{1/2}$ (C) $V = \left(\frac{2}{3} gH\right)^{1/2}$ (D) $\left(\frac{3}{2} gH\right)^{1/2}$

9. The conservation of momentum of a two body system is possible if
(A) external force acts on any one of the bodies
(B) external forces act on both the bodies
(C) no external force acts on either body
(D) each body exerts no force on the other body

10. A disc is fixed at its center to the one end of a shaft of torsional stiffness K_t, the other end of the shaft is fixed. If the mass moment of inertia of the disc about the axis of the shaft is I, what is the natural frequency of the torsional system ?
(A) $(K_t/I)^{1/2}$ (B) $(K_tI)^{1/2}$ (C) $(I/K_t)^{1/2}$ (D) $(2K_t/I)^{1/2}$

11. The area under the stress – strain curve (up to elastic limit) gives ________
(A) strain energy (B) strain energy per unit volume
(C) modulus of elasticity (D) bulk modulus

12. In which cross section of a cantilever beam with an end point load, the maximum bending stress occurs ?
(A) Cross section at free end (B) Cross section at mid length
(C) Cross section at the fixed end (D) Depends on the magnitude of the load

13. The shape of Bending moment diagram for a cantilever beam subjected to uniformly distributed load consists of __________
(A) rectangle (B) parabola (C) cubic curve (D) triangle

14. According to the theory of simple bending, the variation of bending stress across a beam cross section is ______________
(A) Linear (B) Zero (C) Parabolic (D) Hyperbolic

15. The rate of change of shear force along the length of a beam is equal to _________

(A) bending moment (B) slope of the beam

(C) intensity of loading (D) deflection of the beam

16. In case of biaxial stresses, the maximum shear stress is _________

(A) difference of normal stresses (B) half the difference of normal stresses

(C) sum of the normal stresses (D) half the sum of normal stresses

17. For two shafts joined in series, which of the following is the same ?

(A) Shear stress (B) Torque (C) Angle of twist (D) Stiffness

18. The ratio of maximum bending stress to maximum shear stress on the cross section when a shaft is simultaneously subjected to a torque T and bending moment M is _________

(A) M/T (B) M/2T (C) 4M/T (D) 2M/T

19. The planes of maximum shear stress lie at ________ to the planes of principal stresses.

(A) 45^o (B) 90^o (C) 270^o (D) 120^o

20. For the case of two perpendicular direct stresses with simple shear, the extremities of its Mohr's stress circle diameter indicate ________

(A) maximum and minimum principal stresses

(B) maximum and minimum shear stresses

(C) maximum principal stress and maximum shear stresses

(D) minimum principal stress and maximum shear stresses

21. A composite slab has two layers of different materials with thermal conductivity K_1 and K_2. If each layer had the same thickness, the equivalent thermal conductivity of the slab would be

(A) $K_1 + K_2$ (B) $\frac{K_1 + K_2}{K_1 K_2}$ (C) $\frac{2K_1 K_2}{K_1 + K_2}$ (D) $K_1 K_2$

22. It is desired to increase the heat dissipation rate over the surface of an electronic device of spherical shape of 5 mm radius exposed to convection with $h=10W/m^2K$ by encasing it in a spherical sheath of conductivity 0.04 W/m K. For maximum heat flow, the diameter of the sheath should be

(A) 18 mm (B) 16 mm (C) 12 mm (D) 8 mm

23. Up to the critical radius of insulation

(A) added insulation will increase heat loss

(B) added insulation will decrease heat loss

(C) convection heat loss will be less than conduction heat loss

(D) heat flux will decrease.

