$1 ev = 1.602 \times 10^{-19}$ J.

$1 \frac{kg m^2}{s^2} = N.m$

$1 ev = J/C$

1.6×10^{-19} J/coulomb.

Plancks constant

But

frequency.

$E = h\nu$ — (1)

as $\lambda\nu = c$

Speed of light

$E = \frac{hc}{\lambda}$ — (2)

wavelength

But,

According to De Broglie wavelength

$\lambda = \frac{h}{p}$ — (3)

Linear momentum of particle

we have taken this because we have to deal with the velocity & force.

Now, we have to go for angular frequency.

$\therefore$ devide by 2π.

Such equation we found,

we go to reduced Plancks constant.

$\therefore \hbar = \frac{h}{2\pi}$ — (4)

& $E = h\nu$

Now,

$\omega =$ angular frequency.

$\omega = 2\pi\nu$

$\therefore \quad E = h\nu$

$E = h\,2\pi\nu$

Now,

$E = h\,2\pi\nu$

& $\hbar = \dfrac{h}{2\pi}$

$$\therefore \quad \underline{\underline{E = \hbar\omega}} \quad — \quad (5)$$

Plancks constant = J.S = $6.62606957(29) \times 10^{-34}$ J.S

Now again we come to the back point

1eV → 1e, Volt = J/C

C: Charge by 1 Amp in 1 sec [C = 1A × 1S]

elementory charge = → on electron, → on proton = 1.6×10^{-19} C — imp.

From Faraday effect, we understand that,
it is actually the phenomenon shows the interaction between light & magnetic field.

Here light is made up of small particles called photons

Energy of photon at 1 ev

$$E = 1.6 \times 10^{-19} J$$

at $\lambda = 1.2398 \mu m$

Now we can focus, how magnetic field makes light to turn.

↳ turn means :- making turn for photon.

Angular frequency of an electron

$$E = \hbar \omega$$

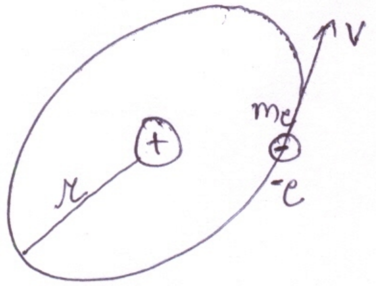


fig - (1)

current

$$m = IA = \mu = IA$$

area.

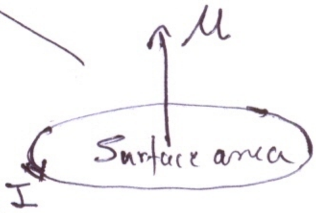


fig- ( )

