K.L.E. SOCIETY'S
P. C. JABIN SCIENCE COLLEGE
HUBBALLI
AUTONOMOUS

Semester Ist

B.Sc.	✓
B.C.A.	
M.Sc.	

Answer Booklet No.
42363

eory Semester End amination	April/May 20
	Nov./Dec. 20

Certified that the entries made by the candidate are found to be correct.

21.3.22

Signature of the Room Supervisor with Date

am. Reg. No. 1 2 1 C Bt 0 0 6

Class : BSC-Ist Subject : Chemistry Subject Code No. 116DSC01T-I-22

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IMPORTANT INSTRUCTIONS TO CANDIDATES

1) On the cover page of answer book compulsorily mention your Register Number, Subject, Course Code and required information.

2) Don't write your name or mark any signs, such answer scripts shall not be assessed and punished.

3) Write your answer from 1st page and don't leave any blank pages and blank space in between.

4) Last page is meant for rough work and on completion put cross mark (x)

5) The candidates are informed strictly to write their answer only with black ink & write on both sides of the answers sheets.

IMPORTANT INSTRUCTIONS TO CANDIDATES

6) Please mention the Question number in the margin. Answer's without Question number & also with wrong question number shall not be valued.

7) The students are informed to take compulsorily the signature of the room supervisor with date on the answer book.

8) The candidate should be present 20 minutes before the commencement of the examination. After that no students wil be allowed in the examination hall.

9) Use of any electronic gadgets in the examination hall is strictly prohibited.

10) After the last warning bell, no candidate is allowed to leave his/her seat.

11) Indulging in different ways and using different means that lead to malpractice is prohibited.

12) Don't fold the answers sheets & keep the answer sheets clean.

UNIT-I

2 (a) The energy required to remove the electron from outermost shell of an isolated gas atom is called Ionisation energy.

IE_1 - first ionisation energy

IE_2 - second ionisation energy

$IE_2 > IE_1$

because removing second electron from outermost shell requires more energy as it is tightly bounded to force of attraction by nucleus.

$$M \longrightarrow M^+ + 1e^-$$

2 (b) ii) The heisenberg's uncertainity principle and stationary orbits of electron gives wave mechanical Model of atom. Schrodinger gave wave equation

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

(or)

$$\nabla^2\psi + \frac{8\pi^2 m}{h^2}[E-V]\psi = 0$$

where ∇^2 = Laplacian eqn $= \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2} + \frac{\partial^2}{\partial z^2}$

h = planks constant

m = mass of e^-

E = energy of electron

V = potential energy of electron

ψ = Eigen function

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Eigen function is the solutions of schondiger wave equation which is finite, continous and single valued Eigen value is the value of E obtained when value of Ψ is substituted in schondiger wave equation

2 (b) (ii) Significance of Ψ and Ψ^2 -

→ Ψ can be poseline, negative or imaginary so it has no significance

→ Ψ^2 is the probability of finding electron in region. It has significance

* if $\Psi^2 = 0$, then probability of finding electron is zero. that electron not present in that region
* if Ψ^2 = high, then probability of finding electron is high, that electron is present for more time in that particular region
* if Ψ^2 = low, then probability of finding electron is low, that electron is present for less time in that particular region.

2 (c) (i) Limitations of Bohr's theory-

* He failed explain the atomic spectra for multi electron atom ie for higher elements.
* He failed to explain the starck effect ie when atomic spectra is subjected to high electric field it splits into into spectral lines
* He failed to explain the zeeman effect ie when atomic spectra is subjected to high magnetic field it splits into spectral lines.

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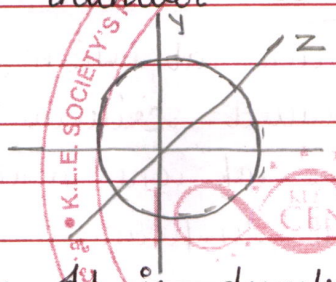
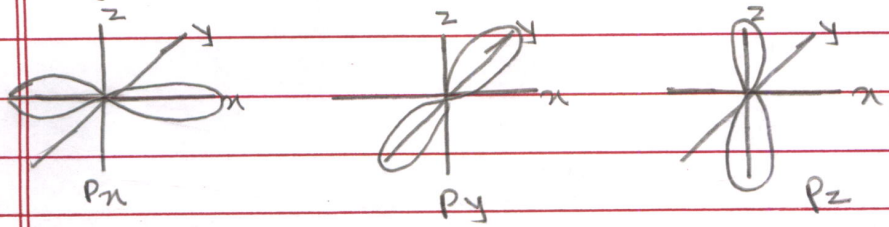
* He only considered particle nature of electron were as it also has wave nature and is given by De Broglie hypothesis.

