SRM IST RAMAPURAM -DEPARTMENT OF CHEMISTRY
CHEMISTRY (18CYB101J) -QUESTION BANK
SEMESTER I (2020-2021)
PART- A MCQ WITH ANSWER (ALL FIVE UNITS)

MODULE -1

1.The filling up of Molecular orbital takes place according to
a) Huckel's rule
b) Hund's rule
c) Fajan's rule
d) Cahn Ingold Prelog rule

2. Which of the following molecule does not exist due to its zero-bond order?
a) H_2^+
b) He_2^+
c) **He_2**
d) H_2^-

3. According to Heisenberg the product of uncertainty in the position & moment run of the body is
a. Equal toh/p
b. Equal toE-V
c. $\geq h/4\pi$
d. ≥E-V

4. CO has 10 bonding electrons and 4 anti-bonding electrons, and its bond order is
a) 3
b) 7
c) 1
d) 5/2

5. Two electrons occupying the same orbital are distinguished by
a) Azimuthal quantum number
b) **Spin quantum number**
c) Magnetic quantum number
d) Orbital quantumnumber

6. The interaction will be attractivebetweenthe orbital [Provided x is theprincipal axis]

a) $2p_y$-$2p_z$
b) 1s-2s
c) $2p_x$-$2p_y$
d) **2s-$2p_x$**

7. Organic compounds which contain more than one benzene rings are termed as -----.

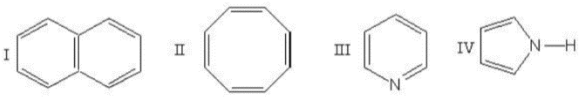
a)Arenes

b) Aryls

c) Acyls

d) Alkyl

8. Which of the following compound is aliphatic? [Based on Huckel'srule]



a. I

b. II

c. III

d. IV

9. Identify the incorrect statement regarding aromaticity

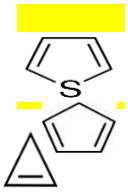
a. It is the extra stability possessed by amolecule

b. p-orbitals must be planar andoverlap

c. Cyclic delocalization takesplace

d. It does not follow Huckel’srule

10. Which of the following molecule is aromatic?

a) 

b.

c.

d. 

11. On the basis of molecular orbital theory, select the most appropriate option.

a. The bond order of O_2 is 2.5 and it isparamagnetic

b. The bond order of O_2 is 1.5 and it isparamagnetic

c. The bond order of O_2 is 2 and it isdiamagnetic

d. The bond order of O_2 is 2 and it isparamagnetic

12. Which of the following is known as the Schrödinger equation?

a. $E=mc^2$

b. $\lambda = h/p$

c. $\hat{H}\psi = E\psi$

d. $-\frac{\hbar^2}{2m}\nabla^2$

13. Choose the incorrect statement from the following options.

a) **In bonding molecular orbital, electron density is low in the region between the nuclei of bondedatoms**

b) The energy of anti-bonding molecular orbital is higher than that of atomicorbitals from which it isformed

c) Every electron in bonding molecular orbital contributes toward stability of the molecule

d) Anti-bonding takes place when lobes of atomic orbitals have different signs.

14. If the sign of the wave function is unchanged when the orbital is reflected about its centre, the orbital is

a) **Gerade**

b) Ungerade

c) Gerade as well asUngerade

d) Anti-Symmetric

15. For a homonuclear diatomic molecule the bonding orbital is

a) **σg of lowest energy**

b) σu of second lowest energy

c) πg of lowest energy

d) πu of lowestenergy

16. The relative energies of molecular orbitals in increasing order have been found to be as follows:

$(\sigma_{1s}) < (\sigma^*_{1s}) < (\sigma_{2s}) < (\sigma^*_{2s}) < [(\pi_{2py})(\pi_{2pz})] < (\sigma_{2px}) < [(\pi^*_{2py})(\pi^*_{2pz})] < (\sigma^*_{2px})$

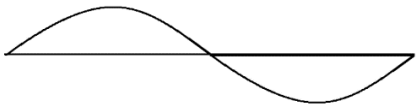
a) For O_2 toNe_2

b) **For H2 toN2**

c) For H_2 toNe_2

d) For N_2 toNe_2

17. The wave function for which quantum state is shown in the figure?



a) 1

b) 2

c) 3

d) 4

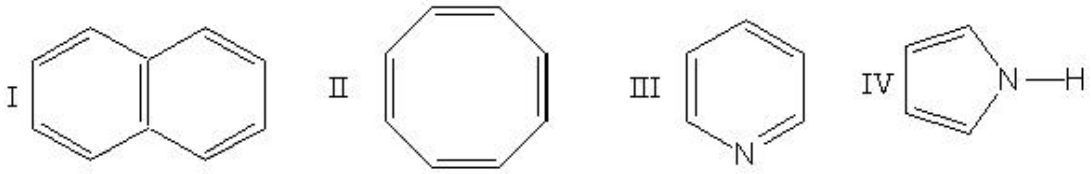
18. Calculate the Zero-point energy for a particle in an infinite potential well for an electron confined to a 1 nm atom?

a) 3.9 X 10-29 J
b) 4.9 X 10-29 J

c) 5.9 X 10-29 J

d) 6.9 X 10-29 J

19. Which of the following compound is aliphatic? [Based on Huckel'srule]



a) I

b) II

c) III

d) IV

20. Molecular orbitals are filled not according to

A. Aufbau Principle
B. Pauli Exclusion Principle
C. Hund's rule
D. Huckel's rule

21. The donor atom of a ligand in coordination chemistry is

A. Lewis acid
B. a counter ion
C. central metal ion
D. ligand atom that shares e- pair with metal

22. Does a linear molecule show aromaticity?

A. may show
B. may not show
C. both a and b
D. cannot show

23. The wave function is a linear combination of

A. Vectors
B. Eigen values
C. Eigen Functions
D. Operators

24. Antibonding molecular orbitals are formed by …… of atomic orbitals.
A. constructive interference
B. destructive interference
C. overlapping of atomic orbitals with two negative signs
D. hybridization

25. For a particle in one dimensional box, potential energy V =_____inside the box.
A. -1
B. ∞
C. 0
D. 1

26. The normalization constant for a particle in one-dimensional box is
A. A
B. 2/a
C. a/2
D. √ (2/a)

27. The points inside the box where ψ=0 is called
A. Antinodes
B. nodes
C. radial points
D. angular points

28. Energy of electron in the nth orbit of H- atom is proportional to
A. square root of n
B. inverse square root of n
C. cube root of n
D. n

29. The probability of finding a particle per unit volume is known as
A. particle density
B. probability density
C. normalization
D. orthogonalization

30. The wave function Ψ describes
A. Intensity
B. energy density
C. state of the system
D. probability

31. For a particle in one-dimensional box, the number of nodes (N) and quantum number are related as

A. N = n
B. N = n-1
C. N = 2n
D. N = n+1

32. The maximum probability of finding the electron for the ground state hydrogen atom is found to be at

A. 0.0529 nm
B. 0.00529 nm
C. 0.529 nm
D. 0.158 nm

33. The carbon of aromatic benzene molecule is

A. sp3d2 hybridized
B. sp hybridized
C. sp2 hybridized
D. sp3 hybridized

34. Aromatic compounds do not have

A. planar structure
B. 4n π-electrons in structure
C. cyclic structure
D. 4n+2 π-electrons in structure

35. Benzene is a ……. structure of two Kekule's structure

A. hybrid
B. meso
C. monoclinic
D. isomeric

36. The name of OH- ligand is

A. Hydroxy
B. hydroxide
C. hydroxo
D. hydroxyl

37. Iso cyano is the name of ……. Ligand

A. CN^-
B. NC^-
C. NCS^-
D. SCN^-

38. If the sign of wave function remains unaffected upon reflecting an orbital about its centre, the orbital is known as _____

A. Gerade
B. Ungerade
C. Gerade as well as Ungerade
D. Centralized

39. Molecular orbitals are being filled as per the _____

A. The Aufbau Principle
B. Pauli Exclusion Principle
C. Hund's rule of maximum multiplicity
D. All the mentioned

40. The correct option as per the MOT

A. The bond order of O2 is 2.5 and it is paramagnetic
B. The bond order of O2 is 1.5 and it is paramagnetic
C. The bond order of O2 is 2 and it is diamagnetic
D. The bond order of O2 is 2 and it is paramagnetic

