R 19

Code: A2005

I B.Tech I Semester (R19) Supplementary Examinations August 2021

Time : 3 hours

Max. Marks: 70

CHEMISTRY

PART- A

(Compulsory Question)

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1. Answer the following: (10 X 02 = 10 Marks)

a. Write Schrodinger equation.
b. Define para magnetic materials
c. Differentiate the primary and secondary batteries.
d. Define electrochemical sensor?
e What are the conducting polymers ? give examples.
f Write the preparation of Buna-S rubber
g State Beer-Lambert's law
h What is electromagnetic spectrum
i What are nanomaterial?
j What is colloid ? Give an example

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT-1

2 a. Derive Schrödinger Equation for the particle in one dimensional box.
b. Describe the MO theory for O_2 and find out bond order.

OR

3 a. Explain crystal field splitting for octahedral complexes with example.
b. Calculate the energy in joule corresponding to light of wavelength 45nm. (Planks constant = 6.625×10^{-34} Js, C= 3.325×10^{8} ms^{-1})

UNIT-II

4 a. Derive Nernst equation
b. Explain the working principle of H2-O2 fuel cell.

OR

5 a. Illustrate the construction and working principle of Calomel electrode
b. Describe the working principle and applications of Photovoltaic cell.

UNIT-III

6 a. Discuss the conducting behavior of polyacetylene
b. Differentiate thermoplastics and thermosetting polymers.

OR

7 a. Explain the preparation and applications of Bakelite and Nylon 6,6.
b. Differentiate chain growth and step growth polymerization

UNIT-IV

8 a Describe the principle and application of IR Spectroscopy
b. How to Separate organic mixtures by using TLC

OR

9 a. List out the applications of Conductometry
b. How to measure the pH of the acid solution by using pH metry.

UNIT-V

10 a. Discuss the synthesis of Nanomaterial by sol-gel method
b. Explain the principle and application of scanning electron microscope (SEM)

OR

11 a. Explain the different types of nanomaterials with an examples.
b. Describe the synthesis and applications of colloids

Regular Examinations

Max. Marks: 60

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I B.Tech I Sem (R 19) Supplementary Examinations August 2021

CHEMISTRY (A2005)

Scheme of Evaluation

Part- A (Compulsory question)

1) a) $\nabla^2\psi + \frac{8\pi^2 m}{h^2}(E-V)\psi = 0$

$\nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}$ [1M]

b) Paramagnetic materials are the materials that tend to get weakly magnetized in the direction of magnetizing field. [1M]

c) Any 4 differences of 1° and 2° batteries [1M]

d) The devices which are able to detect a change in physical / Chemical quantity and produce any electrical signal suitable for a computer [1M]

e) An organic polymers with highly delocalised Pi-electron systems having electrical conductance on par with metallic conductor is called a conducting polymer [1M]

f) $n\,CH_2=CH-CH=CH_2 + n\,CH_2=CH(C_6H_5) \rightarrow \{CH_2-CH=CH-CH_2-CH(C_6H_5)\}$

1,3 butadiene — Styrene — Buna-S

g) When a beam of light is allowed to pass through a transparent medium, the rate of decrease of intensity with the thickness of medium is directly proportional to the intensity of light. - [1M]

h) Electromagnetic Spectrum is the range of all the frequencies or wavelengths of electromagnetic radiation. [1M]

i) Nanomaterials can be defined as materials possessing the range between 1 to 100 nm size. [1M]

j) Colloids are the combination of molecules mixed through other substances that will not settle out of join with the other substances is called colloid.

Ex: Myonnaise, blood. etc..

Part - B

9) a) From classical wave mechanics, if 'ψ' is amplitude moving in three dimensional space with a velocity 'v' and frequency 'ϑ', the wave eqn is. [5M]

$$\frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2} + 4\pi^2 v^2 \psi = 0.$$

$$\Rightarrow \frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2} + 4\pi^2 \left(\frac{mv}{h}\right)^2 \psi = 0$$

$\because$ $KE = \frac{1}{2} mv^2$. (or) $m^2v^2 = 2m \cdot KE$

$$\Rightarrow \frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2} + \frac{8\pi^2 m\, KE}{h^2} \psi = 0.$$

$$\frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} + \frac{\partial^2\psi}{\partial z^2} + \frac{8\pi^2 m (E-V)}{h^2} \psi = 0.$$

$$\rightarrow \nabla^2\psi + \frac{8\pi^2 m}{h^2}(E-V)\psi = 0$$

Inside a box, the Schrodinger's wave eqn is.

$$\frac{\partial^2\psi}{\partial x^2} + \frac{8\pi^2}{h^2} m (E-V)\psi = 0.$$

$$\frac{\partial^2\psi}{\partial x^2} + \frac{8\pi^2}{h^2} m(E\psi) = 0 \quad (\because V=0)$$

ψ must be zero outside the region, $x=0$ and

$$\psi = a \sin \frac{2\pi}{h}(2mE)^{1/2} x + b \cos \frac{2\pi}{h}(2mE)^{1/2} x$$

where a = maximum amplitude, b = constant.

