Maximum : 100 marks

Time : 1 hour and 30 minutes

1. A car horn emits sound of frequency 500 Hz. If the car moves towards a stationary observer with a speed of 30 m/s (speed of sound = 330 m/s), observed frequency is approximately :

   (A) 550 Hz
   (B) 630 Hz
   (C) 470 Hz
   (D) 450 Hz

2. According to Einstein's postulates, the speed of light in vacuum :

   (A) Depends on observer
   (B) Depends on motion of source
   (C) Is constant in all inertial frames
   (D) None of these

3. A moving clock appears to tick once every 2.5 s for a stationary observer. If the clock's proper period is 2 s, find the speed of the clock :

   (A) 0.2 c
   (B) 0.4 c
   (C) 0.6 c
   (D) 0.8 c

4. A soap bubble of radius 2 cm has surface tension 0.03 N/m. The excess pressure inside the bubble is :

   (A) 1.5 N/m^2
   (B) 3 N/m^2
   (C) 12 N/m^2
   (D) 6 N/m^2

5. A copper wire of length 2 m and radius 1 mm is hung vertically and loaded with a weight of 1 kg :

   If the Young's modulus of copper is 2×10^{10} N/m^2, then the elongation produced in the wire is approximately :

   (Take $g = 10$ m/s^2 and $\pi = 3$)

   (A) 3×10^{-5} m
   (B) 6×10^{-5} m
   (C) 3×10^{-4} m
   (D) 6×10^{-4} m

6. A body undergoes forced oscillations. The amplitude of oscillation will be maximum when the driving frequency equals :

   (A) Zero
   (B) Natural frequency
   (C) Damping constant
   (D) Twice the natural frequency

7. A body of mass 5 kg is acted upon by two perpendicular forces of 6 N and 8 N. The acceleration of the body is :

(A) 1 m/s^2 (B) 2 m/s^2

(C) $\sqrt{2}$ m/s^2 (D) 10 m/s^2

8. A constant force of 20 N acts on a body of mass 4 kg moving in a straight line. The body moves 5 m. The work done by the force is :

(A) 4 J (B) 25 J

(C) 50 J (D) 100 J

9. A bullet of mass 0.01 kg is fired into a block of 2 kg resting on a smooth surface. If the bullet embeds in the block and the velocity of the bullet before impact is 300 m/s, find their common velocity :

(A) 1.5 m/s (B) 2.5 m/s

(C) 5 m/s (D) 1 m/s

10. A solid sphere and a solid cylinder, each of same mass and radius, roll down an incline. Which one reaches the bottom first?

(A) Sphere (B) Cylinder

(C) Both together (D) Depends on inclination

11. The amplitude of a damped oscillator decreases to half its initial value in 10 s. The logarithmic decrement is :

(A) 0.069 (B) 0.035

(C) 0.693 (D) 1

12. Two waves $y_1 = 0.02\sin(100\pi t)$ and $y_2 = 0.02\sin(100\pi t + \pi/2)$ are superimposed. The resultant amplitude is :

(A) 0.02 m (B) 0.028 m

(C) 0.04 m (D) 0

13. The core material with a very narrow hysteresis loop is desirable for which of the following applications?

(A) Permanent bar magnets (B) Magnetic data storage devices

(C) Electromagnets and transformers (D) Magnetic refrigerator seals

14. For an RC differentiator circuit, the correct condition for proper differentiation is :

(A) $RC >> T$ (B) $RC \approx T/2$

(C) $RC = T$ (D) $RC << T$

15. The energy stored in an inductor of 2 H carrying 1 A current is :

(A) 1 J
(B) 2 J
(C) 0.5 J
(D) 4 J

16. A current source of 0.1 A has a parallel internal resistance of 10 Ω. It is connected to a 10 Ω load. Find the current through the load 0.02 A :

(A) 0.02 A
(B) 0.05 A
(C) 0.01 A
(D) 0.005 A

17. The capacitor in an RC discharging circuit loses 80% of its initial charge in a certain time t. Find time in terms of RC :

(A) 1.609 RC
(B) 0.693 RC
(C) 1.386 RC
(D) 5 RC

18. The simplified form of $AB + A'C + BC$ is :

(A) $AB + A'C$
(B) $AC + B$
(C) $A'C + AB$
(D) $AC + BC$

19. Which of the following Boolean expressions not correctly represents the **Exclusive–OR (XOR)** operation for two inputs A and B :