* He did not considered Heisenberg's uncertainty principle that it is impossible to calculate position and momentum of particle like electron simultaneously

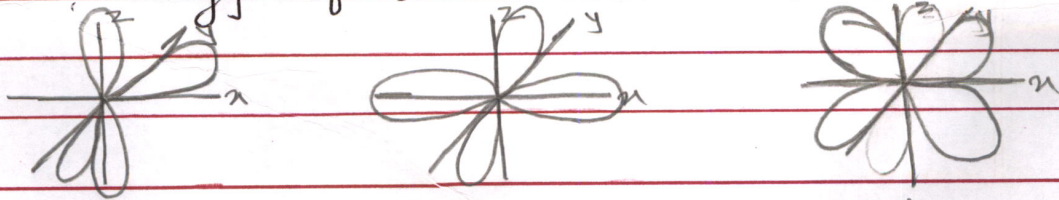
2 (c)(ii) s- It is sphere in shape. The probability of finding electrons is same in every region. The energy of s orbital increases with increase in ~~atomic~~ principle quantum number 1s < 2s < 3s



p-orbital- It is dumbell in shapes. It consist of lobes. It has 3 magnetic quantum number so three orbitals, they are same in size, shape and energy but they orient in different direction.



d-orbital- It has 5 magnetic quantum number 5 orbital. Out of five four are clover in shape and one is dumbell with doughnut in the middle The energy of each orbital is same.



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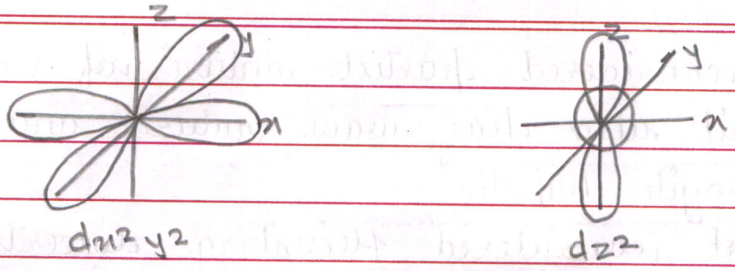


$d_{x^2-y^2}$ d_{z^2}

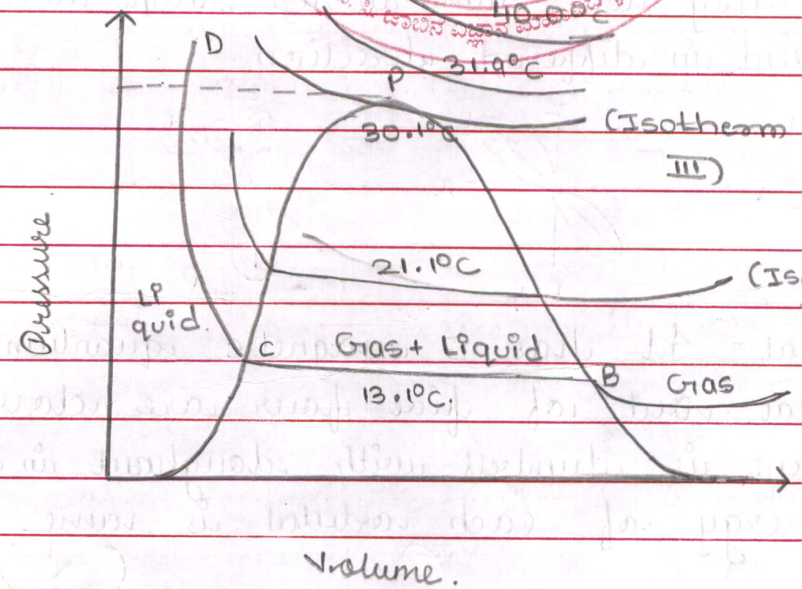
UNIT - III

5 (c) Critical temperature - Temperature above which liquefication of gas doesn't takes place is called critical temperature

Critical pressure - Pressure at which gas and liquid cannot co-exist is called critical pressure.

Critical Volume - Volume of one mole of liquid is required at critical temperature is called critical volume.