as $I = \frac{-e}{T} = \frac{ev}{2\pi r}$

radius

period of orbit

Can be written as

$$I = \frac{-e\, m_e v r}{2\pi m_e r^2}$$

orbital angular momentum

$$\therefore \mu = IA = \frac{-e}{2m_e} L$$

But when we go with force component we need to draw diagram in other way

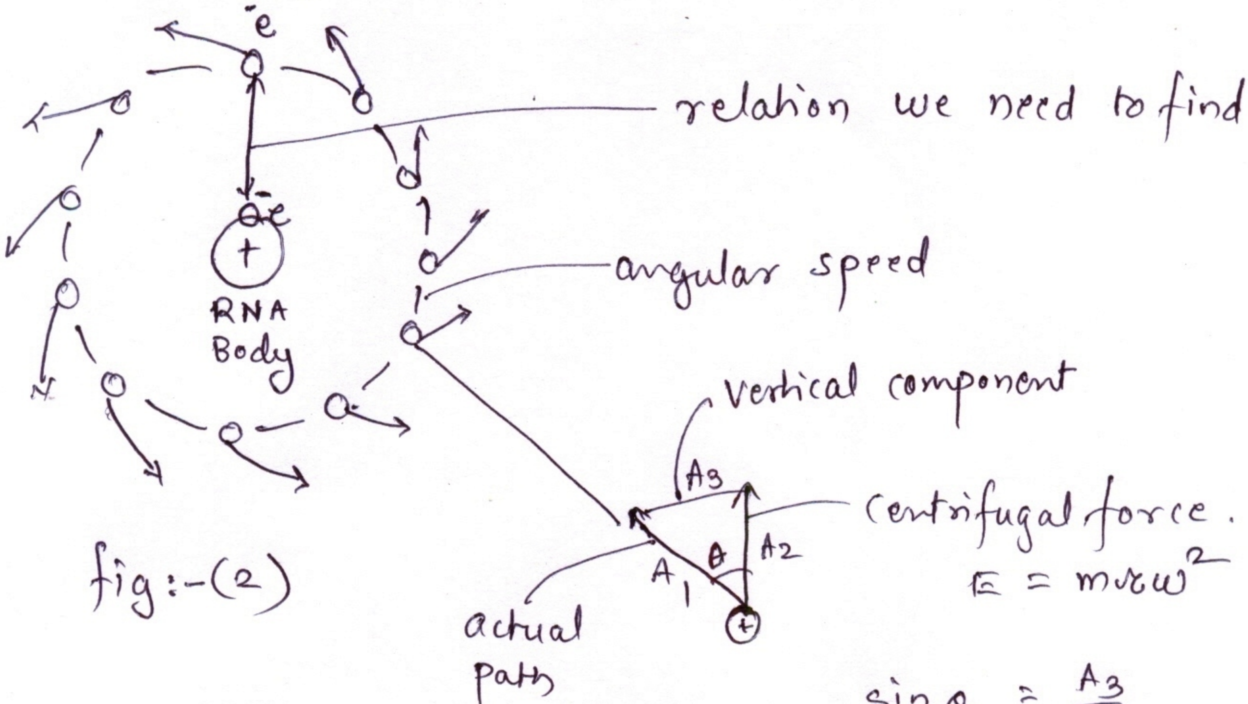


fig:-(2)

$$\sin\theta = \frac{A_3}{A_1}$$

$$A_1 = \frac{A_3}{\sin\theta}$$

we keep diameter = 10 cm

To take this theory forward

1) we need to check electron energy inside atom, how it is getting delivered outside in the form of electromagnetic waves

&

2) How outside generated electromagnetic field is affecting on (-ve) charge [equal to 1 coulomb]

electron charge -ve
Proton charge +ve

$\Big\} = 1.6 \times 10^{-19} C.$

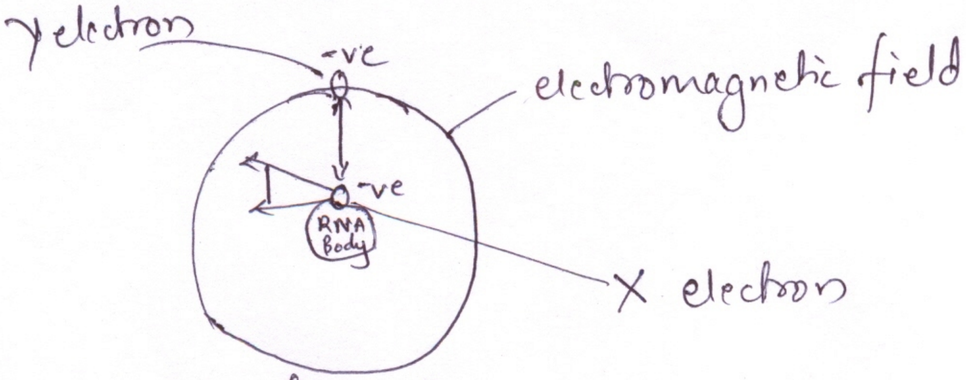


fig :- 3

intention

1) we have to generate traction in electron X.

2) we have to form couple pair X & Y.

1) To develop traction we need following factors

* we go for what is the natural angular rotation of electron of RNA cell.

* Room temperature molecular thermal energy $= 0.04 eV$.

* $1 eV = 1.602 \times 10^{-19}$ joule.

* Energy for dissociation of an NaCl molecule into Na^+ & Cl^- $= 4.2 eV$.

in this way RNA charge we need to find out.

once it is clear that

dissociation energy < seperated ionic energy charge.

that is

NaCl energy < $Na^+ + Cl^-$ energy

Because bonding requires energy.

Lets keep in mind that we should not go upto ionizing or beyond ionizing energy

Lets take an example of Hydrogen atom.

the ionization energy of H atom = 13.6 ev.

Now

Assumption we take for RNA ionization energy

Lets consider the ionization energy of RNA = ionization energy of H.

$$\therefore \; 13.6 \times 1.602 \times 10^{-19}$$

$$= 2.17872 \times 10^{-18}$$

Now,

we have to determine frequency of particle when Hydrogen atom forms

$$\nu = \frac{E}{h} = \frac{2.18 \times 10^{-18}}{6.6256 \times 10^{-34}}$$

$$= 3.29 \times 10^{15} \text{ Hertz.}$$

From Hydrogen electron shift we observed that, shift of electron from orbit 4 to orbit 2 is

$$3.40 \text{ eV} - 0.85 \text{ eV} = 2.55 \text{ eV}$$

$$\therefore \quad \nu = \frac{E}{h} = \frac{2.55 \times 10^{-18}}{6.6256 \times 10^{-34}}$$

$$= 3.84 \times 10^{15} \text{ Hz}$$

But it is actually $= 6.19 \times 10^{15}$ Hz.

So it would be exponential change during ionization. We found variations in it, so there is no direct relation between energy & frequency.

Lets take direct ionization energy of RNA, found emperically. Taking into account the stabilization of the free electron by the solvent, the adiabatic ionization energy in aqueous solution are estimated to be 5.27, 5.05, 4.91, 4.81 and 4.42 eV.

it is clear that the ionization energy of DNA / RNA ranges from 5.27 to 4.42 eV.

Ionization disrupts an atom and make it a chemically active ion. It may disrupts the molecule in which atom resides, and that could damage some process that depends upon the integrity of this molecule.

Our intention is to make (-ve) charge on RNA to make it into ion. Once we make it into (+ve) ion it may interact back to (-ve) RNA. Even it might stop its process of interaction with other DNA. If we make it neutral, then indirectly it will not stay in association with any other charged body.

