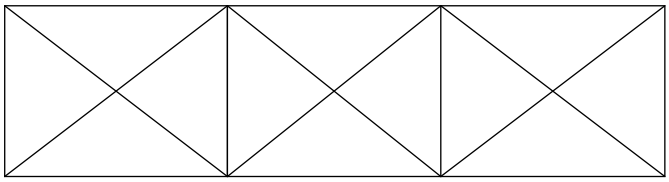
PART – A

Questions 1 – 10 : Fill in the blanks with the most grammatically correct and meaningful option from those provided :

1. You_____ better consult a doctor soon.
   A) have to B) has to C) had D) shall
2. She stands a good chance —— the match.
   A) to win B) of winning C) for winning D) towards winning
3. Your performance is very —— .
   A) applicable B) appreciating C) remarking D) remarkable
4. The invention of the wheel has proved a great —— for mankind.
   A) devise B) use C) boon D) service
5. I have not had —— breakfast this morning.
   A) some B) any C) nothing D) something
6. He —— for her since morning.
   A) waited B) waiting
   C) has been waiting D) may been waiting
7. I prefer tea —— coffee.
   A) to B) than C) more D) rather
8. My parents were —— happy to see me win.
   A) too B) most C) more D) extreme
9. The police forbade us —— enter the house where the theft had taken place.
   A) not to B) to C) do not D) to not
10. Success is —— on hard work.
    A) depend B) depended C) dependent D) depending
11. Choose the appropriate answer for the following :

    Conscience : Wrong : : Police : ?
    A) Thief B) Law C) Discipline D) Crime
12. Which number will come in the blank space ?
    20, 19, 17, __, 10, 5
    A) 12 B) 13 C) 14 D) 15
13. A woman introduces a man as the son of the brother of her mother. How is the man related to the woman ?
    A) Nephew B) Grandson C) Cousin D) Uncle
14. A shepherd had 17 sheeps. All but nine died. How many was he left with ?
    A) Nil B) 8 C) 9 D) 17

15. How many triangles and squares are there in the following figure ?



A) 28 triangles, 5 squares
B) 24 triangles, 4 squares
C) 28 triangles, 4 squares
D) 24 triangles, 5 squares

16. Select the most suitable synonym for MYTH
A) truth
B) falsehood
C) illusion
D) concoction

17. Select the most suitable antonym for JUBILANT
A) lethargic
B) inebriated
C) refreshed
D) morose

18. Identify the meaning of idiom "Child's play"
A) to handle a situation calmly
B) to play like a child
C) an easy task
D) to treat lightly

19. Select the pair which shows the same relationship as the capitalized pair of words

ROAD : FOOTPATH
A) Drawing room : kitchen
B) River : riverbank
C) Box : lock
D) Window : shutter

20. Choose the correct option

100 + 50 x 2 = ?
A) 75
B) 150
C) 200
D) 300

21. Find the average of all the numbers between 6 and 34 which are divisible by 5.
A) 18
B) 20
C) 24
D) 30

22. The ratio 5 : 4 expressed as a percent equals
A) 12.5%
B) 40%
C) 80%
D) 125%

23. I gains 70 paise on Rs. 70. My gain percent is
A) 0.1%
B) 1%
C) 7%
D) 10%

24. If A : B = 5 : 7 and B : C = 6 : 11, then A : B : C is
A) 55 : 77 : 66
B) 30 : 42 : 77
C) 35 : 49 : 42
D) None of these

25. A does a work in 10 days and B does the same work in 15 days. If they work together, in how many days the same work will be done ?
A) 5
B) 6
C) 8
D) 9

PART – B

26. The spherical polar co-ordinates of a point are $(r, \theta, ö) = (8, 30^o, 45^o)$ then the Cartesian Co-ordinates (x,y,z) of the same point are

A) $2\sqrt{2}, 2\sqrt{2}, 4\sqrt{3}$
B) $4\sqrt{2}, 2\sqrt{2}, 2\sqrt{3}$
C) $2\sqrt{3}, 2\sqrt{2}, 4\sqrt{3}$
D) none of these

27. The total force acting on a freely falling body of mass 5 kg with reference to a frame moving with a downward acceleration of $2\ ms^{-2}$ is

A) 35N B) 10N C) 39N D) 50N

28. If the average distance of mars from sun is 1.52 times than that of earth from sun. Then what will be the period of revolution of mars around sun ?

A) 6838 days B) 683.8 days C) 783.8 days D) 7838 days

29. What will be the time period of a compound pendulum if the distance of its point of suspension from the center of gravity is 1.23 m and $g = 9.84\ ms^{-2}$?

A) 31.4 sec B) 3.14 sec C) 6.28 sec D) 628 sec

30. What is the percentage decrease in length of a body which is moving with a velocity of 0.8c, where c is velocity of light ?