(A) $A \oplus B$
(B) $\overline{A}B + A\overline{B}$
(C) $(A + B)(\overline{A} + \overline{B})$
(D) $\overline{A} + \overline{B}$

20. A capacitor is often referred to as a blocking capacitor because it :

(A) allows AC current to pass
(B) blocks DC current
(C) blocks both AC and DC current
(D) blocks AC current

21. The primary characteristics of the common collector configuration of transistor is :

(A) current gain is nearly unity
(B) low input impedance and medium output impedance
(C) voltage gain nearly unity
(D) high bandwidth

22. Which of the following is an advantage of a bridge rectifier compared to a center-tapped rectifier?

(A) Requires fewer diodes
(B) Lower transformer utilization factor (TUF)
(C) Lower PIV requirement for diodes
(D) Both (B) and (C)

23. Which specific, new physical phenomenon was uniquely predicted as a consequence of Maxwell's addition of the displacement current term to Ampere's Circuital Law?

(A) Propagation of self-sustaining electromagnetic waves in vaccum

(B) The existence of magnetic monopoles

(C) Changing magnetic fields produce electric fields

(D) Light is a form of transverse wave

24. Which statement accurately describes the key advantage of a piezoelectric oscillator over standard LC or RC oscillators?

(A) They provide exceptionally high frequency stability and a superior quality factor

(B) They offer a highly adjustable frequency range, easily tuned by external voltage

(C) They consume significantly less power

(D) They require no external amplification circuits

25. A Carnot engine operates between two reservoirs at temperature of 500 K and 300 K. What is the maximum possible efficiency of this engine?

(A) 20%

(B) 60%

(C) 40%

(D) 80%

26. A canonical ensemble in statistical mechanics is defined as a collection of systems that all share the same :

(A) Temperature (T), Volume (V) and Chemical Potential (μ)

(B) Temperature (T), Volume (V) and Number of Particles (N)

(C) Energy (E), Constant Pressure (P) and Temperature (T)

(D) Energy (E), Volume (V) and Number of Particles (N)

27. According to the equipartition theorem, what is the average energy per translational degree of freedom for a molecule at temperature T?

(A) $\frac{1}{2}$ kT

(B) $\frac{3}{2}$ kT

(C) kT

(D) $\frac{5}{2}$ kT

28. A plano convex lens is made up of a glass of refractive index 1.50. If the radius of the curved surface is 40 cm, the focal length of the lens will be :

(A) 50 cm

(B) 80 cm

(C) 60 cm

(D) 40 cm

29. The total angular width of the central bright maximum in the Fraunhofer diffraction pattern of a slit of width 12×10^{-5} cm, when the slit is illuminated by monochromatic light of wavelength 600 nm is:

(A) 30° (B) 15°

(C) 45° (D) 60°

30. In the context of polarization by reflection, what defined the Brewster angle?

(A) The angle of incidence where the reflected and refracted rays are perpendicular to each other

(B) The angle where total internal reflection first occurs

(C) The angle at which no light is reflected from the interface

(D) The angle of incidence where the reflected light is completely unpolarized

31. Which of the following factors primarily determines the resolving power of a diffraction grating?

(A) The distance between the grating and the screen

(B) The intensity of the incident light

(C) The refractive index of the grating material

(D) The total number of ruled lines on the grating

32. Why is a metastable state essential for laser action?

(A) It enables the achievement of population inversion

(B) It ensures that only spontaneous emission occurs

(C) It allows for rapid decay to the ground state

(D) It increased the energy of the emitted photons

33. Wien's displacement law states that the wavelength corresponding to maximum spectral emission (λ_{max}) from the black body is :

(A) Directly proportional to its absolute temperature (T)

(B) Directly proportional to T^4

(C) Inversely proportional to its absolute temperature (T)

(D) Inversely proportional to T^4

34. The Clausius statement of the Second Law of Thermodynamics essentially asserts that :

(A) You cannot build an engine that is 100% efficient

(B) Heat cannot spontaneously flow from a cold body to a hot body without an external work

(C) Absolute zero cannot be reached in a finite number of steps

(D) Energy flow from hot body to cold body

35. In statistical mechanics, what is the dimension of the phase space for a system containing N independent particles (with no internal structure)?

(A) N

(B) 2 N

(C) 6 N

(D) 3 N

36. In the Maxwell-Boltzmann distribution, what physical quantity is most likely for a particle to have near the peak of the curve?