Lets find interaction energy of atomic electron

We required to design it in quantum form.

Lets take external magnetic field around RNA body.

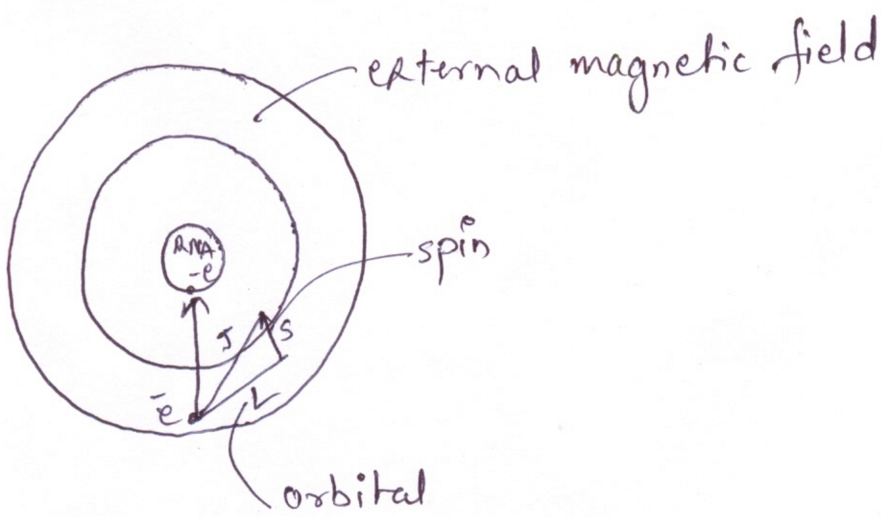


fig (4)

Both orbital & spin angular momenta contribute to the magnetic moment of an atomic electron.

$$\text{Orbital} = \mu_{orbital} = -\frac{e}{2m}\vec{L}$$

$$\text{spin} = \mu_{spin} = -g\frac{e}{2m}\vec{S}$$

From,

Bohr magneton

$$\mu_B = \frac{e\hbar}{2m}$$

← [we have taken this because we have to deal with $\hbar$.]

& from Lande 'g' factor

$$g_L = \frac{1 + j(j+1) + s(s+1) - l(l+1)}{2j(j+1)}.$$

$$\underline{g_L = -1}$$

Evolution of 'g' factor we need to calculate be equation

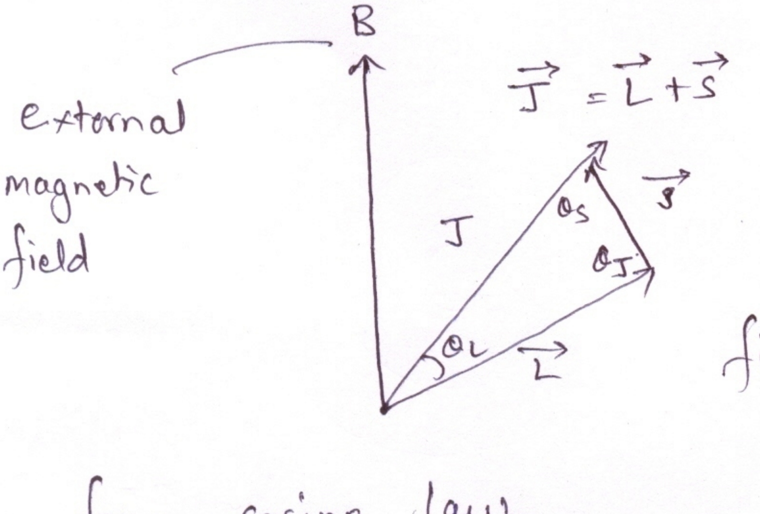


fig-(5)

from cosine law

$$J^2 = L^2 + S^2 - 2LS\cos\theta_J.$$

Expressing this in terms of the external angle gives

$$J^2 = L^2 + S^2 + 2\vec{L}\cdot\vec{S}$$

rearranging gives the scalar product term

$$3\vec{L}\cdot\vec{S} = \frac{3}{2}\left[J^2 - L^2 - S^2\right] \quad -(6)$$

Energy of interaction of atomic electron given as

$$\Delta E = \frac{e}{2m}\left[L^2 + 2\vec{S}\right]\vec{B} \quad -(7)$$

Substituting (6) & (7)

$$\Delta E = \frac{e\hbar}{2m}\left[\frac{L^2 + 2S^2 + \frac{3}{2}(J^2 - L^2 - S^2)}{J^2}\right] m_j B$$

which can be reduced to

$$\Delta E = \frac{e\hbar}{2m}\,\frac{(3J^2 - L^2 + S^2)\, m_j B}{2J^2}.$$

$$= g_L \, m_j \, \mu_B \, B$$

magnetic field

orbital angular momentum

Landes factor

quantum number associated with mass of an electron

But

$$\mu_B = \frac{e\hbar}{2m}$$

$$= 5.78838 \times 10^{-5} \; \frac{eV}{T}$$

orbital cycle

&

$$g_L = -1$$

$$\therefore \quad \Delta E = -1 \times m_j \times 5.78838 \times 10^{-5} \times B$$

$$\therefore \quad \Delta E = 5.79 \times 10^{-5} \text{ for magnetic field of 1 tesla.}$$

$$\Delta E = \mu_B \cdot B \qquad — (8)$$

From fig (1) we get magnetic moment.