A) 30 B) 50 C) 40 D) 10

31. Determine b so that the vector $A = x^2\hat{i} + (y-2xy)\hat{j} + (x+bz)\hat{K}$ is solenoidal.

A) 1 B) 0.5 C) –2 D) –1

32. Gauss's divergence theorem is used to transform

A) A volume integral into surface integral
B) A line integral into surface integral
C) A surface integral into line integral
D) A volume integral into line integral

33. A vector field $\vec{A}$ is irrotational if

A) $\nabla \times A = 0$ B) $\nabla . A = 0$ C) $\nabla \times A = 1$ D) $\nabla . A = 1$

34. A sphere of radius 3 cm has a point charge $q = 7.6\mu C$ located at its centre. Find the electric flux through it.

A) $9\times10^9 Nm^2C^{-1}$
B) $6.2\times10^7 Nm^2C^{-1}$
C) $8.59\times10^5 Nm^2C^{-1}$
D) $6.6\times10^{-8} Nm^2C^{-1}$

35. Choose the correct relation between three electric vectors E, D, P. The symbols have their usual meaning.

A) $D = P + E$ B) $D = P/E$ C) $D = \varepsilon_0 E + P$ D) $\varepsilon_0 (E + P)$

36. The dielectric constant of dielectrics is always

A) less than one B) more than one

C) zero D) equal to one

37. A 150 m long conductor of uniform cross-section has a voltage drop of 1.3V and current density 4.65×10^5 A/m^2. What is the conductivity of the material of the conductor ?

A) $5.4 \times 10^7\ \Omega^{-1}m^{-1}$ B) $9.6 \times 10^7\ \Omega^{-1}m^{-1}$

C) $5.2 \times 10^3\ \Omega^{-1}m^{-1}$ D) $6.5 \times 10^3\ \Omega^{-1}m^{-1}$

38. A solenoid is 0.5 m long and has radius 0.01m. If it has 500 turns and is wound on a material of relative permeability 800, calculate the co-efficient of self inductance of the solenoid

A) 0.961 H B) 0.158 H C) 0.209 H D) 0.634 H

39. What will be the skin depth of a medium having conductivity 2×10^7 Siemen/meter for electromagnetic waves of frequency 10 KHz ? Given $\mu = 4\pi \times 10^{-7}$ H/m.

A) 1.25×10^3 m B) 1.125×10^6 m

C) 1.125×10^{-3} m D) 1.125×10^{-6} m

40. The ratio of most probable speed (V_m), average speed (V_{av}) and root mean square speed (v_{rms}) of the molecule of an ideal gas [V_m:V_{av}:V_{rms}] is

A) 1.59 : 1.73 : 1.41 B) 1.73 : 1.41 : 1.59

C) 1.73 : 1.59 : 1.41 D) 1.41 : 1.59 : 1.73

41. Six particles are to be distributed in two compartments. Calculate the probability of macro state (0,6).

A) 9/64 B) 5/64 C) 1/64 D) 19/64

42. In a crystal, a plane cuts intercepts of 2a, 3b, and 6c along the three crystallographic axes. What will be the Miller indices of the plane ?

A) (312) B) (645) C) (321) D) (311)

43. The FCC structure is

A) Primitive
B) Non primitive
C) May be either primitive or non primitive
D) None of these

44. The spacing between principle plane of NaCl crystal is 2.82 Å. It is found that first order Bragg reflection occurs at an angle of 10°. What is the wavelength of X-rays ?

A) 0.98 Å
B) 0.5 Å
C) 0.66 Å
D) 0.3 Å

45. The Lande's 'g' factor for s-electron will be

A) 3
B) 2
C) 1
D) None of these

46. What will be the speed of the transverse wave in a wire of radius 0.05cm under the tension produced by 1.0 kg weight ? The density of the material of wire is 9.8×10^3 kgm^{-3}.

A) 7.14 ms^{-1}
B) 71.4 ms^{-1}
C) 3.57 ms^{-1}
D) 35.7 ms^{-1}

47. Newton's rings are observed by placing water between the plate and the lens. The diameter of 8th ring is 3.8 mm. If the system is illuminated by sodium light of wavelength 589.3 nm and radius of curvature of the plano-convex lens is 1 m, then the refractive index of water will be

A) 1.51
B) 1.41
C) 1.31
D) 1.21

48. When the movable mirror of Michelson's Interferometer is shifted through 0.0589 mm, a shift of 200 fringes is observed. What is the wavelength of light used ?

A) 598 nm
B) 589 nm
C) 985 nm
D) 895 nm

49. What will be the minimum number of lines that a grating should have to resolve the first order sodium doublet having a wavelength difference of 0.6 nm at 589.3 nm ?