41. Which one is incorrect from the following options?

A. Electron density is low in the region between the nuclei of bonded atoms in case of bonding MO.
B. Antibonding MO is higher in energy than atomic orbitals from which it is formed
C. Every electron in bonding MO contributes toward stability of the molecule
D. Antibonding takes place when lobes of atomic orbitals have different signs

42. Electrons residing in the same orbital will have _____.

A. Same spin
B. Opposite spin
C. Same or opposite spin
D. No spin

43. The concept of matter wave was suggested by

A. Heisenberg
B. Schrodinger
C. De Broglie
D. Niels Bhor

44. The operator ∇^2 is called operator

A. Hamiltonian
B. Poisson
C. Laplacian
D. Vector

45. The shape of s-orbital?

A. Sphere
B. Dumbbell
C. Pear-shaped lobe
D. Conical

46. Developing year of Valence Bond Theory was?

A. 1925
B. 1927
C. 1929
D. 1932

47. The Valence Bond Theory was developed by?

A. Heitler and London.
B. Bhor
C. Linus Pauling
D. Pauli

48. The s-orbital does not show preference to any direction because _____

A. It is the smallest orbital
B. It is present in every atom
C. It is spherically symmetric
D. It is the first orbital

49. Schrodinger equation in shorter form is given by $\hat{H}\ \Psi=$

A. EH
B. E
C. EΨ
D. G

50. Which of the following molecule is not homonuclear?

A. H_2
B. N_2
C. CO
D. O_2

51. Which of the following molecule is homonuclear?

A. HF
B. NO_2
C. NO
D. O_2

52. The shape of a p orbital is?
A. Sphere
B. Dumbbell
C. Pear-shaped lobe
D. Cuboid

53. The interaction between a pair of orbitals of the same type is _____
A. Attractive
B. Repulsive
C. There is no interaction
D. None of the mentioned

54. Potential energy of a particle outside the box is
A. 1
B. Infinity
C. Zero
D. Finite

55. The de Broglie equation applies to
A. Electrons only
B. Protons only
C. Neutrons only
D. All the material objects in motion

56. The number of nodal planes in a p_x orbital is
A. One
B. Two
C. Three
D. Zero

57. As compared to bonding MO, the antibonding MO has
A. Higher energy
B. Lower energy
C. Equal energy
D. Unpredictable value of energy

58. Which is incorrect about aromaticity?
A. It must be planar
B. It must be conjugated
C. Cyclic delocalization takes place
D. It must not obey Huckel's rule

59. Carbon monoxide has a ….. bond order

A. 3

B. 5

C. 1

D. 1/2

60. What is the bond order in H_2?

A. 3.0

B. 2.0

C. 1.5

D. 1.0

61. The total probability of finding the electron in a orbital must be

A. Zero

B. One

C. Infinity

D. Double

62. Which one is the correct expression for uncertainty principle?

A. $\Delta X.\Delta p \geq h/4\pi$

B. $\Delta X.\Delta p \geq h/2\pi$

C. $\Delta E.\Delta t \leq h/4\pi$

D. None of these

63. An atom has two unpaired electrons. The total spin of this atom will be

A. 0

B. 1

C. 1.5

D. 2

64. Energy expression of a particle in one dimensional box is

A. $n^2\, h^2/4mL^2$

B. $n^2\, h^2/6mL^2$

C. $n^2\, h^2/8mL^2$

D. $n^2\, h^2/mL^2$

65. The bond order of O_2 molecule on the basis of molecular orbital theory …..

A. is 2 and it is paramagnetic

B. is 2.5 and it is paramagnetic

C. is 1.5 and it is paramagnetic

D. is 2 and it is diamagnetic

66. When $\psi(x) = \psi(-x)$ the function is

A. Symmetric
B. antisymmetric
C. sine
D. finite

67. Correct set of four quantum numbers for the valence (outermost) electron of Rubidium (Z=37) is:

A. 5, 0, 0, +½
B. 5, 1, 0, +½
C. 5, 1, 1, +½
D. 6, 0, 0, +½

68. Which hydrogen like species will have same radius as that of Bohr's first orbit of hydrogen atom?

A. n=2, Li2+
B. n=2, Be3+
C. n=2, He+
D. n=3, Li2+

69. The number of radial nodes of 3s and 2p orbitals are respectively:

A. 2, 0
B. 0, 2
C. 1, 2
D. 2, 11

70. Uncertainty in position of a particle of 25 g in space is 10-5 m. Hence, uncertainty in velocity (m s-1) is: (Planck's constant, h = 6.6 x 10-34 J s)

A. 2.1×10^{-28}
B. 2.1×10^{-34}
C. 0.5×10^{-34}
D. 5.0×10^{-24}

71. The relative energies order of molecular orbitals in increasing order to be as follows. $(\sigma_{1s}) < (\sigma^*_{1s}) < (\sigma_{2s}) < (\sigma^*_{2s}) < [(\pi_{2py})(\pi_{2pz})] < (\sigma_{2px}) < [(\pi^*_{2py})(\pi^*_{2pz})] < (\sigma^*_{2px})$

A. For O_2 to Ne_2
B. For H_2 to N_2
C. For H_2 to Ne_2
D. For N_2 to Ne_{2+}

72. Order of the following molecules in increasing stability is?

A. $N_2 < N_2^- < N_2^{2-}$
B. $N_2^{2-} < N_2^- < N_2^+$
C. $N_2^{2-} < N_2^- < N_2$
D. $N_2 < N_2^+ < N_2^{2-}$

73. Bond Order of O_2, N_2 are ……., respectively?

A. +1, +2
B. +2, +3
C. +2, +1
D. +3, +2

74. The combination of H ($1s^1$) and F ($2px^1$) gives _____

A. Bonding orbital
B. Antibonding orbital
C. Both bonding and antibonding orbital
D. P-orbital

75. Ground state energy of an electron in an infinite 1-dimensional box of width of 1A°?

A. 38 eV
B. 342 eV
C. 152 eV
D. 28eV

76. Calculate the Zero-point energy for a particle in an infinite potential well for an electron confined to a 1 nm atom.

a. 3.9 X 10-29 J
b. 4.9 X 10-29 J
c. 5.9 X 10-29 J
d. 6.9 X 10-29 J

MODULE -2

1. The different types of energies associated with a molecule are

a) Electronic, Vibrational and Rotational energies
b) Dissociation energy
c) Potential energy
d) Kinetic energy

2. The nuclei with spin quantum number greater than _____ can exhibit the NMR phenomenon.

a) 0
b) 5
c) 10
d) -5

3. The number of different orientations which a magnetic nucleus can take is------.

a) 2I
b) 2I-1
c) 2I+1
d) 4I

4. The selection rule for vibrational transition in simple harmonic oscillation is ----.

a) $\Delta J = \pm 1$
b) $\Delta V = \pm 1$
c) $\Delta J = +1$
d) $\Delta V = +1$

5. Which of the following electronic transitions is forbidden in the H atom spectrum?

a) 1S →nP
b) 1S →nS
c) 2P →nS
d) 2P →nD

6. Which of the following transitions between rotational energy levels is not allowed?
a) J=1 →J=0
b) J=1←J=2
c) J=0←J=1
d) J=1←J=3

7. The wavenumbers are expressed in-----.
a) sec^{-1}
b) cm^{-1}
c) $cm.sec^{-1}$
d) $cm^2.sec^{-1}$

8. The electronic spectra are caused by -----.
a) Microwave
b) Radio waves
c) UV-Visible rays
d) Infra-red rays

9. In $K_4[Fe(CN)_6]$ the number of unpaired electrons in iron are?
(a) 0
(b) 2
(c) 3
(d) 5

10. The tetrahedral complexes have coordination number
(a) 3
(b) 6
(c) 4
(d) 8

11. The spin only magnetic moment value (in Bohr magneton units) of $Cr(CO)_6$ is
(a) 0
(b) 2.84
(c) 4.90
(d) 5.92

12. Potassium ferrocyanide is an example of
(a) Tetrahedral
(b) Octahedral
(c) Square Planar
(d) Linear

13. In the complex compound K4[Ni(CN)4] oxidation state of nickel is?
(a) -1
(b) 0
(c) +1
(d) +2

14. The spin only formula (μs) for octahedral complexes is
a) $(4S(S+1))^{1/2}$
b) $(4S(S+1))^{1/2} + (L\ (L+1))^{1/2}$
c) $(L\ (L+1))^{1/2}$
d) L(L+1)

15. The selection rule for microwave spectroscopy is
a) $\Delta J = \pm 1$
b) $\Delta V = \pm 1$
c) $\Delta J = +1$
d) $\Delta V =$ **±2**.