Hence. $\psi = a \sin \frac{2\pi}{h}(2mE)^{1/2} \psi$

At boundary $\psi = 0$ at $x = d$ then

$$\psi = a \sin \frac{2\pi}{h}(2mE)^{1/2} d = 0.$$

$$= \sin \frac{2\pi}{h}(2mE)^{1/2} d = 0.$$

$$= \frac{2\pi}{h}(2mE)^{1/2} d = n\pi.$$

On Squaring & rearranging. the above eqn.

$$E_n = \frac{n^2 h^2}{8md^2}. \quad (\because n = 1, 2, 3 \ldots)$$

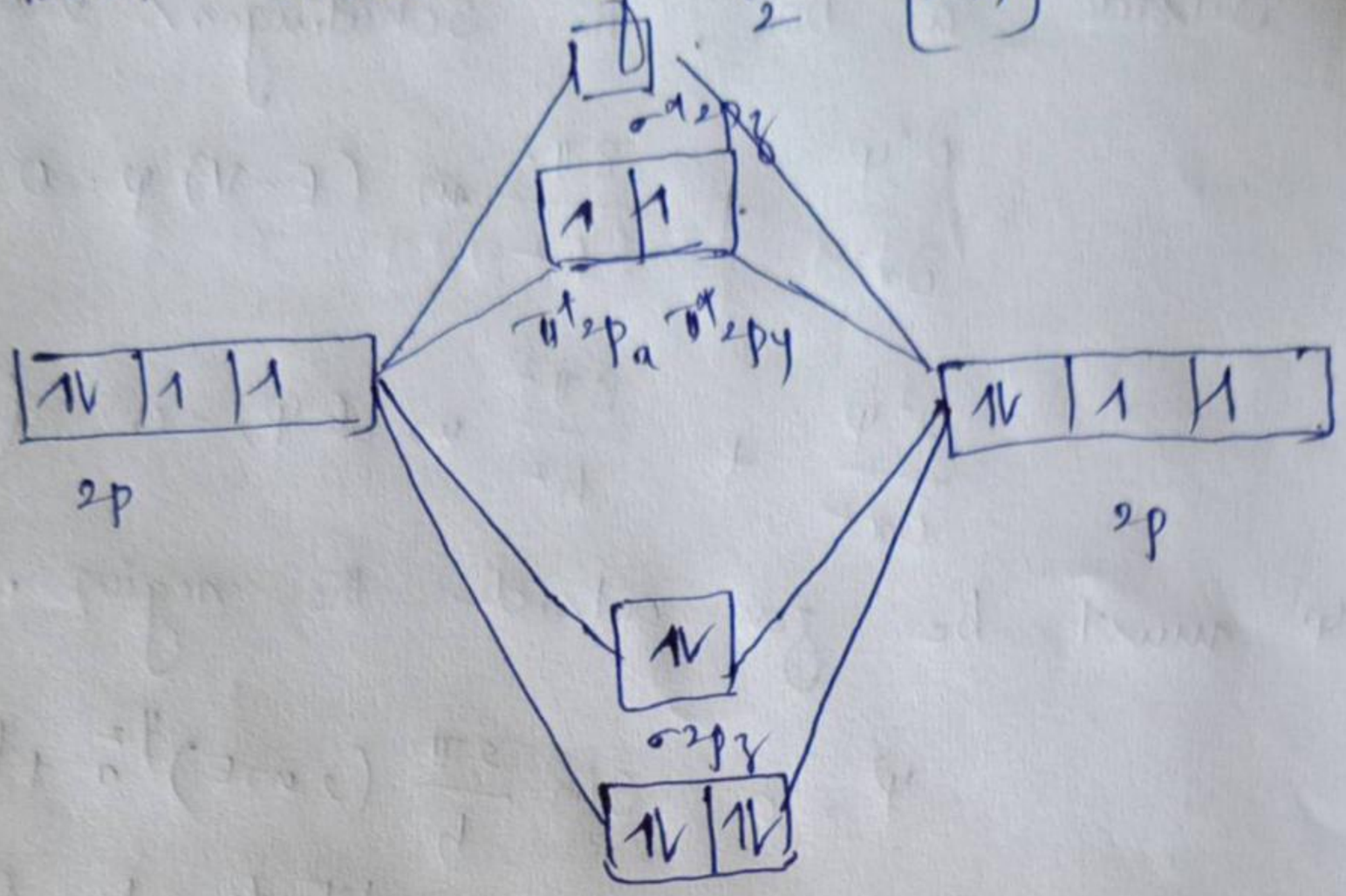
The particle in a box does not posses any arbitrary amount of energy rather possesses. a discrete set.