$$\mu = I \times A.$$

Magnetic moment can be considered to be vector quantity which direction perpendicular to the current loop.

$$\therefore \quad \underbrace{\tau}_{\text{torque}} = \underbrace{\mu}_{\text{magnetic moment}} \times \underbrace{B}_{\text{magnetic field.}}$$

Since torque acts perpendicular to the magnetic moment, then it can cause the magnetic moment to precess around the magnetic field at a characteristic frequency called as Larmor frequency

for 1 tesla magnetic field

$$\Delta E = 5.79 \times 10^{-5} \text{ eV/T} \qquad — (9)$$

& for 1 militesla magnetic field

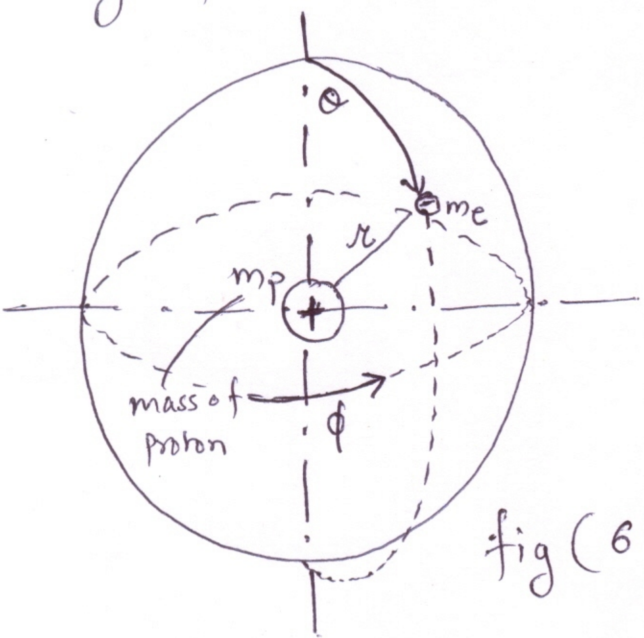
$$\Delta E = 5.79 \times 10^{-9} \text{ eV}$$

From equation (of μ) we found that

$$\mu = IA = \frac{-e}{2m_e} L$$

Now we have to prove that frequeny required to spin electron is less than frequency generated during ionization of RNA.

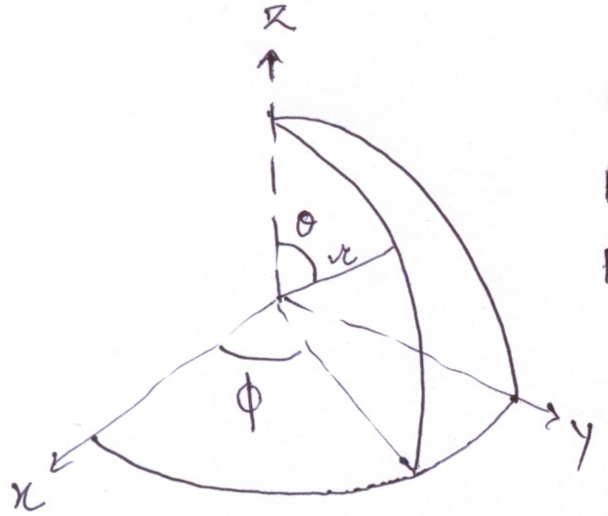
When we go with electron spin, then we go with quantum theory of atom.



seperated into equations in terms of the spherical co-ordinates.

r, θ & ϕ

fig (6)