16. The spin only magnetic moment value (in Bohr magneton units) of $Cr(CO)_6$ is
a) 0
b) 2.84
c) 4.90
d) 5.92

17. The number of unpaired electrons in d6 low spin octahedral complex is
a) 0
b) 1
c) 2
d) 3

18. The vibrational rotational spectrum is observedregion.
a) near IR
b) microwave region
c) visible region
d) radiofrequency region

19. The crystal field splitting energy for octahedral and tetrahedral complexes is related as
a) $\Delta t \approx 4/9\ \Delta o$
b) $\Delta t \approx 1/2\ \Delta o$
c) $\Delta o \approx 2\ \Delta t$
d) $\Delta o \approx 4/9\ \Delta t$

20. Among the ligands NH3, en, CN-and CO the correct order of their increasing field strength, is
(a) CO< NH3 <en< CN–
(b) NH3<en< CN–< CO
(c) CN–< NH3< CO<en
(d) en< CN–<NH3< CO

21. Which of the following octahedral complexes of Co (at. no.27) will be magnitude of Δoct be the highest?
(a) $[Co(CN)_6]^{3-}$
(b) $[Co(C_2O_4)_3]^{3-}$
(c) $[Co(H_2O)_6]^{3+}$
(d) $[Co(NH_3)_6]^{3+}$

22. The magnetic moment of $[Co(NH_3)_6]CI_3$ is
(a) 1.73
(b) 2.83
(c) 6.6
(d) Zero

23. The magnetic moment (spin only) of [NiCI4]2-is
(a) 1.82 BM
(b) 5.46 BM
(c) 2.82 BM
(d) 1.41 BM

24. The region of electromagnetic spectrum for nuclear magnetic resonance is
a) Microwave
b) Radio frequency
c) Infrared
d) UV-rays

25. Which of the following cannot show a vibrational absorption spectrum?
a) OCS
b) H_2O
c) CO_2
d) $CH_2 = C H_2$

26. Presence of functional group in a compound can be established by using
a) Chromatography
b) IR spectroscopy
c) Mass spectroscopy
d) X-ray diffraction

27. Which of the following molecules will not display an infrared spectrum?
a) CO2
b) N2
c) H2O
d) SO2

28. Which of the following compounds is frequently used as an internal reference in proton NMR spectroscopy?
a) TMS
b) TNS
c) DMF
d) DMSO

29. The electronic spectra lies within the region of _____
a) Infrared
b) Radio wave
c) Microwave
d) Ultraviolet or Visible

30.Which of the following molecule is not homonuclear?
a) H_2
b) N_2
c)NO
d)O_2

31.The CFSE for a high spin d^4 octahedral complex is
a)-0.6Δ_{oct}
b) -1.8Δ_{oct}
c) -1.6 Δ_{oct}+P
d) -1.2Δ_{oct}

32. Which of the following molecules is IR active?
a) H2
b) N2
c) O2
d) CO2

33.The allowed electronic transition of hydrogen atom
a) 3d-⟶1s
b) 2p -⟶1s
c) 2pz-⟶2py
d) 2py-⟶2px

34. What is the coordination number and oxidation state for the cobalt atom in the compound $[Co(NH_3)_5Cl]Cl2$?
a) 4; +2
b) 5 ; +2
c) 6 ; +2
d) 6 ;+3

35. Which of the following species will be diamagnetic?

a) $[Fe(CN)_6]^{4-}$
b) $[FeF_6]^{3+}$
c) $[Co(C_2O_4)_3]^{3-}$
d) $[CoF_6]^{3-}$

36. How many unpaired electrons are there in a strong field complex $[Co(NH_3)Cl_2]$?
a) Zero
b) One
c) Two
d) three

37. Which one of the following nuclei has a magnetic moment?
a)12C
b) 14N
c) 16O
d) 32S

38. $Co[(NH_3)_6]^{3+}$ ion is:
(a) Paramagnetic
(b) Diamagnetic
(c) Ferromagnetic
(d) Ferri magnetic

39. Which of the following molecules have infrared active vibrations?

a) NO

b) CH_4

c) H_2

d) N_2

40. The correct order of different types of energies is

a) Eel>>Evib>>Erot>> E tr

b) Eel>>Erot>>Evib>> E tr

c) Eel>>Evib>>Etr>> E rot

d) Etr>>Evib>>Erot>> E el

41. Which statement is incorrect about H_2O?

a) It has four degrees of vibrational freedom.

b) It is non-linear.

c) It undergoes symmetric and asymmetric stretching modes of vibration.

d) It has three IR active modes of vibration.

42. For which of the following molecules could a pure rotational spectrum not be observed in the gas phase?

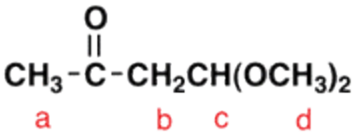
a) HCl

b) NO

c) N2

d) CO

43. Which of hydrogens a-d in the following molecule gives a triplet signal in a normal 1H NMR spectrum?



a) Hydrogen a

b) Hydrogen b

c) Hydrogen c

d) Hydrogen d

44. Out of the given vibrational modes which one does not belong to IR spectroscopy?

A. Stretching

B. Scissoring

C. Rocking

D. Rolling

45. Select the device used to separate the radiation of specific wavelength from wavelength of a continuous spectra?

A. Monochromator
B. Radiation source
C. Recorder
D. Processor

46. According to Beer's Law

A. absorbance is proportional to both the path length and concentration of the absorbing species
B. absorbance is proportional to the log of the concentration of the absorbing species
C. absorbance is equal to P0 / P
D. absorbance is equal to transmittance

47. Fine lines observed in atomic absorption spectra along with narrow brand with peaks are produced by

A. Electronic transition only
B. Vibrational transitions only
C. Rotational transitions only
D. Ro-vibrational transitions only

48. Which formula is correct for nuclear spins?

A. 2I
B. 2I-1
C. 2I+1
D. 4I

49. What is the wavelength of ultra-violet region?

A. 400 nm – 700 nm
B. 700 nm to 1000 nm
C. 400 nm to 1000 nm
D. 10 nm to 400 nm

50. Which one is correct?

A. Eel >Evib >Erot > E tr
B. E tr >Erot >Evib > Eel
C. Etr >Evib > Eel > E rot
D. Erot >Evib >Etr > E el

51. The nuclear magnetic resonance occurs in region of electromagnetic spectrum

A. Visible region
B. Radiowave region
C. Infrared region
D. UV region

52. Which of the region of IR spectra cannot be same for two compounds?
    A. Functional group region
    B. Fingerprint region
    C. Low-frequency region
    D. No specific region

53. Which of the following is not a type of bending molecular vibration?
    A. Scissoring
    B. Symmetric Stretching
    C. Wagging
    D. Rocking

54. Presence of a functional group in a compound is investigated by
    A. Chromatography
    B. IR spectroscopy
    C. X-ray photoelectron spectroscopy
    D. X-ray diffraction

55. Hydrogen bonding can be detected by
    A. IR
    B. UV
    C. XPS
    D. XRD

56. The absorption or emission of light can be analysed using _____
    A. Potentiometry
    B. Conductometry
    C. Spectroscopy
    D. Viscosity

57. The CFSE for a high spin d4 octahedral complex is:
    A. –0.6 Δoct
    B. –0.8 Δoct
    C. –0.4 Δoct
    D. –0.2 Δoct

58. $[Cr(CN)_6]^{3-}$ will be …… in nature:
    A. paramagnetic
    B. diamagnetic
    C. nonmagnetic
    D. uniform

