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RERERENCES

1. Ouseph C.C., U.J. Rao and V. Vijayendran 2007, Practical Physics and Electronics, S.Viswanathan (Printers & Publishers) Pvt. Ltd., Chennai
2. Singh S.P., 2003, Advanced Practical Physics – 1, 13th Edition, Pragathi Prakashan, Meerut
3. Singh S.P., 2000, Advanced Practical Physics – 2, 12th Edition, Pragathi Prakashan, Meerut

Characteristics of Geiger Muller Counter

Exp No.:

Date:

Aim:

To plot the characteristic curve of the GM counter and to determine the starting voltage Vs of the GM counter, Threshold voltage Vth. (or V1) of the GM counter and Operating voltage V0 of the GM counter.

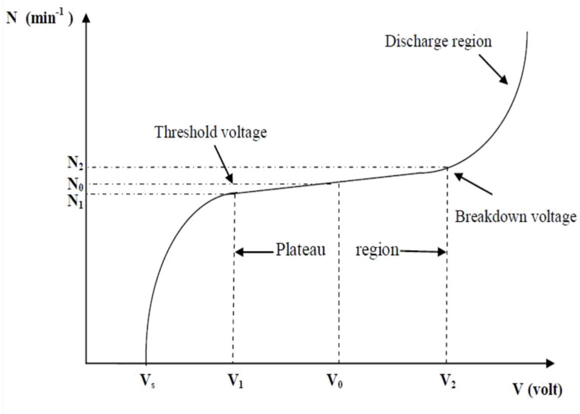
Apparatus:

Source of radiation. Geiger detector, HV power supply.

Procedure:

1. Connect the plugs of the electric mains.
2. Set the timer to 60 s and the HV to 280 Volt.
3. Record the count rate per one minute for the back ground (NB.G).
4. Put the source in front of the Gieger tube on the second shelf from top .
5. Set the high voltage to 220 V and start counting. Increase the applied voltage in steps of 20 V until the detector begins to operate, this is the starting voltage (Vs).
6. Increase the applied voltage and record the count rate per one minute (N_1) for each voltage. Take two readings for each voltage and take their average.
7. Plot the counting rate (N) versus the applied voltage (V) deduce the threshold voltage, the plateau length, the operating voltage and the percentage gradient of the detector.

Model Graph



Calculations and results:

Vs = …........… (………)

V_1 = ……..….. (………)

V2 = ..…...….. (………)

V_0= (………)

Plateau length =

N1 = …..….. (………).

N_2 = ……..… (………)

N0 = ……..... (………)

Result

The Characteristic curve for Geiger Muller counter has been drawn and the operating voltage and threshold voltage has been found.

Exp No: **MATLAB Program – Radioactive Decay**

Date:

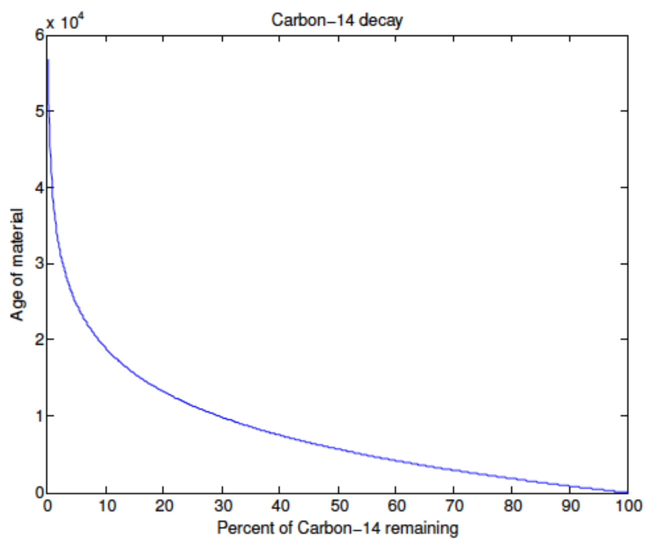
Aim:

To write and execute a MATLAB program for radioactive decay of C-14

Program:

```
lambda=log10(2)/5700;
for i=1:100
y(i)=(-1/lambda)*log10(i/100)
end
x = [i:100];
y = [i:100];
plot(x, y);
title('Carbon-14 decay');
xlabel('Percent of Carbon-14 remaining');
ylabel('Age of material');
xlim([0, 100]);
ylim([0, 60000]);
grid on;
```

Result



The MATLAB program has been written for radioactive decay and executed.