$R(r)$ = Principal quantum number $n = 1, 2, 3, ..$

$P(\theta)$ = Orbital quantum number $l = 0, 1, 2, .. n-1$

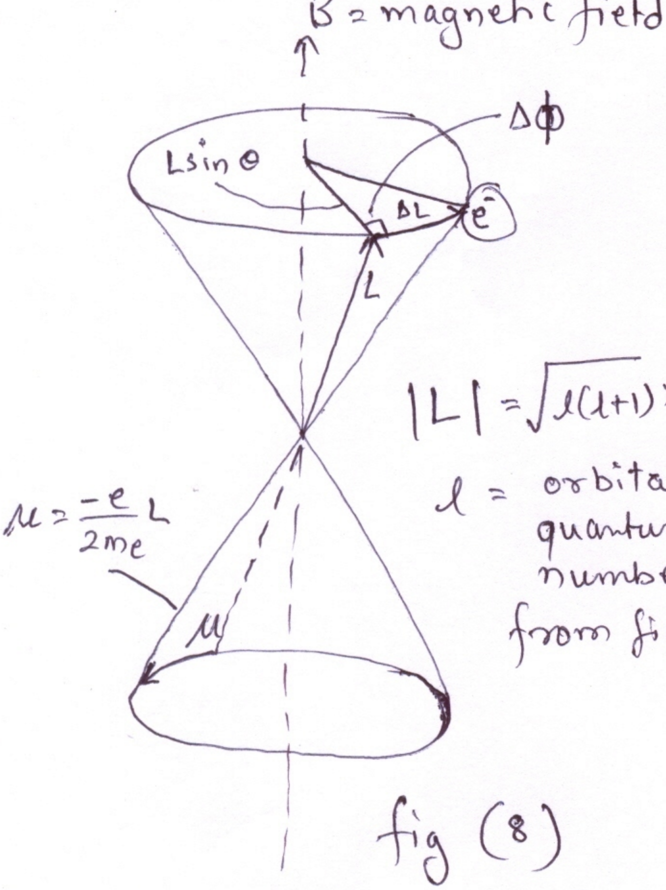
$F(\phi)$ = Magnetic quantum number

$m_l = -l, -l+1, \dots 0 \dots l-1,$

spin quantum number $m_s = +\frac{1}{2}, \frac{-1}{2}$.

fig (7)

From Larmor Precession



$$|L| = \sqrt{l(l+1)} \times \hbar$$

l = orbital quantum number

from fig (7)

fig (8)

magnetic moment 'μ' arises from the motion of an electron in orbit around nucleous, the magnetic moment is proportional to the angular momentum 'L' of the electron. The torque exerted then produces a change in angular momentum which is perpendicular to the 'L', causing the magnetic moment to precess around the direction of the magnetic field rather than settle down in the direction of the magnetic field. This is called Larmor precession

Value of 'L' in classical angular momentum

$$L = mvr \sin\theta$$

velocity

ie. $L = I\omega$

moment of interia

angular velocity

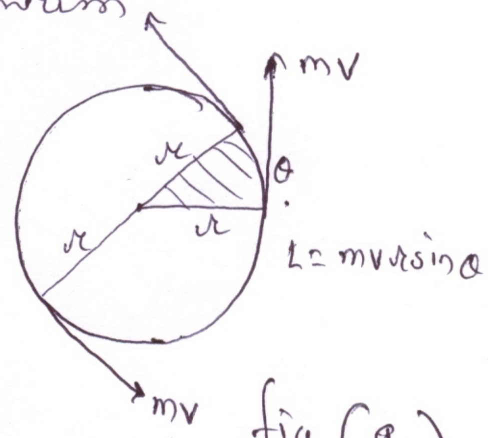


fig (9)

from fig (8)

when a torque is exerted ⊥ to the 'L', it produces a change in angular momentum (ΔL), which is ⊥ to L,

causing it to process about the z axis.
Labelling the precession angle as ϕ, we can describe the effect of the torque as follows

$$\tau = \frac{\Delta L}{\Delta t} = \frac{L \sin\theta \, \Delta\phi}{\Delta t} = |\mu B \sin\theta|$$

$$\tau = \underbrace{\frac{e}{2m_e} L}_{\mu} \; \underbrace{B}_{B} \sin\theta$$

taken due to vector quantity (as magnetic moment is vector quantity)

$$\omega_{Larmor} = \frac{d\phi}{dt} = \frac{e}{2m_e} B.$$

But.

$$\mu_B = \frac{e\hbar}{2m}$$

Proof = described further

[+++ spin quantum number]

from eq^n (9)

$$\therefore \quad \omega_{\substack{electron\\spin}} = \frac{2 \mu_e B}{\hbar}$$

$$= \frac{2 \times 2 \times \frac{1}{2} (5.79 \times 10^{-5} \, eV/T) \, 1(T)}{6.58 \times 10^{-16} \, eV.s}$$

$$= 1.7608 \times 10^{11} \, s^{-1} \quad \text{— (10)}$$

Hence from eq^n (5) description

$$\nu = \frac{\omega}{2\pi} = 28.025 \, GHz$$

$$\nu = 28.025 \times 10^{6} \, Hz. \quad \text{— (11)}$$

Now from eq^n - (11)

$$\left.\text{electron spin frequency} < \begin{matrix}\text{ionization}\\ \text{frequency}\end{matrix}\right] \quad -(12)$$

[+++
spin quantum number ⇒ proof]

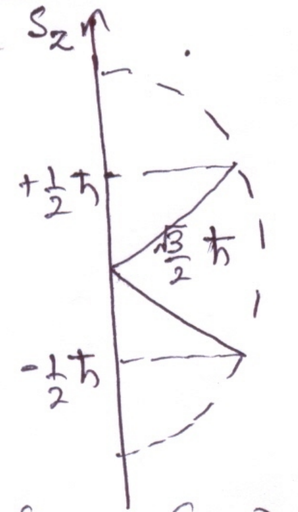


fig - (10)

An electron spin $s = \frac{1}{2}$ is an intrinsic property of electrons. Electrons have intrinsic angular momentum characterized by quantum number $\frac{1}{2}$. In the pattern of other quantized angular momenta, this gives angular momentum,

$$S = \sqrt{\tfrac{1}{2}\left(\tfrac{1}{2}+1\right)}\,\hbar = \frac{\sqrt{3}}{2}\,\hbar$$

The resulting fine structure which is observed corresponds to two possibilities for the z-component of the angular momentum

$$S_z = \pm\frac{1}{2}\hbar$$

∴ for every calculation electron spin $+\frac{1}{2}$ & or $-\frac{1}{2}$ are taken in to a account.