24. The average heat transfer coefficient of an electric heater which has heat flux 6000 W/m^2, the surface temperature of 120 °C is cooled by air at 70 °C is

(A) 60 (B) 120 (C) 180 (D) 240

25. A flat composite wall with three different materials whose thermal conductivity and thicknesses are k_1, k_2, & k_3 and x_1, x_2, & x_3 respectively. The surface temperatures are t_1, t_2, t_3 & t_4. The conduction through wall is

(A) $Q = \dfrac{\frac{k_1 A}{x_1} + \frac{k_2 A}{x_2} + \frac{k_3 A}{x_3}}{(t_1 - t_4)}$

(B) $Q = \dfrac{(t_1 - t_4)A}{\frac{k_1}{x_1} + \frac{k_2}{x_2} + \frac{k_3}{x_3}}$

(C) $Q = \dfrac{t_1 - t_4}{\frac{k_1 A}{x_1} + \frac{k_2 A}{x_2} + \frac{k_3 A}{x_3}}$

(D) $Q = \dfrac{t_1 - t_4}{\frac{x_1}{k_1 A} + \frac{x_2}{k_2 A} + \frac{x_3}{k_3 A}}$

26. The radial heat transfer rate through hollow cylinder increases as the ratio of outer radius to inner radius

(A) constant (B) increases

(C) decreases (D) decreases first and then increases

27. A hollow cylinder of internal radius r_1, external radius r_2, and length L, the heat transfer in radial direction is

(A) $Q = \dfrac{2\pi L(t_1 - t_2)k}{\log_{10} r_2 / r_1}$

(B) $Q = \dfrac{2\pi L \log_e (t_1 / t_2)}{(r_2 - r_1)k}$

(C) $Q = \dfrac{2\pi L(t_1 - t_2)}{k(r_2 - r_1)}$

(D) $Q = \dfrac{2\pi L(t_1 - t_2)k}{\log_e r_2 / r_1}$

28. The ratio of inertia force to viscous force is

(A) Biot number (B) Euler number

(C) Reynolds number (D) Reyleigh number

29. Mean radius of a hollow sphere of outer and inner radii of 16mm and 9mm is equal to

(A) 12.5mm (B) 14.4 mm (C) 17 mm (D) 12mm

30. If k is thermal conductivity and h is film coefficient of heat transfer at outer radius of a sphere, then the critical radius of insulation is

(A) $\dfrac{k}{h}$ (B) $\dfrac{2k}{h}$ (C) $\sqrt{\dfrac{k}{h}}$ (D) $\sqrt{\dfrac{2k}{h}}$

31. Wavelength for maximum emissive power is given by

(A) Stefan's law (B) Kirchoff's law

(C) Wein's law (D) Plank's law

32. Air at 50 ºC blows over a plate of 50 cm × 20 cm maintained at 250 ºC. If the convection heat transfer coefficient is 25 W/m^2 ºC, the heat transfer rate is

(A) 125W (B) 500W (C) 750W (D) 1000W

33. A furnace wall of thickness 1 m and of surface area 3 m^2, is made of a material whose thermal conductivity is 1 kJ/hr mºC. The temperature of inner surface of the wall is 950 ºC and of outer surface is 150 ºC. Heat flow through the wall in kJ/hr

(A) 450 (B) 2400 (C) 2650 (D) 2850

34. Three metal walls of the same cross-sectional area having thermal conductivities in the ratio 1 : 3 : 5 transfer heat at the rate of 6000 kJ/hr. For the same wall thickness, the temperature drops will be in the ratio.

(A) 1 : 1 : 1 (B) 1 : 3 : 5 (C) $1:\frac{1}{3}:\frac{1}{5}$ (D) $\frac{1}{5}:\frac{1}{3}:1$

35. A wall of (surface area A, thickness Δx and conductivity k) contains hot fluid at temperature T_1 on one side and cold fluid at temperature T_2 on the other side. The rate of heat transfer from hot fluid to cold fluid is equal to

(A) $\frac{\left(\frac{1}{h_1 A}+\frac{\Delta x}{kA}+\frac{1}{h_2 A}\right)}{(T_1 - T_2)}$ (B) $\frac{(T_1 - T_2\left(\frac{1}{h_1}+\frac{1}{h_2}\right)A}{\Delta x}$

(C) $\frac{(T_1 - T_2)(h_1 - h_2)}{A(\Delta x)}$ (D) $\frac{T_1 - T_2}{\left(\frac{1}{h_1 A}+\frac{\Delta x}{kA}+\frac{1}{h_2 A}\right)}$

36. A drum of radius R full of a fluid of density d is rotated at ω rad/sec. The increase in pressure at the outer edge of the drum will be