$$E_1 = \frac{h^2}{8md^2}$$

$$E_2 = \frac{4h^2}{8md^2} \ldots.$$

b) Molecular orbital diagrams of O_2 [3M]

bond orders of O_2 [2M]

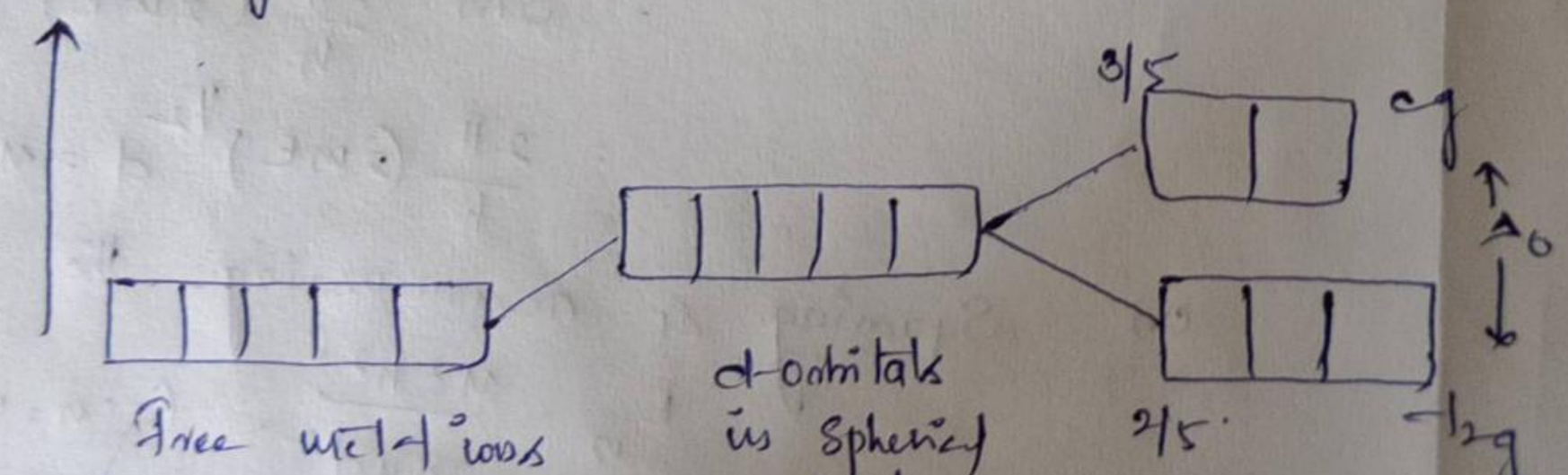


Bond order = $\frac{1}{2}(N_b - N_a)$

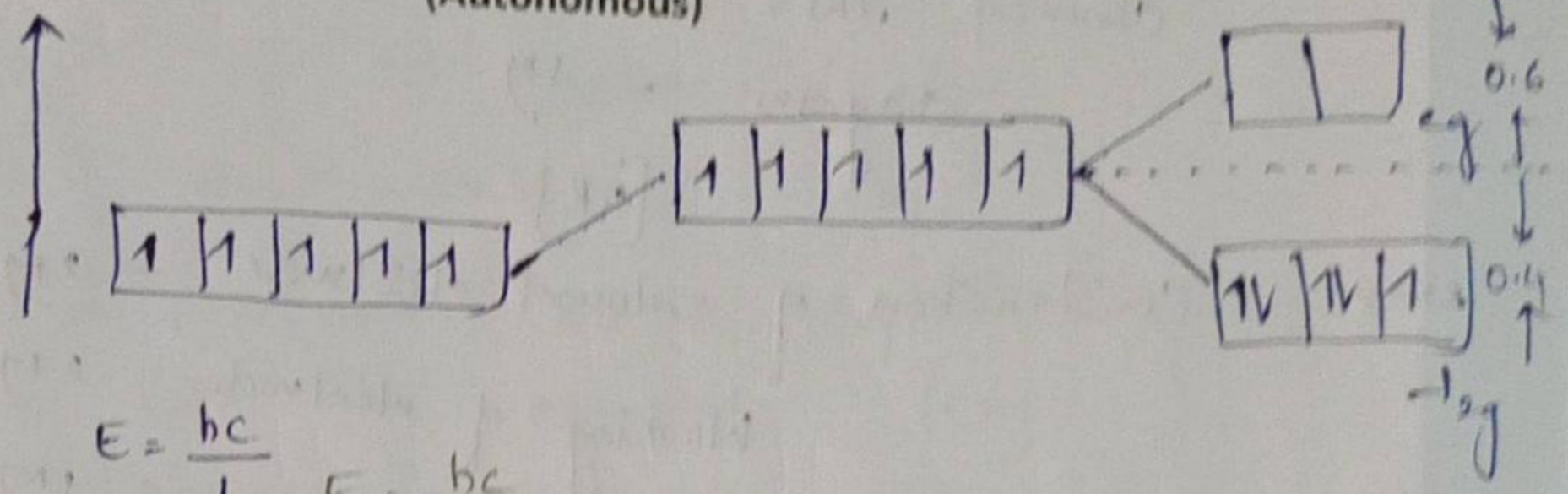
$= \frac{1}{2}(8-4) = 2$

[OR]

3) a) Explanation of Crystal field splitting of octahedral complex with diagram [5M]



Ex: $[Fe(CN)_6]^{3-}$



By

$$E = \frac{hc}{\lambda} \qquad E = \frac{hc}{\lambda}$$

$$= \frac{6.63 \times 10^{-34} \times 3 \times 10^{8}}{4.5 \times 10^{-9}} = \frac{6.63 \times 10^{-34} \times 3 \times 10^{8}}{4.5 \times 10^{-7}} = 4.4 \times 10^{-18}$$

$$= 4.4 \times 10^{-18} \text{ J} \qquad 4.42 \times 10$$

Ans In the Daniel cell,

$$Zn / Zn^{2+} \,\|\, Cu^{2+} / Cu$$

electrode potential of right hand electrode.

$$E_{Cu^{2+}/Cu} = E^{\circ}_{Cu^{2+}/Cu} + \frac{RT}{2f} \ln [Cu^{2+}]$$

electrode potential of left hand electrode.

$$E_{Zn^{2+}/Zn} = E^{\circ}_{Zn^{2+}/Zn} + \frac{RT}{2f} \ln [Zn^{2+}]$$

$$E_{cell} = \left(E_{Cu^{2+}/Cu} - E^{\circ}_{Zn^{2+}/Zn}\right) + \frac{RT}{2f} \ln \frac{[Cu^{2+}]}{[Zn^{2+}]}$$

$$= E^{\circ}_{cell} + \frac{RT}{2f} \ln \frac{[Cu^{2+}]}{[Zn^{2+}]}.$$

$$= E^{\circ}_{cell} + \frac{0.0592}{2} \log \frac{[Cu^{2+}]}{[Zn^{2+}]}$$

b) Working principle — 2M
chemical rxns — 2M
diagram — 1M

[OR]