A) 765
B) 756
C) 928
D) 982

50. Which of the following is not essential for simple harmonic motion ?

A) Inertia
B) Gravity
C) Restoring force
D) Material

51. Leakage current I_{CBO}= 10 μA and β_{dc} = 100, find I_{CEO} where symbols have their usual meanings

A) 1110 μA
B) 1000 μA
C) 1010 μA
D) none of these

52. A wire of length 6 m and area of cross section 1mm^2 carries a current of 2A . If unit cubic meter of material of wire contains 10^{29} free electrons , then average time taken by an electron to cross the length of the wire will be

A) 20 hr
B) 13.33 hr
C) 10 hr
D) 33.13 hr

53. What will be the current density in a wire of diameter 0.2 cm in which current of 10 A flows ?

A) 19.5×10^3 Am^{-2}
B) 3.18×10^6 Am^{-2}
C) 4.99×10^5 Am^{-2}
D) none of these

54. The turn ratio of the transformer used in bridge rectifier is $n_1 : n_2$ = 12 : 1 primary is connected to 220v , 50 Hz power main . Assuming diodes to be ideal diode. Find d.c voltage across load.

A) 20.54v
B) 25.44v
C) 16.48v
D) 12.84v

55. D.C. current amplification of a common Emitter amplifier is 100, find D.C. current amplification of common base.

A) 0.95
B) 0.85
C) 0.99
D) 0.89

56. To an amplifier of gain 60 dB, a –ve feedback is applied with β = 0.005 what would be the change in overall gain of feedback amplifier if internal amplifier is subjected to a gain of 12%

A) – 0.01
B) – 0.02
C) – 0.03
D) – 0.04

57. The magnitude of induced e.m.f. in a coil of inductance 1mH, in which current is changing from 0.1 A to 2.1 A in 0.01 s, will be

A) 0.1 v
B) 0.2v
C) 0.3v
D) 0.4v

58. What will be the thickness of quarter wave plate of quartz for light of wavelength 5000 Å and μ_0=1.544 and μ_e = 1.533 ?

A) 0.11×10^{-4} m
B) 5.23×10^{-6} m
C) 10.23×10^{-6} m
D) none of these

59. Binary number system has radix

A) 2
B) 1
C) 10
D) 16

60. In Kirchhoff Voltage Law algebraic sum of all voltages in a loop is

A) non-zero
B) zero
C) 1
D) 2

61. Operational amplifier is a

A) direct coupled
B) TC coupled
C) RC coupled
D) uncoupled

62. For transistor in active region biasing arrangement is

A) Both junction forward bias
B) Both junction reverse bias
C) B-E forward bias, B-C reverse bias
D) B-E reverse bias, B-C forward bias

63. In Zener diode as voltage regulator, Zener diode is biased in

A) At knee voltage
B) Forward bias region
C) At cut-off region
D) Reverse bias region

64. Which of the following device offers negative resistance ?

A) UJT
B) BJT
C) FET
D) p-n junction diode

65. Silicon Controlled Rectifier (SCR) is a

A) pnpn device
B) pn device
C) pnp device
D) npn device

66. Field Effect Transistor is

A) voltage controlled device
B) current controlled device
C) impedance controlled device
D) admittance controlled device

67. For transistor as an amplifier, input impedance should be ideally

A) 2 B) 1 C) infinite D) zero

68. Which configuration of BJT is best suitable for amplifier ?

A) CE B) CB C) CC D) CB and CE

69. Which of the transistor characteristic is used as OFF switch ?

A) cut-off B) active C) saturation D) inverter

70. A zener diode is specified as having a breakdown voltage 9.1 v, with a maximum power dissipation of 364 mW. What is the maximum current the diode can handle ?

a) 40 mA b) 30 mA C) 50 mA D) 60 mA

71. Wavelength of light emitting diode by a certain LED is 600 nm. Find the energy gap.

A) 1.01eV B) 2.02eV C) 3.03 eV D) none of these

72. A unijunction transistor has 12 V between the bases, If the intrinsic stand off ratio is 0.60 . What will be the peak point voltage, if the forward voltage drop in the pn-junction is 0.7 ?

A) 4.2 v B) 5.0 v C) 7.9 v D) 6.5 v

73. In a half wave rectifier , the applied a.c voltage is $E = 10 \sin 100 \pi t$. Given a load resistance of 100 Ω And assuming the diode to be ideal, calculate the d.c output voltage.

