**SRM IST RAMAPURAM -DEPARTMENT OF CHEMISTRY CHEMISTRY (18CYB101J) -QUESTION BANK**

**SEMESTER I (2020-2021)**

**PART- A MCQ WITH ANSWER**

**MODULE -1**

1. The filling up of Molecular orbital takes place according to
2. Huckel’s rule

# Hund’s rule

1. Fajan’s rule
2. Cahn Ingold Prelog rule
3. Which of the following molecule does not exist due to its zero-bond order?
4. H2+
5. He2+
6. **He2**
7. H2–
8. According to Heisenberg the product of uncertainty in the position & moment run of the body is
9. Equal toh/p
10. Equal toE-V

# ≥ h/4π

1. ≥E-V
2. CO has 10 bonding electrons and 4 anti-bonding electrons, and its bond order is

# 3

1. 7
2. 1

d) 5/2

1. Two electrons occupying the same orbital are distinguished by
   1. Azimuthal quantum number

# Spin quantum number

* 1. Magnetic quantum number
  2. Orbital quantumnumber

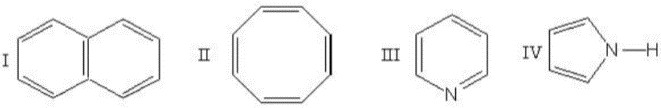
1. The interaction will be attractivebetweenthe orbital [Provided x is theprincipal axis]
2. 2py-2pz
3. 1s-2s
4. 2px-2py

d) **2s-2px**

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

# Arenes

1. Aryls
2. Acyls
3. Alkyl
4. Which of the following compound is aliphatic? [Based on Huckel'srule]



1. I

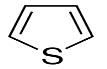
# II

1. III
2. IV
3. Identify the incorrect statement regarding aromaticity
4. It is the extra stability possessed by amolecule
5. p-orbitals must be planar andoverlap
6. Cyclic delocalization takesplace

# It does not follow Huckel’srule

1. Which of the following molecule is aromatic?

# a)



b.

c.

d. 

1. On the basis of molecular orbital theory, select the most appropriate option.
2. The bond order of O2 is 2.5 and it isparamagnetic
3. The bond order of O2 is 1.5 and it isparamagnetic
4. The bond order of O2 is 2 and it isdiamagnetic

# The bond order of O2 is 2 and it isparamagnetic

1. Which of the following is known as the Schrödinger equation?
2. E=mc2
3. λ= h/p c.



d. -

1. Choose the incorrect statement from the following options.

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

1. The energy of anti-bonding molecular orbital is higher than that of atomicorbitals from which it isformed
2. Every electron in bonding molecular orbital contributes toward stability of the molecule
3. Anti-bonding takes place when lobes of atomic orbitals have different signs.
4. If the sign of the wave function is unchanged when the orbital is reflected about its centre, the orbital is

# Gerade

1. Ungerade
2. Gerade as well asUngerade
3. Anti-Symmetric
4. For a homonuclear diatomic molecule the bonding orbital is

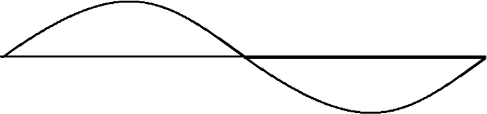
# σg of lowest energy

1. σu of second lowest energy
2. πg of lowest energy
3. πu of lowestenergy
4. The relative energies of molecular orbitals in increasing order have been found to be as follows:

(σ1s) < (σ\*1s) < (σ2s) < (σ\*2s) <[(π2py)(π2pz)] < (σ 2px) < [(π\*2py)(π\*2pz)] < (σ\*2px)

1. For O2 toNe2

# For H2 toN2

1. For H2 toNe2
2. For N2 toNe2
3. The wave function for which quantum state is shown in the figure?
4. 1

# 2

1. 3
2. 4
3. Calculate the Zero-point energy for a particle in an infinite potential well for an electron confined to a 1 nm atom?