59. The magnetic moment for $[Cr(CN)_6]^{3-}$ is approximately:

A. 3.87 μB
B. 4.87 μB
C. 2.87 μB
D. 1.87 μB

60. Which is correct according to ligands in spectrochemical series:

A. I– < Cl– < H2O <en
B. I– < Cl– < H2O = en
C. I– = Cl– < H2O <en
D. I– < Cl– = H2O <en

61. The electron acceptor in coordination complex is

A. Metal ion
B. ligand
C. p-orbital
D. s-orbital

62. Which metal ion have d3 electronic configuration in the following complexes?

A. [Cr(NH3)6]3+
B. [Co(OH2)6]2+
C. [Fe(CN)6]3-
D. [Ni(OH2)6]2+

63. From the following options, choose the heteronuclear diatomic molecules which are paramagnetic in nature?

A. HF and NO
B. HF and O_2
C. NO and O_2
D. Only NO

64. Which complex ion will be having tetrahedral geometry?

A. $[PdCl_4]^{2-}$
B. $[PtCl_4]^{2-}$
C. $[NiCl_4]^{2-}$
D. $[AuCl_4]^{2-}$

65. $[Co(NH_3)_6]^{3+}$is

A. Diamagnetic
B. paramagnetic
C. nonmagnetic
D. comagnetic

66. What is the coordination number of the metal in $[Co(en)_2Cl_2]^+$

A. 4
B. 5
C. 6
D. 3

67. Which of the following has square planar structure

A. $[NiCl_4]^{2-}$
B. $[Ni(CO)_4]$
C. $[Ni(CN)_4]^{2-}$
D. $MnCl_2$

68. Which of the following molecule have infrared active vibrations?

A. HCl
B. CH_4
C. H_2
D. N_2

69. Which rays have larger wavelengths?

A. Gamma rays
B. Beta rays
C. Microwave
D. Visible light

70. Which one of the following transitions of an electron in hydrogen atom emits radiation of the lowest wavelength?

A. n2=∞ to n1=2
B. n2=4 to n1=3
C. n2=2 to n1=1
D. n2=5 to n1=3

71. Which of the following is not an ambidentate ligand?

A. CN-
B. SCN-
C. NH_3
D. NO_2

MODULE -3

1.Which of the following is also known as X-ray photoelectron spectroscopy?

a. Auger electron spectroscopy
b. Electron impact spectroscopy
c. Electron spectroscopy for chemical analysis
d. Secondary ion mass spectroscopy

2. Which of the following methods use soft X-rays to eject electrons from inner shell orbitals?

a. Auger electron spectroscopy
b. Electron impact spectroscopy
c. X-ray crystallography
d. X-ray photoelectron spectroscopy

3. The energy required to remove an electron from the highest occupied atomic orbital is known as _____

a. Ionization energy
b. Kinetic energy
c. Binding energy
d. Vibrational energy

4.X-ray diffractometers are not used to identify the physical properties of which of the following?

a. Metals
b. Liquids
c. Polymeric materials
d. Solids

5. The Bragg's equation for diffraction of X-rays is _____

a. $n\lambda = 2d^2\sin\theta$
b. $n\lambda = 2d\sin\theta$
c. $n\lambda = 2d\sin^2\theta$
d. $n\lambda = d^2\sin\theta$

6. Obtain a Miller indices of a plane whose intercepts are 4, 4 and 2 units along the three axes.

a. (122)
b. (211)
c. (121)
d. (112)

7.The size of Mo is very similar to W due to_____

a. Shielding effect
b. Actinide contraction
c. Poor Shielding by 4f electrons
d. Poor shielding by 4d electrons

8.Choose the correct order ionization energy

a. N > O > F
b. F > O > N
c. N > O < F
d. O > F > N

9.Choose the incorrect order with respect to the properties indicated

a. Electro negativity F >Cl> Br
b. Electron affinity Cl> F > Br
c. Oxidizing power F2> Cl2> Br2
d. Bond enthalpy F2> Cl2> Br2

10. Choose the correct statement

a. As shielding effect increases electro negativity decreases
b. As shielding effect increases electro negativity increases
c. As ionization potential increases metallic property increases
d. As +ve charge on species increases ionic radii increases

11. Choose the correct statement with respect to oxidising property of F

a. It is the strongest oxidising agent because it has highest electron gain enthalpy
b. It is the strongest oxidising agent due to its small size
c. It is the strongest oxidising agent because it has maximum electron negativity
d. It is the strongest oxidising agent due to high lattice enthalpy.

12. In a period with increase in atomic number, the metallic character of an element

a. Decrease across period increases in group
b. increase across period& decreases in group
c. increase across period& increases in group
d. Decrease across period and decreases in group

13. Which of the following species has the highest ionization potential?

a. Li^+
b. Mg^+
c. Al^+
d. Ne

14.. The source for XPS is ----------

a. Mercury- arc
b. Nernst glower
c. Globar source
d. AlKα

15. Compute the miller indices for the intercepts X 1/4, Y=1 and Z=1/2

a. **(412)**
b. (632)
c. (101)
d. (110)

16. The correction factor for modified Van der Waals equation of state is

a. a/b
b. a/V^2
c. a/V
d. V-nb

17. The second ionisation energy is always higher than the first ionization energy because
the

a. electron is attracted more by the core electrons
b. electron is more tightly bound to the nucleus in an ion
c. becomes more stable attaining the octet or duplet configuration
d. atomic radii is large

18. In XPS, the primary and secondary beams consist of

a. X-ray photon, electron
b. electrons, X-ray photon
c. electrons, electrons
d. UV-photons, electrons

19. Repeatable entity of a crystal structure is known as

a. crystal
b. Lattice
c. unit cell
d. miller indices

20.If the angle of incidence is 30°, then the wavelength for first-order spectrum is equal to _____

a. **d**
b. 2d
c. d/2
d. d/3

21.The most electronegative element possesses the electronic configuration?

a. $ns^2\ np^2$
b. $ns^2\ np^4$
c. $ns^2\ np^5$
d. $ns^2\ np^3$

22. Minimum interplanar spacing required for Bragg's diffraction is _____

a. λ/4
b. λ/2
c. 4λ
d. 2λ

23.The first, 2nd and 3rd ionization enthalpies of gallium are 579KJmol^{-1}, 1979 KJmol1and 2962 KJmol–1even though the 3rd I.P is highest, Ga^{3+} is the most stable because

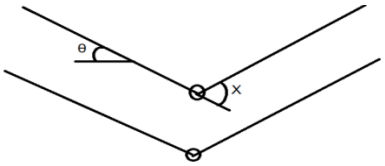
a. The energy loss is maximum resulting greater stability
b. The size of Ga^{3+} is smallest
c. Ga^{3+} is most reactive
d. It attains a stable configuration

24.The co-ordination number and oxidation number of X in $[X(SO_4)(NH_3)_5]Cl$ is

a. 10 and 3
b. 2 and 6
c. 6 and 3
d. 6 and 4

25.If the angle of incidence is 30°, then the wavelength for first-order spectrum is equal to _____

a) d
b) 2d
c) d/2
d) d/3



26.What should be the value of X?

a) θ
b) θ/2
c) 2θ
d) θ/3

27. X-ray photoelectron spectroscopy is also known as

A. EPS
B. ECS
C. ESCA
D. EAS

28. Which energy is responsible to release the electron in XPS?

A. rotational energy
B. gibbs energy
C. binding energy
D. free energy

29. In XPS, the photon ejects electrons from which orbital?

A. 1s electron
B. 3s electron
C. 2s electron
D. 2p electron

30. In Bragg's equation [$n\lambda = 2.d.\sin\theta$], d is the:

A. interplanar spacing
B. inter spacing
C. planar spacing
D. extraplanar spacing

31. Which bond is weaker?

A. van der Waals bond
B. sigma bond
C. coordination bond
D. Ionic bond

32. Particles those are responsible for most of the properties

A. Nucleons
B. Protons
C. Shell electrons
D. Valence shell electrons

33. Which is correct?

A. $d \sin\theta = n\lambda$
B. $d = n\lambda\sin\theta$
C. $d = n\lambda\sin\theta$
D. $2d \sin\theta = n\lambda$

34. Which of the following elements has completely filled two shells?
A. Ni
B. Ne
C. Na
D. No

35. Electronic configuration 2,8 is related to
A. Al+
B. Al+2
C. Al+3
D. Al+4

36. Periodic table gives a platform for studying
A. physical properties only
B. chemical properties only
C. not any property
D. physical and chemical properties both

37. The nature of bond between two dissimilar atoms having different charges
A. polar only
B. non-polar only
C. polar and non-polar both
D. neutral

38.The geometry of [PtCl4]2- is
A. tetrahedral
B. octahedral
C. square planar
D. pyramidal

39. Miller indices is indicated by
A. (hkl)
B. (h,k,l)
C. [h,k,l]
D. {h,k,l}

40. What is the value of average kinetic energy per molecule _____.

A. (3/2)kT
B. (3/2) RT
C. (½)kT
D. (1/2) RT

41. Which one has the highest value of first ionisation energy _____.
A. Hydrogen
B. Helium
C. Lithium
D. Sodium

42. Choose the correct option regarding the formation of a chemical bond _____.
A. Energy is always absorbed
B. Energy in always released
C. More energy is released than is absorbed
D. Energy is neither released nor absorbed

43. The correct statement about the atomic of the alkaline earth metals is _____.
A. it is smaller than corresponding alkali metals in the same periods
B. it is larger than corresponding alkali metals in the same periods
C. It is same as the corresponding alkali metals in the same periods
D. None of the above