(A) The average speed

(B) The root mean square speed

(C) The maximum spe

(D) The most probable speed

37. Calculate the Miller indices of the crystal plane whose intercepts are $3a$, $6b$ and $3c$:

(A) (2 2 1)

(B) (1 3 1)

(C) (2 1 2)

(D) (3 1 3)

38. The wave function ψ^2 in Schrodinger wave equation represents :

(i) Amplitude of the wave function.

(ii) Eigen functions and eigen values.

(iii) The probability of finding an electron of a given energy.

(A) Only (iii)

(B) Only (i) and (iii)

(C) All the above (i), (ii) and (iii)

(D) Only (i)

39. Which of the following statement is true?

(i) Packing fraction can have only positive value

(ii) A positive value of packing fraction implies the instability of nuclei.

(iii) A positive value of packing fraction implies the stability of nuclei.

(A) Only (iii)

(B) Only (ii)

(C) Only (i) and (iii)

(D) None of the above (i), (ii) and (iii)

40. An example of Orthorhombic crystal system :

(A) Na_2SO_4 (B) KCl

(C) K_2SO_4 (D) $CuSO_4$

41. Which of the following statements are true considering Uncertainty principle?

(i) If the object is microscopic its position or velocity will not be altered with by the impact of light photons.

(ii) If the object is extremely minute it will suffer a change in its position or velocity by the impact of light photons.

(iii) If the object is of reasonable size, its position or velocity will not be altered with by the impact of light photons.

(A) Only (ii) and (iii)

(B) Only (i)

(C) Only (ii)

(D) Only (i) and (iii)

42. Which one is a postulate of wave mechanics?

(i) For a system moving in one dimension, i.e. x-coordinate, the physical state of a system at time t is described by the wave function $\psi(x, t)$.

(ii) The wave function $\psi(x, t)$ and its first and second derivatives are continuous, finite and single valued for all values of x.

(iii) A physical observable quantity can be represented by a Hermitian operator.

(A) Only (ii) and (iii) (B) Only (i)

(C) Only (ii) (D) All the above

43. Which of the following is not true?

(i) Bohr's theory helped in calculating the energy of the electron in a particular orbit of hydrogen atom.

(ii) Bohr atomic model couldn't explain the stability of an atom.

(iii) Bohr's theory provided explanation about the shapes of molecules.

(A) All the above (i), (ii) and (iii) (B) Only (i) and (ii)

(C) Only (ii) and (iii) (D) None of the above

44. Which series of lines in the hydrogen spectrum appears in the visible region?

(i) Lyman

(ii) Paschen

(iii) Pfund

(A) All the above (i), (ii) and (iii)
(B) Only (ii)
(C) Only (iii)
(D) None of the above

45. Which processes is responsible for the production of hydrogen bomb?

(A) Uncontrolled release of fission energy
(B) Threshold energy
(C) Controlled release of fission energy
(D) Nuclear Fusion

46. Calculate the number of atoms contained within a face-cantered cubic unit cell :

(A) 3
(B) 4
(C) 1
(D) 8

47. Name the defect in crystals which is caused by the shifting of an ion from its normal position to an interstitial position :

(i) Metal excess defect

(ii) Schottky defect

(iii) Frenkel defect

(A) All the above (i), (ii) and (iii)
(B) None of the above
(C) Only (iii)
(D) Only (ii)

48. Elementary particles of non-integral spin are called :

(A) Fermions
(B) Photon
(C) K-meson
(D) Neutrino

49. Which of the following is not true?

(i) Superconductivity is the property of certain materials to conduct direct current electricity without energy loss when they are cooled above a critical temperature.

(ii) The main advantage of the superconductive magnet, in contrast to the electromagnet, is that it does not dissipate energy to maintain the magnetic field.

(iii) Superconductors prevent external magnetic field from penetrating the interior of the superconductor.

(A) All the above (i), (ii) and (iii)
(B) Only (i)
(C) None of the above
(D) Only (iii)

50. The bombardment of boron with alpha particles yields a radioactive isotope of :

(A) ${}_7N^{13} + {}_0n^1$ (B) ${}_6C^{13} + {}_0n^1$

(C) ${}_7N^{14} + {}_0n^1$ (D) ${}_{12}C^{12} + {}_0n^1$

51. Which one of the following is a colligative property?

(A) Refractive index (B) Osmotic pressure

(C) Melting point (D) Colour

52. Solubility of AgCl decreases in :

(A) $NaNO_3$ (B) NaCl

(C) $AgNO_3$ (D) Both (B) and (C)