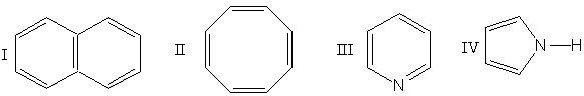
a) 3.9 X 10-29 J

b) 4.9 X 10-29 J

# c) 5.9 X 10-29 J

d) 6.9 X 10-29 J

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



1. I

# II

1. III
2. IV
3. **Molecular orbitals are filled not according to**
4. Aufbau Principle
5. Pauli Exclusion Principle
6. Hund’s rule

# Huckel’s rule

1. The donor atom of a ligand in coordination chemistry is
2. Lewis acid
3. a counter ion
4. central metal ion

# ligand atom that shares e- pair with metal

1. Does a linear molecule show aromaticity?
2. may show
3. may not show
4. both a and b

# cannot show

1. The wave function is a linear combination of
2. Vectors
3. Eigen values

# Eigen Functions

1. Operators
2. Antibonding molecular orbitals are formed by of atomic orbitals.
3. constructive interference

# destructive interference

1. overlapping of atomic orbitals with two negative signs
2. hybridization
3. For a particle in one dimensional box, potential energy V = inside the box.
4. -1
5. ∞

# 0

1. 1
2. The normalization constant for a particle in one-dimensional box is
3. A
4. 2/a
5. a/2

# D. √ (2/a)

1. The points inside the box where ψ=0 is called
2. Antinodes

# nodes

1. radial points
2. angular points
3. Energy of electron in the nth orbit of H- atom is proportional to
4. square root of n

# inverse square root of n

1. cube root of n
2. n
3. The probability of finding a particle per unit volume is known as
4. particle density

# probability density

1. normalization
2. orthogonalization
3. The wave function Ψ describes
4. Intensity
5. energy density

# state of the system

1. probability
2. For a particle in one-dimensional box, the number of nodes (N) and quantum number are related as
3. N = n

# N = n-1

1. N = 2n
2. N = n+1
3. 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

1. The carbon of aromatic benzene molecule is
2. sp3d2 hybridized
3. sp hybridized

# sp2 hybridized

1. sp3 hybridized
2. Aromatic compounds do not have
3. planar structure

# 4n π-electrons in structure

1. cyclic structure
2. 4n+2 π-electrons in structure
3. Benzene is a structure of two Kekule’s structure

# hybrid

1. meso
2. monoclinic
3. isomeric
4. The name of OH- ligand is
5. Hydroxy
6. hydroxide

# hydroxo

1. hydroxyl
2. Iso cyano is the name of Ligand
3. CN-

# NC-

1. NCS-
2. SCN-
3. If the sign of wave function remains unaffected upon reflecting an orbital about its centre, the orbital is known as

# Gerade

1. Ungerade
2. Gerade as well as Ungerade
3. Centralized
4. Molecular orbitals are being filled as per the
5. The Aufbau Principle
6. Pauli Exclusion Principle
7. Hund’s rule of maximum multiplicity

# All the mentioned

1. The correct option as per the MOT
2. The bond order of O2 is 2.5 and it is paramagnetic
3. The bond order of O2 is 1.5 and it is paramagnetic
4. The bond order of O2 is 2 and it is diamagnetic

# The bond order of O2 is 2 and it is paramagnetic

1. Which one is incorrect from the following options?

# Electron density is low in the region between the nuclei of bonded atoms in case of bonding MO.

1. Antibonding MO is higher in energy than atomic orbitals from which it is formed
2. Every electron in bonding MO contributes toward stability of the molecule
3. Antibonding takes place when lobes of atomic orbitals have different signs
4. Electrons residing in the same orbital will have .
5. Same spin

# Opposite spin

1. Same or opposite spin
2. No spin
3. The concept of matter wave was suggested by
4. Heisenberg
5. Schrodinger

# De Broglie

1. Niels Bhor
2. The operator ∇2 is called operator

# Hamiltonian

1. Poisson
2. Laplacian
3. Vector
4. The shape of s-orbital?

# Sphere

1. Dumbbell
2. Pear-shaped lobe
3. Conical
4. Developing year of Valence Bond Theory was? A. 1925

# B. 1927

C. 1929

D. 1932

1. The Valence Bond Theory was developed by?
2. Heitler and London.
3. Bhor

# Linus Pauling

1. Pauli
2. The s-orbital does not show preference to any direction because
3. It is the smallest orbital
4. It is present in every atom