Andrew's Isotherm of gas -



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At temperature 13.1°C ie (Isotherm I), at point A the CO_2 will be in gas form and on increasing pressure, there is decrease in volume till B. At B, the liquefication of gas starts, and on increasing pressure there is slight change in volume till point C. At point C liquefication completes, and CO curve defines that on increasing pressure there is no change in volume and the liquid obtained is slightly compressible. Same thing happens in (Isotherm II) but the horizontal line ie BC goes on decreasing. On increase in temperature the horizontal line goes on decreasing till point P were critical temp is obtained (30.1°C) Above this temperature there is no liquefication of gas takes place on rise in temperature.

5 (b) Maxwell along with Boltzman gave law of Molecular velocities. After collision the velocites of molecule changes and most of them move with Most probable velocity.

Fraction of molecules having most probable velocity is given by $\frac{dNc}{n} = 4\pi \left(\frac{M}{2\pi RT}\right)^{3/2} \cdot e^{-E_a/RT} \cdot c^2$

Probability of molecules having most probable velocity is by $P = \frac{1}{n} \cdot \frac{dNc}{c} = 4\pi \left(\frac{M}{2\pi RT}\right)^{3/2} \cdot e^{-E_a/RT}$.

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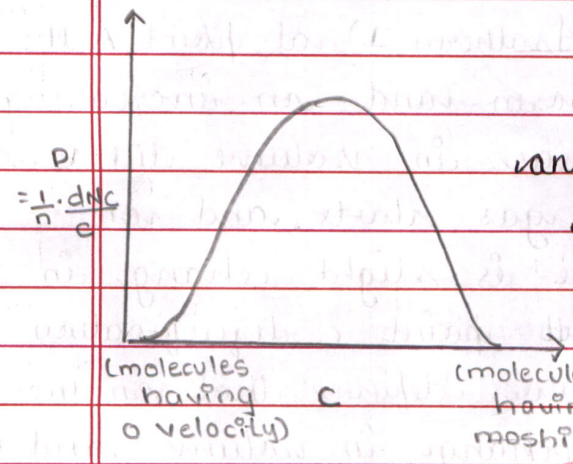
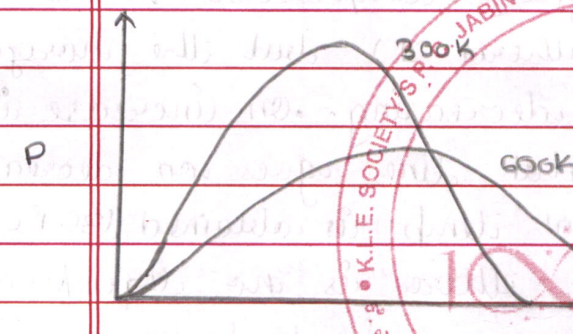


Molecules having zero velocity and molecules having most probable velocity is negligible but average molecules or most of molecules have most probable velocity.



On increasing temperature nor of molecules having most probable velocity increases but fraction or probability of molecules having most probable velocity decreases.

★ Most probable velocity - It is defined as velocity with maximum number of molecules move with

$$\alpha = \sqrt{\frac{2RT}{M}}$$

★ Average velocity - It is defined as the sum of the velocities of molecules to that of nor of molecules

$$v = \frac{v_1+v_2+v_3+\cdots+v_n}{n} \qquad v = \sqrt{\frac{8RT}{\pi M}}$$

★ Root mean square velocity - It is defined as square root of sum of squares of velocity divided by number of molecules

$$v = \sqrt{\frac{v_1^2+v_2^2+v_3^2+\cdots+v_n^2}{n}} \qquad v = \sqrt{\frac{3RT}{M}}$$

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5 (a) Surface tension is defined as the force acting in dynes/cm on the surface of liquid at right angle.

It is given by γ and Units are dynes/cm
N/m

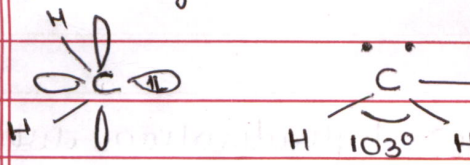
Surface energy is the amount of work needed to be done in order to reduce the surface area by one cm^3.

Ex Needle floating on the surface of liquid.