44. The general electronic configuration of outermost orbital in the elements of Group 13 is _____.
A. ns2 np2
B. ns2
C. ns2 np1
D. ns2 np3

45. The correct statement about the variation of electronegativity in a group of the periodic table
A. It increases
B. It decreases
C. It remains constant
D. All of the above

46.The correct reason for the increase in the electronegativity across a period in periodic table
A. attraction between the valence electrons and the nucleus increases
B. attraction between the valence electrons and the nucleus decreases
C. increase in the atomic weight
D. decrease in the atomic weight

47. What is the reason for variable valency of transition metals

A. Release of electrons from ns orbitals
B. Release of electrons from np orbitals
C. Release of electrons from (n-1)d orbitals
D. Release of electrons from (n-1)d& ns orbitals

48. Which of the following outer electronic configurations is characteristic of alkali metals
A. ns^1
B. ns^2
C. ns^2np^6
D. ns^2np^2

49. Group 2 elements are
A. oxidizing agents
B. reducing agents
C. oxidizing as well reducing agents
D. microbial agents

50. Paramagnetism is common in
A. p- block elements
B. d- block elements
C. s- block elements
D. f- block elements

51. d- block elements form coloured ions because
A. They absorb some energy for d – s transition
B. They absorb some energy for p – d transition
C. They absorb some energy for d – d transition
D. They do not absorb any energy

52. Which of the following elements involves gradual filling of 5f level
A. Lanthanides
B. Actinides
C. Transition metals
D. Coinage metals

53. The hardness of water is measure by
A. EDTA method
B. Distillation method
C. Conductivity method
D. Viscosity method

54.Which method is used in XRD?

A. Lawe method
B. Leue method
C. Liue method
D. Laue method

55. Which one is having largest atomic radii?
A. Oxygen
B. Nitrogen
C. Fluorine
D. Lithium

56. Bond angle in PCl_5 molecule are _____
A. 120^0 and 60^0
B. 120^0 and 90^0
C. 120^0 and 180^0
D. None of these

57. Shape of H_2O molecule is _____
A. Tigonal Planar
B. Linear
C. Angular or bent structure
D. Tetrahedral

58.Which dissolves in water according to Fajans rule?
A. silver fluoride
B. silver fluoride
C. silver bromide
D. silver iodide

59. Ion etching technique provides the …….. from the surface.
A. depth profiling
B. round profiling
C. vertical profiling
D. horizontal profiling

60 X-ray diffractometers cannotanalyse ……
A. Metals
B. Liquids
C. Polymers
D. Solids

61. XRD can be used to analyze the samples ……..

A. quantitatively
B. qualitatively
C. quantitatively and qualitatively both
D. Either quantitatively or qualitatively

62. The reason for greater strength of diamond as compared to graphite is _____.
A. Difference in layers of atoms
B. Tetrahedral structure of diamond
C. Difference of crystalline structures
D. Lusture of diamond

63. Polythene is industrially manufactured from _____.
A. Methane
B. Styrene
C. Acetylene
D. Ethylene

64. The correct statement about methane is _____.
1. The largest reservoir of methane on earth is under the permafrost at arctic and Antarctic
2. Methane has a tetrahedral structure and known as Hydrogen Carbide
3. Methane can be produced by Serpentinite method
Select the correct option from codes given below:
A. Only 1 & 2
B. Only 1 & 3
C. Only 2 & 3
D. 1, 2 & 3

MODULE -4

1. Select the incorrectstatement from the following option?
   a) Racemic modification is an equimolar mixture of dextrorotatory and levorotatory isomers
   b) Meso compounds contains more than one chiral carbon centre
   c) Meso compounds are externally compensated
   d) Racemic mixture is designated as dl-pair
2. How many optical isomers are possible in a compound with one chiral carbon?
   a) 5
   b) 4
   c) 2
   d) 3
3. Which of the following compounds would show optical isomerism?
   a) CH_3 – CH(OH) COOH
   b) H_2N $CH(CH_3)_2$
   c) $(CH_3)_2$ CHCHO
   d) H_2N CH_2 COOH
4. The number of configurational isomers of molecules having (n) different chiral carbons is?
   a) 2^n
   b) 2n
   c) 2n-1
   d) 2n+1
5. The number of racemic forms of molecules having (n) different chiral carbons is?
   a) 2n
   b) 2^n
   c) 2^{n-1}
   d) 2^{n+1}
6. For a molecule with two like chiral carbon atoms, the number of optically inactive form is?
   a) 1
   b) 2
   c) 3
   d) 4
7. For a molecule with two like chiral carbon atoms, the number of optically active form is?
   a) 4
   b) 3
   c) 1
   d) 2
8. Find the number of stereoisomers for CH_3 – CHOH – CH = CH – CH_3?[E]
   a) 1
   b) 2
   c) 3
   d) 4

9.Chiral molecules are those whichare

a. Shows geometricalisomerism
b. Superimposable on their mirrorimages
c. Not superimposable on their mirrorimages
d. Unstablemolecules

10.Which of the following is not an example of chiralobject?

a. Cylindricalhelix
b. Squarebox
c. Sandal orshoe
d. Glove

11.Chiral molecules which are non-super-imposable mirror images of each otherare called

a. Diastereomers
b. Mesocompounds
c. Racemicmixture
d. Enantiomers

12. Select the correct statement from the followingoption

a. Enantiomer rotate plane of polarised light in opposite direction and to different extent
b. Enantiomer rotate plane of polarised light in same direction but to different extent
c. Enantiomer rotate plane of polarised light in same direction and to same extent
d. Enantiomer rotate plane of polarised light in opposite direction but to same extent

13.The plane which divides the molecule into two equal parts so that each half isthe mirror image of other half iscalled -----.

a. Centre ofsymmetry
b. Plane ofsymmetry
c. Axis of symmetry
d. Angle ofsymmetry

14.When a molecule has a plane of symmetry, it willbe_____

a. Opticallyinactive
b. Opticallyactive
c.Both optically active and optically inactive
d. Enantiomer

15.Diastereomers are

a. Geometricalisomers
b. Mirrorimages
c. Non-mirrorimages
d.Unstablemolecules

16.Which of the following is not a priority rule for R,S-Configuration?

a. If the four atoms attached to the chiral centre are all different, priority depends on atomic number, with the atom of lower atomic numbers getting lowerpriority.

b. If the two atoms attached to chiral centre are same, the atoms attached to each of these first atoms are compared.

c. When there is a double bond or triple bond, both atoms are considered to be duplicated or triplicated.

d. If the four atoms attached to the chiral centre are all different, priority depends on atomic number, with the atom of higher atomic numbersgetting lower priority.

17.Passivity on a metal is dueto

(a) Higher EMF

b) Lower EMF

c) Oxide film formation

d) stability

18.The process of gaining of electrons by metal ions with discharge of metal iscalled _____

a) **De-electronation**

b) Electronation

c) Reduction

d) Cathode

19.The anode of the galvanic cellhas_____

a) Positivepolarity

b) Negativepolarity

c) Nopolarity

d) Neutral

20.According to the convention, the Daniel cell is representedas_____

a) Zn l $ZnSO_4$ll $CuSO_4$ l Cu, E = 1.09volt

b) Zn l $ZnSO_4$ll Cu l $CuSO_4$, E = 1.09volt

c) $ZnSO_4$ l Zn ll $CuSO_4$ l Cu, E = 1.09volt

d) Zn l ZnSll $CuSO_4$ l Cu, E = 1.09volt

21.Decrease in free energy can be given by-ΔG= _____

a) nFE

b) n/FE

c) nF/E

d) F/nE

22. Generally, electrode potential refersto _____

a) Reduction potential

b) Oxidationpotential

c) Electronpotential

d) Cannot bedetermined

23.The following are state functionsEXCEPT

a) H – enthalpy

b) q – heat

c) E – internal energy

d) S – entropy

24.Gibbs function G is givenby

a) H-TS

b) U+PV

c) E+PV

d) U-TS

25.Which of the following is the correctequation?

a) $E = E^o [(2.303RT)/nF] \log_{10}[H^+]$.

b) $E = E^o+[(2.303RT)/nF] \log_{10} [H^+]$.

c) $E = E^o – [(2.303RT)/nF] \log_{10} [H^+]$.

d) $E = E^o/ [(2.303RT)/nF] \log_{10} [H^+]$.