Hence from equation - (11 & 12)
it is clear that our step to treat RNA below ionization frequency or energy is perfect.

Now we have to spin the -ve charge on RNA below the ionizing frequency / energy.

-ve charge is completely associated with the body of RNA.
We have to check whether there would be any physical damage to RNA at electron spin frequency.

It is also clear that we need to rotate magnetic field with 'ω', so that -ve charge on RNA will get spin.

Now we go with body structure of RNA.
We need to find the pressure exerted with respect to velocity, radius & lift of body (RNA) in Z axis.

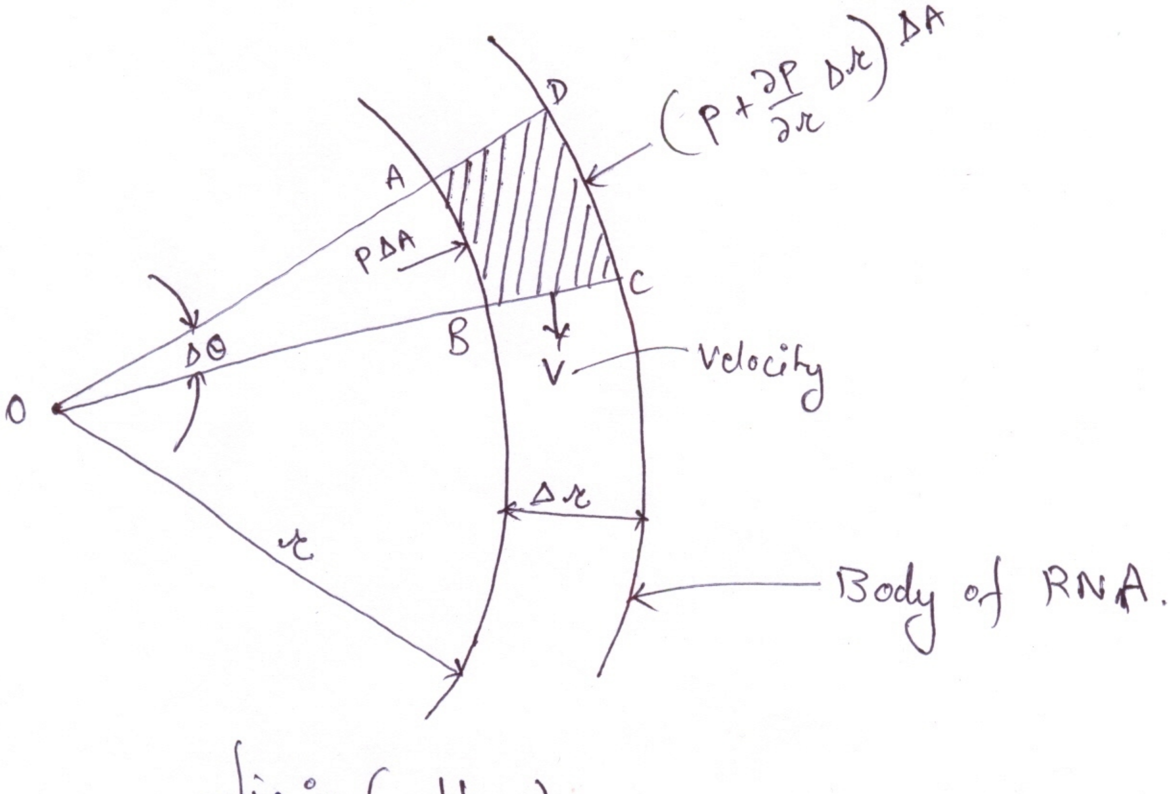


fig:- (11)

Consider a element ABCD in body of RNA. Once we want to spin (-ve) charge on RNA, then there might be possibility to rotate RNA Body.

When spin extends the inertia of RNA then we can make it neutral. To study this we have taken small element ABCD.

Rotating to an uniform velocity in a horizontal plane about an axis perpendicular to the plane and passing through O.

r = Radius of the element.

$\Delta\theta$ = Angle subtended by the element

Δr = Radial thickness of the element.

ΔA = Area of cross section of element

Let the forces acting on the element are

i) Pressure force $P\Delta A$, on the AB side

ii) Pressure force $\left(P + \frac{\partial P}{\partial r}\Delta r\right)\Delta A$, on the CD side

iii) Centrifugal force, $\frac{mv^2}{r}$ along acting in the direction away from the centre O,

Now the mass of the element = mass density × volume

$$= \rho \times \Delta A \times \Delta r.$$

$$\therefore \text{ Centrifugal force } = \rho \times \Delta A \times \Delta r \times \frac{v^2}{r}$$

Equating the forces in the radial direction we get

$$\left(P + \frac{\partial P}{\partial r}\Delta r\right)\Delta A - P\Delta A = \rho\,\Delta A\,\Delta r\,\frac{v^2}{r}$$

cancelling $\Delta r \times \Delta A$ to both sides,

we get

$$\frac{\partial p}{\partial r} = \rho \frac{v^2}{r} \quad \text{— (13.)}$$

$\frac{\partial p}{\partial r} = \rho \frac{v^2}{r}$ gives the pressure variation along the radical direction for a forced or free vortex flow in horizontal plane.