UNIT - II

3 (c) ii) Carbenes are divalent reactive intermediates. They are formed by Homolytic fission of two different constituents. The structure of Carbenes is

* Singlet - When the two electrons goes to same orbital then it form singlet in structure is bent with bond angle 103° and sp^2 hybridised carbon There is presence of paired electron so it is paramagnetic in nature



$\longrightarrow sp^2$ (bent) paramagnetic

* Doublet - When due to fission electron goes to different orbital, it form doublet in structure is bent with bond angle 136° and sp hybridised carbon. There is no presence of paired electron so it is diamagnetic in nature.

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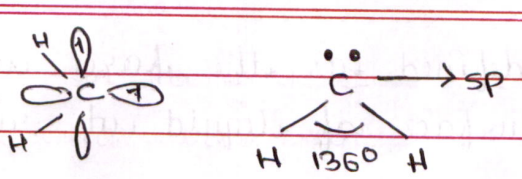


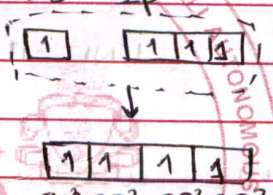
diamagnetic

3 (c) (iii) * Ethane C_2H_6

It is the example of sp^3 hybridisation. When one s orbital of same energy intermix with 3 p orbital with nearly same energy, they give sp^3 hybrid orbitals of same energy

C = 6 Ground state - $1s^2\ 2s^2\ 2p^2$

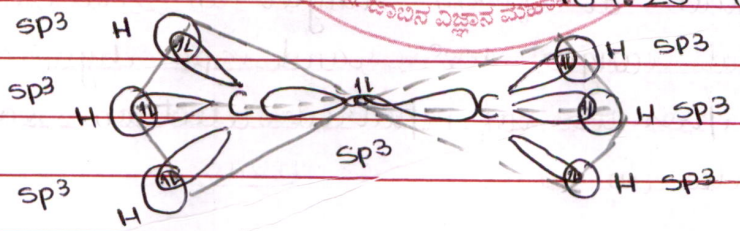
Excited state $1s^2\ 2s^1\ 2p^3$



One orbital bonds with carbon and other 3 orbital with hydrogen.

The structure formed is tetrahedral

109.28° (bond angle)

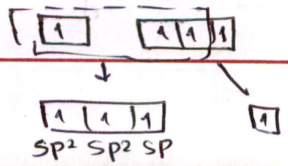


* Ethene $CH_2 = CH_2$.

It is the example of sp^2 hybridisation. When one s orbital of same energy or nearly same energy intermix with 2p orbital, they give sp^2 hybrid orbital of same energy.

C = 6 Ground state $1s^2\ 2s^2\ 2p^2$

Excited state $1s^2\ 2s^1\ 2p^3$



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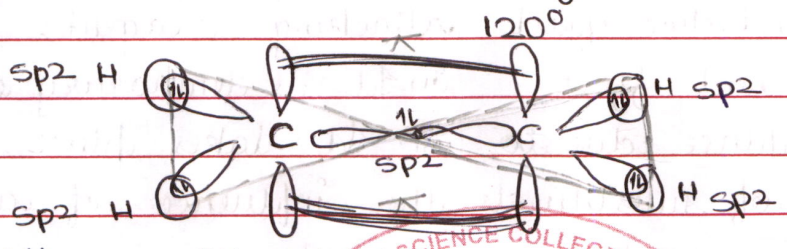
out of three hybrid orbital one forms bond with carbon other two with hydrogen and one unhybridised p orbital form π bond
The structure is triangular

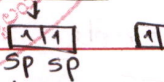


★ ethyne $CH \equiv CH$

It is example of sp hybridisation . when one s orbital ~~interm~~ of same energy or nearly same energy intermix with p orbital they give new sp hybrid orbital with same energy.

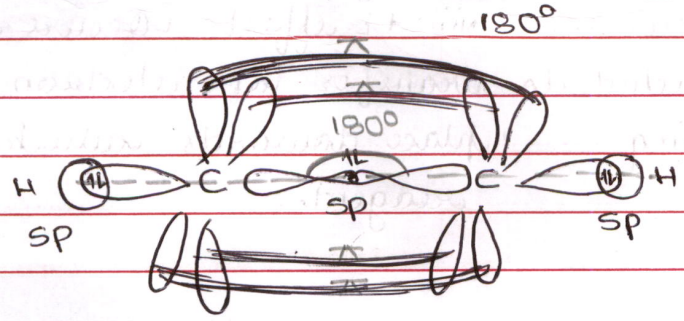
C = 6 ground state $1s^2 2s^2 2p^2$

excited state $1s^2 2s^1 2p^3$



(unhybrised p orbital)

one s & sp hybrid orbital forms bond with carbon and one with hydrogen. The two unhybrised p orbital are involved in p bond.
The structure is linear