(A) $\frac{\omega^2 R^2 d}{2}$ (B) $\frac{\omega^2 Rd}{2}$ (C) $\frac{\omega R d}{2}$ (D) $\frac{\omega R d^2}{2}$

37. The critical velocity is

(A) maximum attainable velocity

(B) terminal velocity

(C) velocity above which the flow ceases to be streamlined

(D) velocity at which flow is maximum

38. Reynolds number for non-circular cross section in terms of V-mean velocity, ν-kinematic viscosity and P- ratio of cross sectional area to the wetted perimeter is

(A) $\frac{V.4P}{\nu}$ (B) $\frac{V.\ P}{\nu}$ (C) $\frac{V.\ P}{4\nu}$ (D) $\frac{VP}{2\nu}$

39. The flow of any fluid, real or ideal, must fulfill the following :
(A) Newton's law of viscosity
(B) Newton's second law of viscosity
(C) Velocity at boundary must be zero
(D) The continuity equation

40. For a two- dimensional fluid element in x-y plane, the rotational component is given as
(A) $\omega_z = \frac{1}{2}\left(\frac{\partial v}{\partial x} + \frac{\partial u}{\partial y}\right)$ (B) $\omega_z = \frac{1}{2}\left(\frac{\partial u}{\partial x} - \frac{\partial v}{\partial y}\right)$
(C) $\omega_z = \frac{1}{2}\left(\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y}\right)$ (D) $\omega_z = \frac{1}{2}\left(\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}\right)$

41. Density of water is maximum at
(A) 0 ºC (B) 4 ºC (C) 32 ºC (D) 100 ºC

42. If the velocity in a fluid flow does not change with respect to length of direction of flow, it is called
(A) rotational flow (B) incompressible flow
(C) uniform flow (D) steady flow

43. The cross sectional areas of a Venturimeter at inlet and outlet are A_1 and A_2 respectively. If the pressure head h, and coefficient of discharge is C_d then the discharge is
(A) $Q = C_d \frac{A_1^2 A_2^2}{\sqrt{A_1^2 - A_2^2}} \times \sqrt{2gh}$ (B) $Q = C_d \frac{A_1 A_2}{\sqrt{2A_1^2 - A_2^2}} \times \sqrt{2gh}$
(C) $Q = C_d \frac{A_1^2 A_2^2}{\sqrt{2A_1^2 - A_2^2}} \times \sqrt{2gh}$ (D) $Q = C_d \frac{A_1 A_2}{\sqrt{A_1^2 - A_2^2}} \times \sqrt{2gh}$

44. The square root of the ratio of inertia force to gravity force is
(A) Reynolds number (B) Euler number
(C) Mach number (D) Froude number

45. Model analysis of aeroplanes and projectile moving at super- sonic speed are based on
(A) Euler number (B) Mach number
(C) Froude number (D) Reynolds number

46. Drag force is expressed mathematically as
(A) $F_D = \frac{1}{2}\rho U^2 \times C_D \times A$ (B) $F_D = \frac{1}{4}\rho U^2 \times C_D \times A$
(C) $F_D = 2\rho U^2 \times C_D \times A$ (D) $F_D = \rho U^2 \times C_D \times A$

47. The thickness of turbulent boundary layer at a distance x from the leading edge over a flat plate varies as

(A) $x^{3/5}$ (B) $x^{1/5}$ (C) $x^{4/5}$ (D) $x^{1/2}$

48. The relation between co-efficient of friction (f) and Reynolds number (R_e) for laminar flow through a pipe is given by

(A) $f = \frac{4}{R_e}$ (B) $f = \frac{8}{R_e}$ (C) $f = \frac{12}{R_e}$ (D) $f = \frac{16}{R_e}$

49. Which furnace employs preheating, heating and soaking zones ?

(A) Soaking pit (B) Cupola

(C) Reheating furnace (D) Open hearth furnace

50. The time period of oscillation of a floating body, whose radius of gyration is k and meta-centre height GM, is

(A) $T = 2\pi\sqrt{\frac{GM}{gk^2}}$ (B) $T = 2\pi\sqrt{\frac{gk^2}{GM}}$

(C) $T = 2\pi\sqrt{\frac{k^2}{GM \times g}}$ (D) $T = 2\pi\sqrt{\frac{GM \times g}{k^2}}$