The $\frac{\partial p}{\partial r}$ is pressure gradient in the radical direction.

As $\frac{\partial p}{\partial r}$ is positive, hence pressure increases with the increase of radius 'r'.

We know that RNA radius is much smaller & approximately equal to charge on it. So during spin of charge we will not get much effect on body of RNA.

The pressure variation in the vertical plane is given by

$$\frac{\partial p}{\partial z} = -\rho g \quad \text{— (14)}$$

mass density

acceleration due to gravity.

Z is measured vertically in the upward direction.

The pressure 'p' varies with respect to 'r' & Z or 'P' is a function of 'r' & 'z'.

so total derivative of p is

$$dp = \frac{\partial p}{\partial r} \partial r + \frac{\partial p}{\partial z} dz.$$

substituting values of (13) & (14)

$$\boxed{dp = \rho \frac{v^2}{r} dr - \rho g\, dz} \quad — (15)$$

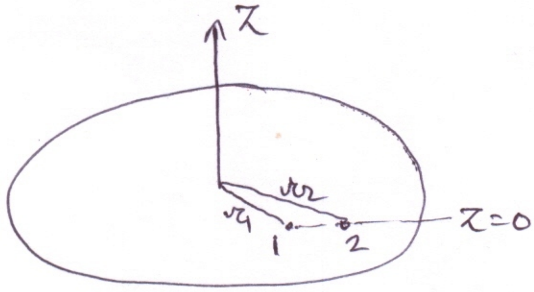
we know that,

$v = r\omega$ — angular velocity = keep constant

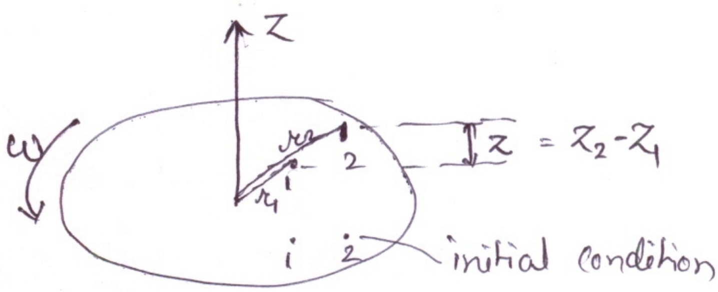
$$dp = \rho \times \frac{\omega^2 r^2}{r} dr - \rho g\, dz$$

$$dp = \rho \times \omega^2 r\, dr - \rho g\, dz \quad — (16)$$

When we rotate the body of RNA forcefully, there might be possibility of raising body parts in Z direction



Body at rest
fig :- (12)



rotating body of RNA
fig :- (13)

consider two points 1 & 2 in the rotating body

integrating equation (16)

$$\int_1^2 dp = \int_1^2 \rho\omega^2 r\, dr - \int_1^2 \rho g\, dz$$

$$(P_2 - P_1) = \left[\rho \omega^2 \frac{r^2}{2}\right]_1^2 - \rho g [z]_1^2$$

$$= \frac{\rho \omega^2}{2}\left[r_2^2 - r_1^2\right] - \rho g [z_2 - z_1]$$

$$= \frac{\rho}{2}\left[\omega^2 r_2^2 - \omega^2 r_1^2\right] - \rho g [z_2 - z_1]$$

$$= \frac{\rho}{2}\left[v_2^2 - v_1^2\right] - \rho g [z_2 - z_1] \quad \left\{ \because \begin{array}{l} v_2 = \omega r_2 \\ v_1 = \omega r_1 \end{array} \right\}.$$

As we know the point 1 & 2 lies on the free surface of the RNA Body then $\underline{P_1 = P_2}$

and hence above equation becomes

$$0 = \frac{\rho}{2}\left[v_2^2 - v_1^2\right] - \rho g [z_2 - z_1]$$

$$\rho g [z_2 - z_1] = \frac{\rho}{2}\left[v_2^2 - v_1^2\right]$$

$$[z_2 - z_1] = \frac{1}{2g}\left[v_2^2 - v_1^2\right]$$

if the point 1 lies on the axis of rotation

then $v_1 = r_1 \omega$

$= 0 \times \omega$

$v_1 = 0$

$\therefore$ The above equation becomes as

$$z_2 - z_1 = \frac{1}{2g} v_2^2 = \frac{v_2^2}{2g}$$

Let

$$z_2 - z_1 = Z$$

$$\therefore \boxed{Z = \frac{v_2^2}{2g} = \frac{\omega^2 \times r_2^2}{2g}} \quad \text{--- (17)}$$

Thus from equation (17) Z varies with the square of 'r', hence equation is an equation of parabola. This means the RNA body forms parabolic shape.