26. If the standard hydrogen electrode is used as the reduction electrode, then the emf is givenby _____

a) $E_{red} = -E^o + (5/n) \log_{10} [H^+]$.

b) $E_{red} = -E^o – (0.0591/n) \log_{10} [H^+]$.

c) $E_{red} = E^o + (0.0591/n) \log_{10} [H^+]$.

d) $E_{red} = E^o -(0.0591/n) \log_{10} [H^+]$.

27. is the device used to measure the emf of thecell.

a) Voltmeter

b) Potentiometer

c) Ammeter

d) Multimeter

28.In corrosion, as a result of decay, the metals are not convertedinto

a) Oxides

b) Hydroxides

c) Carbonates

d) Peroxides

29.Iron undergoes corrosiontoproduce_____coloured hydrated ferricoxide

a) Red

b) Brown

c) Green

d) Blue

30.The rusting iron of Iron is_____

a) Oxidation corrosion

b) Liquid metalcorrosion

c) **Wetcorrosion**

d) Corrosion by othergases

31.MoO layer is ----- layer that leads to corrosion.

a) Stable

b) Unstable

c) Volatile

d) Porous

32. Helmholtz free energy A is expressedas

a) A=U+TS

b)A=H+TS

c) A=U-TS

d)A=H-TS

33. In a reversible process $\Delta_{sys} + \Delta_{surr}$ is

a. > 0

b. < 0

c. ≥0

d)=0

34. Identify the hard acid from thefollowing:

a) $AlCl_3$

b)N_2H_4

c) H_2O

d) $OH^{(-)}$

35.Entropy change for a spontaneous processis

a) (-) ve

b) (+) ve

c) 0

d) Both a and b

36. In a reversible process, entropy of thesystem

a) increases

b) decreases

c) zero

d) remainsconstant

37.The name of the equation showing relation between electrode potential, standard potential (E^o) and concentration of ions in solution is

a) Kohlrausch equation

b) **Nernst equation**

c) Faradays equation

d) Ohm'sequation

38.Corrosion of metals involves

a) Physical reaction

b) Chemical reaction

c) Both a and b

d)Only A

39. A centre of symmetry isequivalenttofold alternating axis of symmetry.

a) One

b) Two

c) Three

d) Four

40. Select the **incorrect** statement from the followingoption.

a) The physical properties of enantiomers areidentical

b) In symmetrical environment, the chemical properties of enantiomersare identical

c)The enantiomers react at same rate and form products in same amounts in asymmetricalenvironment

d) Enantiomers have different solubility in same chiralsolvent

41.A plane of symmetry is equivalent to ---------- fold alternating axis of symmetry.

a) One

b) Two

c) Three

d) Four

42. If our eyes travel in counter clockwise direction from the ligand of highestpriority to the ligand of lowest priority, the configurationis

a) R-Configuration

b) S-Configuration

c) E-Configuration

d) C-Configuration

43.According to the Cahn Ingold Prelog selection rules, the decreasing orderof preferenceis

a) $-NH_2$> $-C_6H_5$> $-CH(CH_3)_2$> -H

b) $-CH(CH_3)_2$> $-C_6H_5$> -H>$-NH_2$

c) $-NH_2$> $-CH(CH_3)_2$> $-C_6H_5$>-H

d) $-C_6H_5$> $-CH(CH_3)_2$>$-NH_2$> -H

44. A spontaneousprocess

a) Is reversible.

b) **Is irreversible**.

c) May be reversible or irreversible depending on whether equilibriumis maintained throughout theprocess.

d) May be reversible or irreversible depending on the value ofΔS.

45.When heat is added to a pureliquid

a. the temperature increases and the entropy isunchanged.

b. the temperature increases and the entropyincreases.

c. the temperature increases and the entropydecreases.

d. the temperature is unchanged and the entropyincreases.

46. Which statement is **incorrect**?

(a) Atconstantpressure,$\Delta H=\Delta E+ P\Delta V$

(b) The thermodynamic symbol for entropy isS.

(c) Gibbs free energy is a statefunction.

d) For an endothermic process, ΔH isnegative.

47. For the reduction of silver ions with copper metal the standard cell potential was found to be +0.46V at 25º C. The value of standard Gibbs energy, $\Delta G^º$ will be (F = 96500 C mol^{-1}) ------.

a. -44.5KJ

b. -98.0KJ

c. -89.0KJ

d. -89.0J

48.The Helmholtz function F is givenby

a) U-TS

b) U+TS

c) -U-TS

d) -U+TS

49. In Pourbaix diagram the redox reaction, $Fe^{2+} + 2e^{-} \rightarrow Fe_{(s)}$ is

a) pH dependent

b) pH independent

c) solvent dependent

d) solvent independent

50. Anhydrous inorganic liquid metal surface in absence of moisture undergoes _____

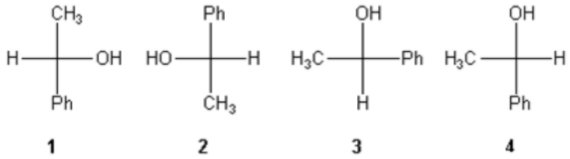
a) Wet corrosion

b) Dry corrosion

c) Galvanic corrosion

d) Pitting corrosion

51. Which of the following Fischer projections is different from the other three?



a. 1

b. 2

c. 3

d. 4

52. The entropy of an isolated system always _____ and reaches _____ when equilibrium is reached.

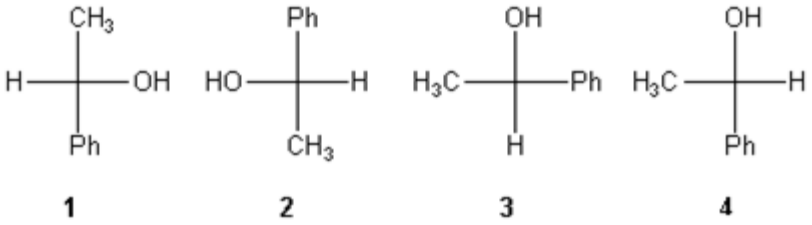
a) remains constant, maximum

b) decreases, minimum

c) increases, maximum

d) decreases, constant

53. Which of the following Fischer projections is different from the other three?



a) 1

b) 2

c) 3

d) 4

54. Stereoisomerism is the study of ……. of the molecules

A. 3D orientation
B. 2Dorientation
C. 1D orientation
D. No orientation

55. The isomers which are having same molecular formula, but different configurations are called as

A. Structural isomers
B. Stereoisomers
C. positional isomers
D. tautomers

56. Geometric isomers are different from

A. Enantiomer
B. diastereomer
C. Both
D. non-mirror images

57. Enantiomerare not

A. Mirror image only
B. achiral
C. superimposable mirror images
D. non-specific images

58.Joule/Kelvin is unit of

A. energy
B. entropy
C. emf
D. power

59. ……is a measure of randomness of a system.

A. entropy
B. internal energy
C. heat flow
D. enthalpy

60. Which one of the following thermodynamic quantities is a state function?

A. Gibbs free energy
B. temperature
C. power
D. work

61. The correct equation is

A. $\Delta G = nF/E$
B. $\Delta G = n/FE$
C. $\Delta G = - nFE$
D. $\Delta G = F/nE$

62. Which of the following statement is correct about galvanic cell?
A. oxidation takes place at the cathode
B. reduction takes place at the cathode
C. reduction takes place at the anode
D. anode is negatively charged

63. Wet corrosion takes place on
A. anode
B. cathode
C. near cathode
D. near anode

64. Wet corrosion products are formed on
A. anode
B. cathode
C. conducting medium
D. near anode

65. Dry corrosion products are formed on
A. anode
B. cathode
C. conducting medium
D. near cathode

66.The rate of dry corrosion is ……than wet corrosion
A. lower
B. faster
C. average
D. moderate

67. Passivation is due to formation of
A. higher EMF
B. lower EMF
C. metal oxide layer on metal
D. electrode potential

68.Total energy of a system remains constant according to

A. first law of thermodynamics
B. second law of thermodynamics
C. third law of thermodynamics
D. newton's law

69. $E = E^{o} - [(2.303RT)/nF] \log_{10} [H+]$ is the formula of ……
A. Nernst equation
B. Newton equation
C. Gibbs equation
D. Free energy equation

70. Which is used to differentiate d- and l-isomers?
A. heat
B. temperature
C. polarized light
D. pressure

71. An equal proportion of two enantiomers is called as a _____
A. cis/trans mixture
B. mirror image
C. constitutional mixture
D. racemic mixture

72. Which of the following properties is most likely to be retained during the process of corrosion?
A. Malleability
B. Ductility
C. Conductivity
D. Colour

73. The reason for conductivity of electrolytic conductors is _____
A. Flow of free mobile electrons
B. Movement of ions
C. Either movement of electrons or ions
D. Cannot be said

74. Which corrosion product is volatile in nature _____.
A. Fe_2O_3
B. MoO_3
C. Fe_3O_4
D. FeO

75. The area in which electrochemical corrosion takes place is

A. Anodic area
B. Cathodic area
C. Near cathode
D. Near anode

76. In anodic reaction of corrosion metal is dissolved by releasing _____.
A. Pair of electrons
B. Free electron
C. Ions
D. Current in electrolytic solution.