A) 4.4 v B) 5.2 v C) 3.2 v D) 7.2 v

74. An electron is in 4f orbital. What possible values for the quantum numbers n, l, m and s can it have ?

A) n = 4, l =3, m= –2,s = +1/2 B) n =3, l=2, m= – 3, s= 0

C) n= 4, l= 3,m= –3, s= –1/2 D) n= 4, l = 2, m= –3,s= –1/2

75. The effective nuclear charge for a 3d electron in Scandium is

A) 2.30 B) 3.90 C) 3.0 D) 1

76. Which of the following has highest electronegativity ?

A) F B) Cl C) Br D) I

77. The hybridization involved in the formation of diborane is
A) sp^2 B) sp^3 C) dsp^2 D) dsp^3

78. The number of pentagonal and hexagonal faces in C_{70} Fullerene are
A) 12, 20 B) 12, 25 C) 12, 28 D) 16, 20

79. Which of the following is not a hard acid ?
A) Na^+ B) Mg^{2+} C) Pd^{2+} D) Ti^{2+}

80. Which of the following ions is not expected to be coloured ?
A) Mn^{2+} B) Fe^{3+} C) Ti^{3+} D) Cu^+

81. The IUPAC name of $K_4[Ni(CN)_4]$ is
A) Potassium tetracyanonickel(III) B) Potassium tetracyanonickel(II)
C) Potassium tetracyanonickel(0) D) Potassium tetracyanonickel(IV)

82. Which of the following does not obey EAN rule ?
A) $[Pt(NH_3)_4]^{2+}$ B) $[Cu(CN)_4]^{3-}$
C) trans$[Pt(NH_3)Cl_2]$ D) $[Co(EDTA)]^-$

83. If K is the magnetic susceptibility per unit volume, 'ρ' is the density and M is the molecular weight then molar susceptibility is
A) KM/ρ B) $K\rho/M$
C) $M/K\rho$ D) $K/M\rho$

84. Ferromagnetic materials show normal paramagnetic behavior at
A) below T_C B) below T_N C) above T_C D) above T_N

85. The term symbol for d^{10} configuration is
A) ^0S B) ^3S C) ^1P D) ^1S

86. The hybridization present in CH_4 molecule is
A) sp^3 B) sp^2 C) dsp^2 D) d^2sp

87. Which of the following molecule is active in IR spectroscopy, butinactive in Raman spectroscopy ?
A) HCl B) CH_4 C) NO D) CO_2

88. Pure rotational spectra of a substance can be observed if it is present in

A) Liquid state
B) Gaseous state
C) Solid state
D) Any state

89. In Raman spectra stokes lines are observed if the frequency of the scattered radiation (v_s) and incident radiation (v_i) are related as

A) $v_s < v_i$
B) $v_s > v_i$
C) $v_s = v_i$
D) $v_s \geq v_i$

90. Which of the following molecule does not have electric dipole ?

A) CCl_4
B) $CHCl_3$
C) CH_2Cl_2
D) CH_3Cl

91. The liquefaction of gas (a and b are Vanderwaal's constants)

A) increases with increase in value of 'a'
B) decreases with increase in value of 'a'
C) increases with increase in value of 'b'
D) decreases with increase in value of 'b'

92. The bond angle in case of sp^3 hybridization is

A) 107°
B) 109°.28′
C) 104°.5′
D) 120°

93. The number of NMR signals shown by CH_3CH_2Cl are

A) 2
B) 1
C) 3
D) 0

94. The electronic configuration of Europium (Eu) is

A) $[Xe]4f^7 5d^0 6s^2$
B) $[Xe]4f^0 5d^7 6s^2$
C) $[Xe]4f^2 5d^2 6s^2$
D) $[Xe]4f^9 5d^0 6s^0$

95. The lanthanide contraction is due to

A) Poor shielding of f-electrons
B) High nuclear charge
C) Due to high ionization energy
D) Both (A) and (B)

96. Which of the following is not an ore of Uranium (U) ?

A) Carnotite
B) Calcium Carnotite
C) Hematite
D) Pitch Blende

97. Which of the following reaction is not feasible ?

A) $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$
B) $Ag(s) + Cu^{2+}(aq) \rightarrow 2Ag^{+}(aq) + Cu(s)$
C) $Cr^{3+}(aq) + Al(s) \rightarrow Al^{3+}(aq) + Cr(s)$
D) $Ni^{2+}(aq) + Zn(s) \rightarrow Zn^{2+}(aq) + Ni(s)$

98. The most powerful reducing agent is

A) Li
B) Li^{+1}
C) Cs
D) Cs^{+1}

99. Which of the following solutes behaves as an acid in liquid sulphurdioxide ?

A) K_2SO_3
B) Cl_2SO_3
C) Na_2SO_4
D) $SOCl_2$

100. If uncertainty in the velocity of an electron is zero. What will be the uncertainty in its position ? (Mass of electron= 9.1×10^{-31} Kg)

A) zero
B) less than zero
C) infinity
D) none of the above

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SPACE FOR ROUGH WORK

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