Lets calculate the actual lift z.

Radius of RNA body $= 1.7 \times 10^{-10}\ m = r$

mass of RNA body $= 1.3 \times 10^{-16}\ kg = m$

Density of RNA body $= \rho = \frac{m}{V} = \frac{1.3 \times 10^{-16}}{1 \times 10^{-6}}$

$$\rho = 1.3 \times 10^{-10}\ m^3$$

The ionization energy of RNA body $= 4.42\ eV$.

From equation (1)

$$E = h\nu$$

$$\nu = \frac{4.42}{3.76 \times 10^{-13}}$$

$$\nu = 1.175 \times 10^{13}\ Hz \quad - (18)$$

from equation (5) description

$$\omega = 2\pi\nu$$

$$\omega = 2 \times \pi \times 1.175 \times 10^{13}$$

$$\omega = 7.38 \times 10^{13}\ rad/sec.$$

from equation (17)

$$z = \frac{\omega^2 \times r_2^2}{2g}$$

Lets consider r_2 at extreme end of RNA body

$$Z = \frac{(7.38 \times 10^{13})^2 \times (1.7 \times 10^{-10})^2}{2 \times 9.8}$$

$$Z = 8043968.421\,m \quad \text{— (19)}$$

The value of Z is high, this makes -ve charge on RNA body to get detach/neutral/spin from body in minimum time of less than 1 sec.

Now,
We calculate how much energy required to spin electron for single RNA body.

We deal with angular velocity

$$\therefore E = \hbar \omega \quad \text{— from eq}^n (5)$$

$$= \hbar \times 2\pi\nu$$

$$= 9.87 \times 10^{-15} \times 2 \times \pi \times 1.175 \times 10^{13} \quad \text{— from eq}^n \text{-(18)}$$

$$E = 0.7286 \text{ joules}$$

So we need energy below 0.7286 joules & frequency less than 1.175×10^{13} Hz.

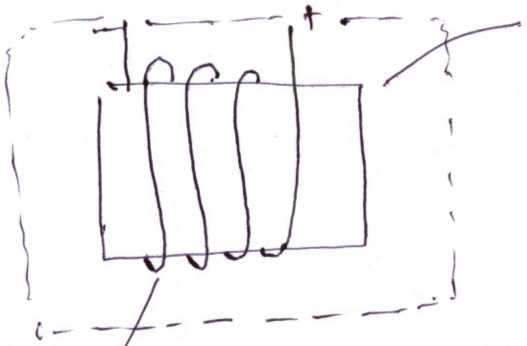
Hence we require frequency 28.025×10^{6} Hz — from eq^n-(11)

From equation (10) we required electron spin angular velocity $1.7608 \times 10^{11}\ s^{-1}$, which is less than $\omega = 7.38 \times 10^{13}$ rad/sec

Hence electron spin Energy, frequency & angular velocity < ionization energy, frequency & angular velocity

We require to calculate magnetic field strength.

$$\text{Voltage generate} = -N \frac{d\phi}{dt} \quad -(20)$$



$$\frac{dA}{dt} = \frac{m^2}{s}$$

$$\frac{dB}{dt} = \frac{\text{tesla}}{\text{sec}}$$

Change with respect to time

fig:-(14)

N = number of turns

Now we have to keep focus, that current should be constant,

take current $I = 0.5$ amp.

$$\therefore \quad E = V \times I \times t$$

Voltage Current time = 1 sec

$$0.7286 = V \times 0.5 \times 1$$

$$V = \frac{0.7286}{0.5}$$

$$V = 1.4572 \text{ volt}$$

In this experiment depends on hardware or equipment available, we can keep V, I or t constant.

from equation – (20) $\frac{d\phi}{dt}$ = common

$$V_{generate} = -N\left(\frac{dA}{dt}\right)\left(\frac{dB}{dt}\right)$$

$$= -N \times A \times B$$

$$1.4572 = -N \times 0.2\ \text{Tesla} \times 0.01$$

$$N = \frac{1.4572}{0.2\ T \times 0.01}$$

$$N = 728.6$$

$$N \approx 729$$

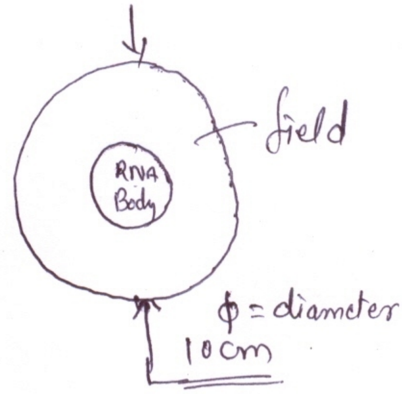


fig:-(15)

number of turns on coil should be 729.

Math conclusions as per requirement of experiment are

i) we go for -ve charge spin.

ii) we require energy below = 0.7286 J.

iii) we require magnetic field strength = 0.2 T

This we can change as per current, Voltage & number of turns.

Field strength also depends on area of action. We have assumed area = $10\ cm^2$.