77.The green film of formed on the surface during corrosion of Cu contains $CuCO_3$ and _____.
A. $BaCO_3$
B. $Ba(OH)_2$
C. $Cu(OH)_2$
D. CuO

78. The low solubility of beryllium sulphate in water is due to _____.
A. High inflammable energy
B. Low Energy of dissociation
C. Low inflammable energy
D. Ionic bond

79. The correct statement about cell potential is _____.
A. sum of the electrode potentials of the cathode and anode
B. difference between the electrode potentials of the cathode and anode
C. half of the sum of the electrode potentials of the cathode and anode
D. twice the difference between the electrode potentials of the cathode and anode

80. The enthalpy change in an exothermic reaction is shown with
A. negative values
B. positive values
C. neutral
D. constant

81. The incorrect statement about entropy is
A. S(monoclinic) > S(rhombic)
B. C(diamond) > C(graphite)
C. $H_2O(g) > H_2O(l)$
D. $O_3(g) > O_2(g)$

82. The Gibbs free energy change in a spontaneous process is equal to the

A. heat content of the system
B. entropy changes of the system
C. work of expansion
D. useful work

83. Which of the following is a state function?
A. q
B. w
C. q_{rev}/T
D. qw

84. Which statement is incorrect?
A. At constant pressure, $\Delta H = \Delta E + P\Delta V$
B. The thermodynamic symbol for enthalpy is H.
C. Gibbs free energy is a state function.
D. For an endothermic process, ΔH is not positive.

85. The purpose of the salt bridge in an electrochemical cell is to _____.
A. increase electrons
B. maintain electrical neutrality
C. decrease electrons
D. decrease electrical neutrality

86. As per the HSAB principle ionic bond is formed when
A. soft acid combines with hard bases
B. hard acid combines with soft bases
C. hard acid combines with hard bases
D. hydrogen combination with acid

87. Which …… nomenclature not used to differentiate enantiomers.
A. R/S
B. E/Z
C. +/–
D. D/L

88. $Fe_2O_3.xH_2O$ is chemical formula for
A. iron catalyst
B. iron metal
C. hydroxyapatite
D. rust

89. Which isomers are not separable from their mixture by any physical method of separation?

1. Enantiomers
2. Conformational isomers
3. Geometrical isomers
4. Functional isomers

A. only I and 2 correct
B. only IV
C. I, II, III, IV
D. only 2,3

MODULE-5

1.The infinity of intermediate conformations are called?
a) Skew conformations
b) Staggered conformations
c) Eclipsed conformations
d) Gauche

2. The potential energy of n-butane is minimum for?
a) Skew conformations
b) Staggered conformations
c) Eclipsed conformations
d) Gauche

3. The potential energy of n-butane is maximum for?
a) Skew conformations
b) Staggered conformations
c) Eclipsed conformations
d) Gauche

4.The relative instability of any of the intermediate skew conformations is due to?
a) Lateral strain
b) Shear strain
c) Longitudinal strain
d) Torsional strain

5.In gauche conformations, the methyl groups are?
a) 60^0 apart
b) 90^0 apart
c) 180^0 apart
d) 360^0 apart

6. Which of the following is least stable?
a) Anti conformation

b) Gauche conformation
c) Staggered conformation
d) Eclipsed conformation

7.When the nucleophile: OR attacks the RX, the resultant product will be?
a) R – OH
b) ROR
c) R:CN
d) RNHR

8.Which step in S_N1 reaction is a slow rate determining step?
a) Attack of nucleophile
b) Formation of racemic mixture
c) Formation of transition state
d) Both a and b

9.Which of the following act as electrophile in halogenation?
a) Nitronium ion
b) Sulphonium ion
c) Halonium ion
d) Acylium ion

10.Which of the following is an initiator molecule in the free radical polymerisation?
a) Benzoyl peroxide
b) Sulphuric acid
c) Potassium permanganate
d) Chromium oxide

11.Aldehydes and ketones are formed from
a) the dehydration of alcohols
b) the oxidation of alcohols.
c) the addition of nucleophiles to alkenes
d) the elimination of alcohols

12.Losing of small molecule from original organic molecule is------
a) Elimination reaction
b) Substitution reaction
c) Addition reaction
d) Both A and D

13. In a free radical reaction, free radicals are formed at----.
a) Initiation step

b) propagation step
c) termination step
d) both a and b

14. An acceptor of pair of electrons is termed as?
a) Nucleophile
b) electrophile
c) carbocation
d)Anion

15.Drugs that are used to diagnose, cure and prevent disease are called?
a) pharmaceutical drugs
b) addictive drugs
c) industrial drugs
d) single cell drugs

16.Which of the following would exhibit co-ordination isomerism?
a)**$[Cr(NH_3)_6][Co(CN)_6]$**
b) $[Co(en)_2Cl_2]$
c) $[Cr(NH_3)_6]Cl_3$
d) $[Cr(en)_2Cl_2]^+$

17. Exchange of co-ordination group by a water molecule in complex molecule results in ----
(a) Ionization isomerism
(b) Ligand isomerism
(c) Hydration isomerism
(d) Geometrical isomerism

18.Which would exhibit co-ordination isomerism?

a) **$[Cr\ (NH_3)_6)]\ [Co\ (CN)_6]$**
b) $[Co(en)_2Cl_2]$
c) $[Cr(NH_3)_6]Cl_3$
d) $[Cr(en)_2Cl_2]$

19.Nucleophilic substitution near takes place when halogeno alkanes is added with aq. solution of
a) Sodium Chloride
b) Sodium Manganate
c) Sodium Hydroxide
d) Sodium chlorate

20.Identify reducing agent the following

a) OSO_4

b) PCC
c) **$LiAlH_4$**
d) $K_2Cr_2O_7$

21.Which of the following compounds will exhibit cis-transisomerism?
a) 2-butene
b) 2-butyne
c) 2-butanol
d) Butanal

22.The isomers which can be inter converted through rotation around a single bond are:
a. conformers
b. diastereomers
c. enantiomers
d. positionalisomers

23. A low concentration of nucleophile favours the
a) S_N2 mechanism
b) S_N1 mechanism
c) Both a and b
d) E1 mechanism

24.Which of the following is rate determining step in electrophilic substitution reaction?
a) Generation of electrophile
b) Attack by an electrophilic reagent on benzene ring
c) Formation of product
d) both a and c

25. Which of the following is an example of optically active compounds without chirality?
a) Tartaric acid
b) Sulfonium salt
c) Diphenic acid
d) Glyceraldehyde

26. Which of the following is not an optically active compound?
a) 1,7- Dicarboxylic Spiro Cycloheptane
b) 1,3- Diphenylpropadiene
c) Meso-tartaric acid
d) Glyceraldehyde

27. What type of reaction takes place upon treatment of a ketone with HCN to form a cyanohydrin?
a) Nucleophilic addition
b) Nucleophilic substitution

c) Electrophilic addition
d) Electrophilic substitution

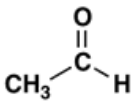
28.Identify the compound with the highest ring strain
a) Cyclomethane
b) Cyclopropane
c) Cyclobutane
d) Cyclopentane

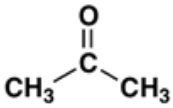
29. $[Co(NH_3)_5NO_2]Cl_2$ and $[Co(NH_3)_5(ONO)]Cl_2$ are related to each other as?
a) Geometrical isomers
b) Optical isomers
c) Linkage isomers
d) Coordination isomers

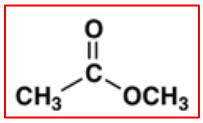
30.The dehydration of alcohols is an example of _____

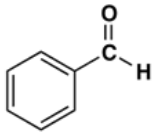
a) Bimolecular elimination/E2 reaction
b) SN2 reaction
c) SN1 reaction
d) Unimolecular elimination/E1 reaction

31.Which is unreactive in hydride reduction with $NaBH_4$?

a) 

b) 

c) 

d) 