53. In paper chromatography, the stationary phase is :

(A) Organic solvent (B) Water absorbed on paper

(C) Paper fibers only (D) Silica gel

54. Zeolites are chemically :

(A) Hydrated aluminosilicates (B) Metallic oxides

(C) Carbonates of alkali metals (D) Sulfides of transition metals

55. The most effective method for removing particulate matter from industrial emissions is :

(A) Electrostatic precipitator (B) Filtration through cloth

(C) Burning again at high temperature (D) Adding more water vapor

56. The oxidizer commonly used in solid rocket propellants is :

(A) Liquid hydrogen (B) Helium

(C) Carbon (D) Potassium nitrate

57. In a 1D particle in a box, boundary conditions require the wave function to be :

(A) Infinite (B) Zero at the walls

(C) Maximum at the walls (D) Constant

58. A 2p orbital corresponds to :

(A) $n = 1, l = 0$ (B) $n = 2, l = 0$

(C) $n = 2, l = 1$ (D) $n = 1, l = 1$

59. The Born–Oppenheimer approximation allows separation of :

(A) Spin and nuclear motions

(B) Rotational and electronic motions

(C) Electronic and nuclear motions

(D) Vibrational and rotational motions

60. The rotational constant B is proportional to :

(A) Moment of inertia

(B) Nuclear spin

(C) Square of radius

(D) 1/(moment of inertia)

61. A molecule is centrosymmetric if it has :

(A) center of symmetry

(B) plane of symmetry

(C) axis of symmetry

(D) rotation reflection axis

62. Schottky defect involves :

(A) Only cation vacancy

(B) Only anion vacancy

(C) Equal number of cation and anion vacancies

(D) Interstitial defects

63. Match the following ores with the metals obtained from them:

Column I (Ore)		Column II (Metal)
(a) Cinnabar	(i)	Lead
(b) Galena	(ii)	Mercury
(c) Bauxite	(iii)	Uranium
(d) Pitchblende	(iv)	Aluminium

(A) (a)–(ii), (b)–(i), (c)–(iv), (d)–(iii)

(B) (a)–(iv), (b)–(ii), (c)–(iii), (d)–(i)

(C) (a)–(i), (b)–(ii), (c)–(iv), (d)–(iii)

(D) (a)–(iii), (b)–(iv), (c)–(ii), (d)–(i)

64. The half-life of a radioactive isotope is 10 days. The fraction of the isotope remaining after 50 days will be :

(A) 1/4

(B) 1/8

(C) 1/16

(D) 1/32

65. In the uranium radioactive disintegration series, the stable end product formed is:

(A) Lead–206

(B) Lead–207

(C) Lead–208

(D) Bismuth–209

66. The nuclear reaction :

$^{14}_{7}N+^{4}_{2}He \rightarrow ^{17}_{8}O+^{1}_{1}H$ is an example of :

(A) Natural radioactivity
(B) Artificial transmutation
(C) Nuclear fission
(D) Nuclear fusion

67. Match the following refining methods with the metals purified by them :

Column I (Refining Process)		Column II (Metal Refined)
(a) Mond's Process	(i)	Zirconium, Titanium
(b) Van Arkel method	(ii)	Nickel
(c) Zone refining	(iii)	Silicon, Germanium
(d) Electrolytic refining	(iv)	Copper, Silver

(A) (a)–(ii), (b)–(i), (c)–(iii), (d)–(iv)
(B) (a)–(i), (b)–(ii), (c)–(iv), (d)–(iii)
(C) (a)–(iv), (b)–(iii), (c)–(ii), (d)–(i)
(D) (a)–(iii), (b)–(iv), (c)–(i), (d)–(ii)

68. In the Born-Haber Cycle for the formation of sodium chloride (NaCl), the following steps are involved :

(i) Sublimation of $Na(s) \rightarrow Na(g)$
(ii) Ionization of $Na(g) \rightarrow Na^{+}(g)+e^{-}$
(iii) Dissociation of $Cl_2(g) \rightarrow 2Cl(g)$
(iv) Electron affinity of $Cl(g)+e^{-} \rightarrow Cl^{-}(g)$
(v) Formation of NaCl(s) from $Na^{+}(g)$ and $Cl^{-}(g)$

Which of the above steps is endothermic?