51. The first law of thermodynamics states

(A) About chemical equilibrium of system

(B) Law of conservation of energy of system

(C) Properties of atoms involved in the system

(D) Phase equilibrium

52. The heat transfer takes place according to

(A) first law of thermodynamics

(B) zeroth law of thermodynamics

(C) second law of thermodynamics

(D) fourier's law

53. At equilibrium of any system

(A) $\Delta G = RT \ln K$ (B) $\Delta G = - RT \ln K$

(C) $\Delta G° = RT \ln K$ (D) $\Delta G° = - RT \ln K$

54. An ideal solution is one, which obeys

(A) Raoult's law (B) Henry's law

(C) Sievert's law (D) Gibb's Duhem law

55. Ellingham diagram for metal-oxide system doesn't give idea about

(A) Oxidation of metals

(B) Reduction of metal oxides

(C) Kinetics of the oxide reaction

(D) Value of partial pressure of oxygen for the reactions shown in a diagram

56. A body which absorbs all the radiations falling on it, is called

(A) Opaque body (B) White body

(C) Black body (D) Transparent body

57. According to phase rule

(A) $P - F = C + 2$ (B) $F + C = P + 2$

(C) $P + F = C + 2$ (D) $P + C = F + 2$

58. The enthalpy of a chemical element in the standard state at 0 °C is

(A) 0 (B) 1 (C) 5 (D) 10

59. The change in enthalpy is given as

(A) dH = V.dP/S.dT (B) dH = P.dv/T.dS

(C) dH = S.dT+P.dv (D) dH = T.dS+V.dP

60. An isolated system is that

(A) whose internal energy is zero

(B) whose enthalpy value is negative

(C) whose thermal conductivity is infinite

(D) which is not affected by its surroundings

61. The well known gas equation $(P+a/V^2)(V-b) = RT$ is called

(A) Charle's (B) Ostwald's

(C) Dulong and Petit (D) Vanderwaal's

62. The measure of the tendency of a given element to leave a given phase is

(A) Its chemical potential (B) Its enthalpy

(C) Its C_p (D) Its C_v

63. The second law of thermodynamics is primarily concerned with

(A) Entropy (B) Free energy (C) Activity (D) Enthalpy

64. In a heat engine following the carnot cycle and operating between a heat source at T_1 and Heat sink at T_2, which of the following will lead to a maximum increase in efficiency (assume that the extent of the change, ΔT, is the same in all cases) ?

(A) Lowering T_2 by ΔT, keeping T_1 constant

(B) Lowering T_1 by ΔT, keeping T_2 constant

(C) Increasing T_2 by ΔT, keeping T_1 constant

(D) Increasing T_1 by ΔT, keeping T_2 constant

65. The enthalpy change for a reaction is the same whether it takes place in one or several stages. This statement refers to

(A) Kirchoff's law

(B) First law of thermodynamics

(C) Hess's law

(D) Second law of thermodynamics

66. For the reaction, $ZnO\ (s) + H_2\ (g) \longrightarrow Zn\ (s) + H_2O\ (g)$

$$\Delta H^0_{500} = +140\ kJ\ mol^{-1};\ \Delta S^0_{500} = +60\ kJ\ K^{-1}\ mol^{-1}$$