5) a) Construction of calomel electrode — 2M
Working of electrode — 2M
diagram — 1M.

b) Photovoltaic cell- definations — 1M
Working & principle — 2M
Any 5 Applications — 2M

6) a) $-CH=CH-CH=CH + C_{10}H_7NH_2 \longrightarrow$ Reduction. [5M]

poly acetylene Napthylamine:

$-CH=CH-\underset{\overset{|}{NH^{\oplus}}}{CH}=CH-\cdots\cdots + C_{10}H_8$
Napthelen

b) Any 5 differences betn thermo plastics and thermo setting plastics.. — [5M]

7) a) preparation & applications of bakelite — [2½ M]
" & " of Nylon — [2½ M]

b) chain growth / Addition poly with example — [2½ M]
Step growth / condensation poly with example — [2½ M]

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8) a) principle of IR spectra - [2M]
Any 5 Applications. - [3M]

b) detailed discussion on the Seperation of organic mixtures with the examples. [5M]
with diagrams.

[OR]

9) a) Any 6 Applications of conductometry [5M]

b) Defination of $\bar{P}^H$ - [1M]
Measurement of acid $\bar{P}^H$ by using $\bar{P}^H$ meter - [4M].
detailed explanation.

10) a) Synthesis of nanomaterials by sol-gel method - [3M]
Equation related to Synthesis - [1M]
diagrams of Synthesis - [1M]

b) Principle of SEM - [3M]
Applications of SEM - [2M]

11) a) classification of nanomaterials with examples [5M]

b) Synthesis of colloids - [2M]
Applications of colloids - [3M].

Prepared by