(A) (iv) and (v) Only
(B) (ii) and (iv) Only
(C) (i), (ii) and (iii) Only
(D) (i), (iii) and (v) Only

69. Which of the following statements about De Broglie's hypothesis is incorrect?

(A) All moving particles have a wavelength associated with them
(B) The De Broglie wavelength increases with increasing mass of the particle
(C) The De Broglie wavelength decreases with increasing velocity
(D) The concept unites the wave and particle nature of matter

70. The correct set of four quantum numbers (n, l, m and s) of the 31st electron of Gallium (atomic number 31) are :

(A) $n = 3, l = 0, m = 0, s = +\frac{1}{2}$

(B) $n = 4, l = 0, m = 1, s = +\frac{1}{2}$

(C) $n = 4, l = 1, m = -1, s = +\frac{1}{2}$

(D) $n = 3, l = 1, m = 1, s = +\frac{1}{2}$

71. The hybridization of Nickel in $[Ni(CO)_4]$ is:

(A) sp^3

(B) sp^2

(C) sp

(D) sp^3d

72. Identify the incorrect statement regarding Hund's Rule of Maximum Multiplicity :

(A) Electrons occupy degenerate orbitals singly before pairing

(B) All unpaired electrons in degenerate orbitals have parallel spins

(C) Pairing starts only after all degenerate orbitals are half-filled

(D) Electrons in degenerate orbitals may have opposite spins before half-filling

73. Among the following compounds, intramolecular hydrogen bonding is observed in:

(i) Water

(ii) Ethanol

(iii) *o*-Nitrophenol

(iv) Salicylaldehyde

(A) (i) and (ii) only

(B) (iii) and (iv) only

(C) (ii) and (iii) only

(D) (i), (ii) and (iv) only

74. The bond order of the O_2, N_2 and F_2 molecules according to Molecular Orbital Theory (MOT) are respectively :

(A) 2, 3, 1

(B) 1, 2, 3

(C) 3, 2, 1

(D) 2, 1, 3

75. Using the Lande's equation, the magnetic moment (μ) of Fe^{2+} ($3d^6$) in Bohr magnetons (B.M.) is approximately :

(A) 2.83

(B) 4.90

(C) 6.70

(D) 5.92

76. According to VSEPR theory, the shape and hybridization of the central sulphur atom in SF_4 molecule are :

(A) Tetrahedral and sp^3

(B) Trigonal bipyramidal and sp^3d^2

(C) See-saw and sp^3d

(D) Square planar and dsp^2

77. Which among the following is not an example of homogeneous catalysis?

(A) Acid catalyzed hydrolysis of ethyl acetate

(B) Decomposition of ozone in stratosphere by NO_x

(C) Bromination of ethylene in a glass vessel

(D) Acid catalyzed conversion of starch to glucose

78. In the adsorption of a gas on solid adsorbent,

(A) $\Delta S = +ve$ and $\Delta H = -ve$

(B) $\Delta S = -ve$ and $\Delta H = -ve$

(C) $\Delta H = +ve$ and $\Delta G = -ve$

(D) $\Delta G = -ve$ and $\Delta S = +ve$

79. Which of the following statements correctly defines the Gold Number?

(A) It is the minimum volume of gold sol (in mL) required to prevent the coagulation of 10 mL of a protective colloid when 1 mL of 10% NaCl is added.

(B) It is the minimum mass of NaCl (in mg) required to coagulate 10 mL of gold sol in presence of 1 mg of a protective colloid.

(C) It is the minimum amount of a protective colloid (in mg) required to prevent the coagulation of 10 mL of a gold sol when 10 mL of 1% NaCl is added.

(D) It is the minimum amount of a protective colloid (in mg) required to prevent the coagulation of 10 mL of gold sol in the presence of 1 mL of 10% NaCl

80. In the decomposition of calcium carbonate at constant temperature, maximum number of phases which can coexist in equilibrium is :

(A) 1 (B) 2

(C) 3 (D) 4

81. During electrolysis, equal amounts of electric charge are passed through the solutions of $CuSO_4$ and $AgNO_3$. Which of the following statement is incorrect?

(A) More silver is deposited than copper because silver ions requires fewer electrons to be reduced than copper ions.

(B) Less silver is deposited than copper because copper ions are divalent and this makes the deposition per ion higher.

(C) Less copper is deposited than silver because the atomic mass to charge ratio of copper is less than that of silver

(D) The mass of deposited metal depends on both the number of electrons transferred per ion and the equivalent masses of the metals.