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3 (b)	Inductive effect	Electromeric effect.
(i)	The permanent dipole between the carbon and an atom attached to carbon is called inductive effect.	(i) The transfer of electron of multibonded atom to bonded atom under the influence of attacking reagent.
(ii)	It is permanent effect	(ii) It is temporary effect.
(iii)	It takes place due to influence of substituents attached to carbon.	(iii) It takes place under the influence of attacking reagent.
(iv)	There is partial charge formation based on substituents	(iv) There is complete transfer of charges taking place.
(v)	electrons don't leave molecular orbitals	(v) electrons leave molecular orbitals.
(vi)	Only occurs in carbon chain and single bonds	(vi) It occurs in unsaturated compounds.
(vii)	-I effect- occurs when carbon is attached to electron withdrawing group	(vii) +E effect- occurs when transfer of electron takes place away from attacking reagent.
(viii)	+I effect- occurs when carbon is attached to electron donating group	(viii) +E effect- occurs when transfer of electron takes place towards attacking reagent.

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3 (a) $CH_3-COOH < ClCH_2COOH < Cl_2CHCOOH < Cl_3C-COOH$.

methyl being electron donating group, it increases the electron density, thus proton don't get loose easily. (+I effect).

Chlorine being electron withdrawing group it decreases the electron density, thus to get stabilize the electrons are taken from H and it gets removed as H^+ (-I effect)

UINT-IV

7 (c) Redox titrations - When in a reaction both oxidation and reduction takes place it leads to redox reaction and titration of it is called redox titration.

Oxidation	Reduction
(i) Addition of oxygen	(i) Addition of hydrogen
(ii) Removal of hydrogen	(ii) Removal of oxygen.
(iii) Loss of electrons	(iii) Gain of electrons
(iv) Increase in oxidation number	(iv) Decrease in oxidation number.

The types of Redox ~~titration~~ reaction is

(i) Thermal decomposition redox reaction
(ii) Displacement redox reaction
(iii) Combination redox reaction
(iv) Disporportination redox reaction
(v) Comproportionation redox reaction.

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Redox indicators - They are the compounds which change colour in oxidised and reduced form

i) The types of redox indicator is

ii) Internal indicator - They are the compounds which change colour in oxidised and reduced form.

Ex	Indicator	oxidised	reduced
	diphenylamine	Violet	colourless
	starch	blue	colourless.
:	methyleneblue	blue	colourless

iii) Self - indicator - The titrant itself acts as an indicator is called self indicator

Ex $KMnO_4$ - pink

iv) External indicator - The end point is detected by the compound which is not added to solution of titrating but it is used outside the titrating system

Ex potassium ferrocyanide

Applications -

i) It is used to track redox reaction

ii) It is used to determine redox potential

iii) It is used to determine the end point

iv) It is used to determine pH of the solution.

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7 (b)	Mohr's Method	Volhard Method.
(i)	It is used to determine the amount of chloride ions present in solution	(i) It is used to determine the amount of cyanide ions present in solution.
(ii)	It is direct method of titration	(ii) It is back method of titration
(iii)	Indicator used in this method is K_2CrO_4	(iii) Indicator used in this method in FAS.
(iv)	It takes place in Alkaline or basic medium	(iv) It takes place in acidic medium.
(v)	It takes place at room temperature	(v) It takes place below ie at 20°C.
(vi)	$AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$ (white ppt)	(vi) $AgNO_3 + NH_4SCN \rightarrow AgSCN + NH_4NO_3$ (white ppt)
	$AgCl + K_2CrO_4 \rightarrow Ag_2CrO_4$ (red ppt)	$AgSCN + Fe^{+3} \rightarrow [FeSCN]^-$ (red ppt)

7 (a) Accuracy is defined as the degree of agreement between true value and measured value ie consistency between true value and measured value.

For example if the burette reading obtained was 27.2 and the true value of burette reading is 26.9 then the accuracy is 99.6% there the value 27.2 can be considered. It is given by Accuracy = $\frac{\text{Measured Value}}{\text{True Value}}$.

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