The above reaction at 500K is ______

(A) feasible

(B) not feasible

(C) forward and backward reaction are equally feasible

(D) feasibility can't be determined

67. In the reaction $N_2 + 3H_2 \rightarrow 2NH_3 + 92.37$ kJ, the formation of NH_3 will be favoured by

(A) low temperature

(B) high temperature

(C) low pressure and high temperature

(D) low temperature and high pressure

68. If the concentration of reactant is increased in a system at equilibrium, the

(A) equilibrium constant increases

(B) reaction will shift to left

(C) reaction will shift to right

(D) equilibrium constant decreases

69. In the reaction $Fe + CO_2 \leftrightarrow FeO + CO$, increasing the pressure will

(A) shift the equilibrium towards right

(B) shift the equilibrium towards left

(C) no change in equilibrium condition

(D) equilibrium constant increases

70. In the reaction, $ZnO + C \rightarrow Zn + CO$, $\Delta H^0 = + 349$ kJ / mol^{-1} increase in temperature will

(A) shift the equilibrium towards left

(B) shift the equilibrium towards right

(C) no change in the position of equilibrium

(D) equilibrium constant remains unaltered

71. Gibbs - Helmholtz equation is

(A) $\Delta G = \Delta H - T\Delta S$

(B) $\Delta G = \Delta H + T [\Delta (\Delta G) / dT]_P$

(C) $dP / dT = \Delta H_{vap}/T\Delta V_{vap}$

(D) $\Delta A = \Delta U - T\Delta S$

72. Ellingham diagrams for $M - MO_x$ reactions is a plot of

(A) ΔG vs T

(B) ΔG vs 1/T

(C) ΔG^0 vs T

(D) ΔG^0 vs 1/T

73. In the Ellingham diagram of oxides, the reaction that is parallel to the temperature axis is

(A) $2C + O_2 = 2CO$

(B) $2Zn + O_2 = 2ZnO$

(C) $C + O_2 = CO_2$

(D) $2CO + O_2 = 2CO_2$

74. In the Ellingham diagram of oxides, the position of formation _____ oxide is very low

(A) Fe

(B) Ca

(C) Mg

(D) Al

75. Ellingham diagram does not give any idea about

(A) reduction of metal sulphides

(B) oxidation of metals

(C) kinetics of reaction

(D) reduction of metal oxides

76. Metal chlorides cannot be reduced by carbon because of the fact that

(A) unstable metal carbide is formed

(B) unstable carbon tetrachloride is formed

(C) reactions require very high temperature

(D) reactions require sub-zero temperature

77. The units of rate constant for a second-order reaction is

(A) $mol^2\ m^3\ s^{-2}$

(B) $mol^{-1}\ m^3\ s^2$

(C) $mol^{-1}\ m^3\ s^{-1}$

(D) $mol^{-2}\ m^3\ s^{-3}$

78. The recrystallised grain size will be smaller
(A) lower the annealing temperature and lower the amount of prior cold work
(B) higher the annealing temperature and lower the amount of prior cold work
(C) lower the annealing temperature and higher the amount of prior cold work
(D) higher the annealing temperature and higher the amount of prior cold work

79. The driving force for grain growth is
(A) decrease in dislocation strain energy
(B) increase in grain boundary energy
(C) decrease in grain boundary energy
(D) decrease in vacancy concentration

80. Hot working of metals is carried out
(A) Below recrystallization temperature
(B) Above recrystallization temperature
(C) Not related to temperature
(D) Above melting point

81. Coordination number in simple cubic crystal structure
(A) 1 (B) 6 (C) 3 (D) 4

82. The angle between the line vector and burgers vector of an edge dislocation is
(A) 180° (B) 120° (C) 90° (D) 0°

83. The close-packed direction in F.C.C. is
(A) [100] (B) [111] (C) [210] (D) [110]

84. Stage III in single crystal deformation is due to
(A) easy glide (B) cross-slip
(C) work hardening (D) dynamic recovery

85. Dislocation density depends on
(A) Temperature (B) Strain-rate
(C) Degree of cold work (D) Time

86. Screw dislocation can move into a different slip plane by
(A) glide (B) cross-slip
(C) cross-slip and climb (D) climb

87. Yield strength of the material is related to grain size 'd'
(A) Proportional to d (B) Inversely proportional to d
(C) Proportional to $\sqrt{d}$ (D) Inversely Proportional to $\sqrt{d}$

88. True stress-strain curve need to be corrected after

(A) Elastic limit (B) Yield limit

(C) Tensile strength (D) No need to correct

89. The coordination number for a H.C.P. lattice is

(A) 4 (B) 6 (C) 12 (D) 8

90. Stacking faults are ________________ imperfections

(A) linear (B) point (C) surface (D) volume

91. Choose the correct statement

(A) Burgers vector is parallel to an edge dislocation

(B) Burgers vector is perpendicular to screw dislocation

(C) Screw dislocation can undergo cross slip

(D) Screw dislocation can undergo climb

92. The dislocation reaction a/2 [1 1 1] + a/2 [1 1 1] -----> a [1 0 0] is

(A) energetically favourable (B) energetically unfavourable

(C) vectorially unbalanced (D) likely to occur in Tin.