82. Rate of diffusion of a gas is :

(A) Directly proportional to square root of pressure and inversely proportional to density

(B) Directly proportional to pressure and inversely proportional to square root of density

(C) Directly proportional to square root of pressure and inversely proportional to square root of density

(D) Directly proportional to pressure and inversely proportional to density

83. Which among the following is a path dependant thermodynamic function?

(A) H (B) S

(C) T (D) W

84. What will be the change in entropy of 2 moles of an ideal gas expanding to ten times its volume at 27°C?

(A) $38.3\ JK^{-1}$ (B) $16.62\ JK^{-1}$

(C) $-19.15\ JK^{-1}$ (D) $19.15\ JK^{-1}$

85. Based on the reaction $2SO_2 + O_2 \rightleftharpoons 2SO_3 + 198$ kJ/mol, the decomposition of SO_3 will be favoured:

(A) At high pressure and low temperature

(B) At low pressure and high temperature

(C) At high pressure and high temperature

(D) At low pressure and low temperature

86. Choose the wrong relationship among the following :

(A) $K_c(RT)^{\Delta n} = K_x P^{\Delta n}$ (B) $K_x = K_p P^{-\Delta n}$

(C) $K_p = K_c(PV/n_{total})^{\Delta n}$ (D) $K_p = K_x V^{\Delta n}$

87. In a reaction between A and B, doubling [A] quadruples the reaction rate and tripling [B] makes the rate one-third of its original value. What will be the overall order of the reaction?

(A) 1 (B) 2

(C) 3 (D) –1

88. Which of the following statements about fluorescence and phosphorescence is incorrect?

(A) Fluorescence is prompt emission from an excited singlet state returning directly to the ground state

(B) Phosphorescence is a delayed radiative transition between two states of same multiplicity

(C) Both involve photon emission after excitation, differing only in the spin multiplicity of the emitting state

(D) Phosphorescence arises when a triplet state, formed via intersystem crossing, relaxes slowly to the singlet ground state

89. The most reactive towards electrophilic substitution :

(A) nitrobenzene (B) aniline

(C) anilinehydrochloride (D) N-acetylaniline

90. Which of the following ions is aromatic?

(A) Cyclopentadienyl anion (B) Cyclopentadienyl cation

(C) Cyclobutadienyl anion (D) Cycloheptatrienyl anion

91. The catalyst used for polymerisation of olefins is :

(A) Ziegler-Natta catalyst (B) Wilkinsons catalyst

(C) pd-catalyst (D) Zeise's complex

92. The sequence in structure of nucleic acid is :

(A) base + phosphate + pentose

(B) phosphate + pentose + base

(C) base + pentose + phosphate

(D) All are correct

93. The Vitamin that contains both nitrogen and sulphur is

(A) Vitamin A (B) Vitamin B1

(C) Vitamin B12 (D) Vitamin C

94. Which among the following exhibit stereoisomerism?

(A) 2-methylbutene-1 (B) 3-methylbutyne-3

(C) 3-methylbutanoic acid (D) 2-methylbutanoic acid

95. The extraordinary stability of carbon-carbon bonds in organic compounds is primarily due to :

(A) High bond enthalpy resulting from effective p-p overlap

(B) Presence of hydrogen atoms nearby

(C) Resonance stabilization in all carbon bonds

(D) High polarity of C–C bond

96. The hybridisation of carbon atoms in C-C single bond of $HC \equiv C - CH = CH$ is :

(A) sp^3-sp^3 (B) sp^2-sp^3

(C) sp-sp^2 (D) sp^3-sp

97. Choose the correct IUPAC for $CH_3 - CH(CH_2CH_3) - CHO$:

(A) butan-2-aldehyde (B) 2-methylbutanal

(C) 3-methylisobutyraldehyde (D) 2-ethylpropanal

98. Match the following :

List I		List II	
(i)	propanamine and N-methylethanamine	(a)	metamers
(ii)	hexan-2-one and hexan-3-one	(b)	positional isomers
(iii)	ethanamide and hydroxyethanamide	(c)	functional isomers
(iv)	o-nitrophenol and p-nitrophenol	(d)	tautomers

(A) (i)-(b), (ii)-(c), (iii)-(a), (iv)-(d)

(B) (i)-(c), (ii)-(d), (iii)-(a), (iv)-(b)

(C) (i)-(d), (ii)-(c), (iii)-(a), (iv)-(b)

(D) none of these

99. Resonance structure of the molecule does not have :

(A) identical arrangement of atoms

(B) nearly the same energy content

(C) the same number of paired electrons

(D) identical bonding

100. Which among the following has highest nucleophilicity?

(A) F^- (B) OH^-

(C) CH_3^- (D) NH_2^-