# It is spherically symmetric

1. It is the first orbital
2. Schrodinger equation in shorter form is given by Ĥ Ψ=
3. EH
4. E

# EΨ

1. G
2. Which of the following molecule is not homonuclear?
3. H2
4. N2

# CO

1. O2
2. Which of the following molecule is homonuclear?
3. HF
4. NO2
5. NO
6. **O2**
7. The shape of a p orbital is?
8. Sphere

# Dumbbell

1. Pear-shaped lobe
2. Cuboid
3. The interaction between a pair of orbitals of the same type is
4. Attractive

# Repulsive

1. There is no interaction
2. None of the mentioned
3. Potential energy of a particle outside the box is

# 1

1. Infinity
2. Zero
3. Finite
4. The de Broglie equation applies to
5. Electrons only
6. Protons only

# Neutrons only

1. All the material objects in motion
2. The number of nodal planes in a px orbital is

# One

1. Two
2. Three
3. Zero
4. As compared to bonding MO, the antibonding MO has

# Higher energy

1. Lower energy
2. Equal energy
3. Unpredictable value of energy
4. Which is incorrect about aromaticity?
5. It must be planar
6. It must be conjugated
7. Cyclic delocalization takes place

# It must not obey Huckel’s rule

|  |  |
| --- | --- |
| 59. | Carbon monoxide has a ….. bond order |
| **A.** | **3** |
| B. | 5 |
| C. | 1 |
| D. | 1/2 |

1. What is the bond order in H2? A. 3.0

B. 2.0

C. 1.5

# D. 1.0

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

# One

* 1. Infinity
  2. Double

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

# ΔX.Δp≥h/4π

* 1. ΔX.Δp≥h/2π
  2. ΔE.Δt≤h/4π
  3. None of these

1. An atom has two unpaired electrons. The total spin of this atom will be
   1. 0

# 1

C. 1.5

D. 2

1. Energy expression of a particle in one dimensional box is
   1. n2 h2/4mL2
   2. n2 h2/6mL2

# n2 h2/8mL2

* 1. n2 h2/mL2

1. The bond order of O2 molecule on the basis of molecular orbital theory …..

# is 2 and it is paramagnetic

* 1. is 2.5 and it is paramagnetic
  2. is 1.5 and it is paramagnetic
  3. is 2 and it is diamagnetic

1. When ψ(x)= ψ(-x) the function is

# Symmetric

* 1. antisymmetric
  2. sine
  3. finite

1. 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

1. Which hydrogen like species will have same radius as that of Bohr's first orbit of hydrogen atom?
   1. n=2, Li2+

# n=2, Be3+

* 1. n=2, He+
  2. n=3, Li2+

1. The number of radial nodes of 3s and 2p orbitals are respectively: A. 2, 0

# B. 0, 2

C. 1, 2

D. 2, 11

1. 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 x 10-28

B. 2.1 x 10-34

C. 0.5 x 10-34

D. 5.0 x 10-24

1. The relative energies order of molecular orbitals in increasing order to be as follows. (σ1s) < (σ\*1s) < (σ2s) < (σ\*2s) < [(π2py)(π2pz)] < (σ 2px) < [(π\*2py)(π\*2pz)] < (σ\*2px)
   1. For O2 to Ne2
   2. **For H2 to N2**
   3. For H2 to Ne2
   4. For N2 to Ne2+
2. Order of the following molecules in increasing stability is? A. N2 < N – < N22-

2

B. N22- < N2– < N2+

**C. N22- < N – < N2**

**2**

D. N2 < N2+ < N22-

1. Bond Order of O2, N2 are , respectively?

A. +1, +2

# B. +2, +3

C. +2, +1

D. +3, +2

1. The combination of H (1s1) and F (2px1) gives
   1. Bonding orbital
   2. Antibonding orbital

# Both bonding and antibonding orbital

* 1. P-orbital

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

# 38 eV

* 1. 342 eV
  2. 152 eV
  3. 28eV

1. 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

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*