93. Material showing well defined yield point in the stress-strain diagram

(A) Aluminium alloy (B) Cast Iron

(C) Mild Steel (D) Cement

94. The stacking fault energy of metal A is greater than that of metal B, then

(A) Width of stacking fault will be greater in metal A

(B) Width of stacking fault will be greater in metal B

(C) Cross-slip of screw dislocation will be easier in metal B

(D) Metal A will work harden more than metal B

95. Which of the following material has over lapping energy bands ?

(A) Diamond (B) Al (C) Ge (D) Si

96. ________ is a donor impurity for a p-type semiconductor

(A) P (B) As (C) In (D) Sb

97. The material used for transformer cores is

(A) Fe - 5% W (B) Fe - 4% Cr (C) Fe - 4% Si (D) Barium ferrite

98. Example for a thermosetting polymer is

(A) Polyethylene (B) Polyester

(C) Cellulose nitrate (D) PVC

99. Electrical conductivity of a metal _______ with temperature and cold working.

(A) decreases (B) increases

(C) remains constant (D) none of the above

100. For soft magnetic materials magnetic coercivity and saturation magnetization should be

(A) low & low (B) high & low (C) low & high (D) high & high

101. In the PTFE (Teflon) monomer, the four side groups are

(A) F F F F (B) H H H H (C) H H H Cl (D) H H H CH_3

102. The first three reflecting planes of silicon (DC) are

(A) 111, 200, 220 (B) 110, 200, 211

(C) 111, 220, 311 (D) 100,110,111

103. The word 'ceramic' meant for ______________.

(A) soft material (B) hard material (C) burnt material (D) dry material

104. Not a characteristic property of ceramic material

(A) high temperature stability (B) high mechanical strength

(C) low elongation (D) low hardness

105. Major ingredients of traditional ceramics

(A) silica (B) clay (C) feldspar (D) all the above

106. Not a major contributor of engineering ceramics

(A) SiC (B) SiO_2 (C) Si_3N_4 (D) Al_2O_3

107. The following ceramic product is mostly used as pigment in paints

(A) TiO_2 (B) SiO_2 (C) UO_2 (D) ZrO_2

108. Most commercial glasses consist of

(A) lime (B) soda (C) silica (D) all the above

109. The atomic diameter of an BCC crystal (if a is lattice parameter) is

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

110. If 'c' is the velocity of light in vacuum, and 'v' is the velocity of light in a material, the index of refraction of the material, 'n', is given by

(A) $n = c/v$ (B) $n = v/c$ (C) $n = (v/c)^2$ (D) $n = (c/v)^2$

111. A very weak form of magnetism that is nonpermanent and persists only when an external field is applied and manifests itself in a direction opposite to that of the applied field is called

(A) Diamagnetism (B) Paramagnetism
(C) Ferromagnetism (D) Ferrimagnetism

112. The energy of a dislocation is

(A) Proportional to b (B) Proportional to b^2
(C) Proportional to 1/b (D) Independent of b

113. The property of a material varies with the orientation or the direction in case of a/an _________ material

(A) Isotropic (B) Anisotropic (C) Plastic (D) Elastic

114. Schottky Defect is

(A) anion and cation vacancy (B) interstitial
(C) inclusion (D) substitutional defect

115. N-type semiconductor is a silicon doped with element of

(A) monovalent (B) divalent
(C) trivalent (D) pentavalent

116. Insulators have

(A) high dielectric constants (B) low dielectric constants
(C) high electrical conductivity (D) none of the above

117. Mechanical properties of fiber reinforced composites depend on

(A) Properties of constituents
(B) Interface strength
(C) Fiber length, orientation, and volume fraction
(D) All the above

118. Nanostructure can be studied using

(A) Optical microscope (B) AFM
(C) Rockwell tester (D) UTM

119. Example of Top-down approach

(A) PVD (B) CVD
(C) High Energy ball mill (D) Electrodeposition

120. Example of one-dimensional nano-structure

(A) Nano-particle (B) Nano-tube
(C) Nano-film (D) Nano-crystal

SPACE FOR ROUGH WORK