32.The major product formed in the reaction of  with HI is

a) $CH_3\text{-}CH_2\text{-}CH_2\text{-}CH(I)\text{-}$

b) CH_3-CH-CH_2-CH_2

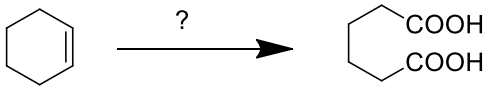
CH_3

c) CH_3- CH_2 - C-CH_3

CH_3

d) CH_3-CH_2-CH=CH_2 + CH_3I

33.The most suitable reagent for the following transformation is



a) $KMnO_4$
b) OsO4
c) K2Cr2O7
d) PCC

34. $[Co(NH_3)_6][Cr(C_2O_4)_3]$ and $[Cr(NH_3)_6][Co(C_2O_4)_3]$ is an example for
a) Coordination isomerism
b) Ionisation isomerism
c) hydrate isomerism
d) linkage isomerism

35.The ionisation isomer of $[Cr(H_2O)_4Cl(NO_2)Cl]$ is
a)$[Cr(H_2O)_4(O_2N)]Cl_2$
a) $[Cr(H_2O)_4Cl_2](NO_2)$
b) $[Cr(H_2O)_4Cl(ONO)Cl$
c) $[Cr(H_2O)_4Cl_2(NO_2)]$ H_2O

36. The ionisation isomer of $[Cr(H_2O)_4Cl(NO_2)C]$ is
a) $[Cr(H_2O)_4(O_2N)]Cl_2$
b) $[Cr(H_2O)_4Cl_2](NO_2)$
c) $[Cr(H_2O)_4Cl(ONO)Cl$
d) $[Cr(H_2O)_4Cl_2(NO_2)]$ H_2O

37. Draw a Newman projection of butane (C4H10) viewed along the central C–C bond and showing the lowest energy conformation. One of the following statements describes the diagram provided it is drawn correctly. Which statement is correct?
a. The Newman projection shows two methyl groups mutually eclipsed.

b. The Newman projection shows a methyl group and an H atom mutually staggered.

c. The Newman projection shows a methyl group and an H atom mutually eclipsed.

d. The Newman projection shows two methyl groups mutually staggered.

38.Which among the following is the strongest oxidising agent?

a) H_2O_2

b) O_3

c) $K_2Cr_2O_7$

d) $KMnO_4$

39.Which is unreactive in hydride reduction with $NaBH_4$?

a) CH_3CHO

b) CH_3COCH_3

c) CH_3COOCH_3

d) CH_4

40.What is the other name for the intra-molecular Claisen condensation?

a) Perkin condensation

b) Stobbe condensation

c) Knoevenagel condensation

d) Dieckmann condensation

41.Cyclopropane with bromine in the presence of UV light undergoes— reaction ?

a) Addition

b) Substitution

c) Redox

d) Elimination

42.Identify the compound with the highest ring strain?

a) Cyclomethane

b) Cyclopropane

c) Cyclobutane

d) Cyclopentane

43.The dehydration of alcohols is an example of _____

a) Bimolecular elimination/E2 reaction

b) SN2 reaction

c) SN1 reaction

d) Uni-molecular elimination/E1 reaction

44. What's the indication for acetaminophen?

a) Mild to moderate pain

b) Fever

c) Nausea

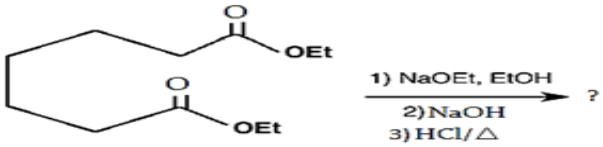
d) Allergic reaction

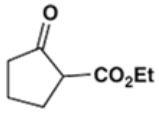
45.Draw a Newman projection of butane (C_4H_{10}) viewed along the central C–C bond and showing the lowest energy conformation. One of the following statements describes the diagram, provided it is drawn correctly. Which statement is correct?

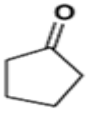
a) The Newman projection shows two methyl groups mutually eclipsed.
b) The Newman projection shows a methyl group and an H atom mutually staggered.
c) The Newman projection shows a methyl group and an H atom mutually eclipsed.

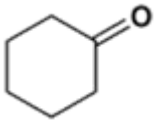
d) The Newman projection shows two methyl groups mutually staggered.

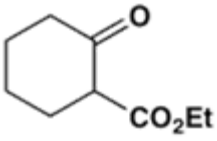
46.What will be the product of the following intramolecular Claisen condensation?



a) 

b) 

c) 

d) 

47. What is a common brand name for acetaminophen?

a) Aspirin
b) Panadol
c) Thyroxin
d) Neurobion

48. Cardiovascular effects can be prevented or treated [if the patients already had a heart attack or stroke] only by taking

a) Ibubruphen
b) Acetaminophen
c) Ketoprofen
d) Acetylsalicylic acid

49.Which cyclic compound feels highest ring strain

A. Cyclomethane
B. Cyclopropane
C. Cyclohexane
D. Cyclopentane

50. Which of the following is used in the sulphonation of benzene?

A. sulphuric acid
B. nitric acid
C. phosphoric acid
D. acetic acid

51. Antipyretics are used to

A. reduce body temperature
B. reduce vomiting
C. reduce nausea
D. increase body temperature

52. Analgesics are used to

A. reduce pain
B. reduce nausea
C. increase ache
D. increase pain

53. Which statement about aspirin is false.

A. Aspirin belongs to narcotic analgesics.
B. It is effective in relieving pain.
C. It has antiblood clotting action.
D. It is a neurologically active drug.

54. Which is most reactive species?

A. free radical
B. nucleophile
C. electrophile
D. cation

55. Which is electron deficient species?

A. free radical
B. nucleophile
C. electrophile
D. anion

56. The chemical formula of aspirin is

A. Methoxy benzoic acid
B. Methyl Salicilate

C. Acetyl Salicillc acid
D. Phenyl Salicilate

57.The most stable free radical among the following is
A. $C_6H_5CH_2CH_2$
B. $C_6H_5CHCH_3$
C. CH_3CH_2
D. CH_3CHCH_3

58.Geometrical Isomerism is shown by
A. CH_2=C(Br)I
B. **CH_3CH=C(Br)I**
C. $(CH_3)_2$C=C(Cl)Br
D. CH_3CH=CCl_2

59. $KMnO_4$ acts as an oxidizing agent in
A. Acidic medium only
B. Neutral and acidic medium
C. Neutral and alkaline medium
D. Neutral, acidic and alkaline medium

60.The drugs used to get relief from pain are called
A. Antipyretics
B. Analgesics
C. Antibiotics
D. Antiseptics

61.The chemical extracted from the plant Rauwolfia serpentine is
A. Aspirin
B. Quinine
C. Bithional
D. Reserpine

62.The potential energy of n-butane is not maximum for _____.
A. Skew conformations
B. Staggered conformations
C. Eclipsed conformations
D. Gauche

63. Which of the following acts as catalysis in the nitration of benzene?
A. Conc. HCl
B. Conc. H_2SO_4
C. both A and B

D. H_3PO_4

64. The aldehydes give …….. on treated with Lithium aluminium hydride.
A. Alcohols
B. benzene
C. toluene
D. furan

65.The Dieckmann condensation reaction gives
A. Alkane
B. cyclic β-ketoesters
C. alocohol
D. acyclic β-ketoesters

66. Paracetamol is synthesized from
A. o-aminophenol and acetic anhydride
B. p-aminophenol and acetic anhydride
C. methyl amine and phenol
D. phenol and amine

67.Aspirin is chemically known as……
A. methyl salicylic acid
B. phenyl salicylic acid
C. acetylsalicylic acid
D. methanol

68. Ketones gives ……. upon reduction.
A. 1^o alcohols
B. 2^o alcohols
C. 3^o alcohols
D. Alkenes

69.Primary amines are formed upon ……of Primary amides.
A. reduction
B. oxidation
C. acylation
D. alkylation

70. The best class of drugs is based upon_____.
A. chemical structure.
B. drug action.
C. molecular targets.

D. pharmacological effect

71. Which is the example of elimination reaction?
A. Hydration
B. Dehydration
C. Halogenation
D. Alkylation

72. The compound of the formula $CH_3CO(CH_2)_5CH=CHCOOH$ would be expected to
I: rotate the plane polarised light
II: contain chiral centre
III: Contain three stereo centres
IV: show geometrical isomerism
A. only I, II, III correct
B. only II, IV correct
C. I, II, III, IV correct
D. only IV correct

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