Exp No: **MATLAB Program – Numerical Integration**

Date:

Aim:

To write and execute a MATLAB program for numerical integration

Program:

```
>> a=0; b=3; n=20;
>> h=(b-a)/n;
>> x=a:h:b;
>> y=x.^2;
>> h*trapz(y)
ans =
   9.0113
>> n=100;
>> h=(b-a)/n;
>> x=a:h:b;
>> y=x.^2;
>> h*trapz(y)
ans =
   9.0004
```

Result

MATLAB program for numerical integration using the trapezoidal approximations and result has been found.

Exp No: **MATLAB Program – Double Integration**

Date:

Aim:

To write and execute a MATLAB program for double integration

$$\int_0^1 \int_{1-x}^{1-x^2} xy\,dy\,dx.$$

To evaluate the integral symbolically, we can proceed in two stages.

Program:

```
syms x y
firstint=int(x*y,y,1-x,1-x^2)
answer=int(firstint,x,0,1)
firstint =
 (x^2*(x - 1)^2*(x + 2))/2
 answer =
1/24
int(int(x*y,y,1-x,1-x^2),x,0,1)
ans =
1/24
```

Result

MATLAB program for the solution of double integration has been written and executed.

Exp No: **MATLAB Program – Solution of ordinary differential equation**

Date:

Aim:

To write and execute a MATLAB program for the solution of ordinary differential equation

Program:

y'=f(t,y) ,

where y=y1+iy2. To solve it, separate the real and imaginary parts into different solution components, then recombine the results at the end. Conceptually, this looks like

yv=[Real(y) Imag(y)]fv=[Real(f(t,y)) Imag(f(t,y))] .

For example, if the ODE is y'=yt+2i, then you can represent the equation using a function file.

```
function f = complexf(t,y)
% Define function that takes and returns complex values
f = y.*t + 2*i;
```

Then, the code to separate the real and imaginary parts is

```
function fv = imaginaryODE(t,yv)
% Construct y from the real and imaginary components
y = yv(1) + i*yv(2);
% Evaluate the function
yp = complexf(t,y);
% Return real and imaginary in separate components
fv = [real(yp); imag(yp)];
```

When you run a solver to obtain the solution, the initial condition y0 is also separated into real and imaginary parts to provide an initial condition for each solution component.

```
y0 = 1+i;
yv0 = [real(y0); imag(y0)];
tspan = [0 2];
```

```
[t,yv] = ode45(@imaginaryODE, tspan, yv0);
```

Once you obtain the solution, combine the real and imaginary components together to obtain the final result.

```
y = yv(:,1) + i*yv(:,2);
```

Result

MATLAB program for the solution of ordinary differential equation has been written and executed.

Exp No: **MATLAB Program – Equation of motion for a moving particle**

Date:

Aim:

To write and execute a MATLAB program for the equation of motion for a moving particle

Program:

```
% script that simulates a moving particle with some initial velocity in a
% magnetic field B
v0 = [5 0 0]; %initial velocity
B = [0 0 -5]; %magnitude of B
m = 5; % mass
q = 1; % charge on particle
r0 = [0 0 0]; % initial position of particle
t = 0;
% Now we want to find the next velocity as the particle enters the magnetic
% field and hence its new position
r = r0;
v = v0;
dt = 0.00000000000000000001;
figure
xlim([-25 25])
ylim([-25 25])
hold on
for n = 1:100
%plot it
plot(r(1),r(2),'*');
%pause
% update time
```

```
t = t+dt;
% new position r
dr = v*dt;
r = r + dr;
%find new velocity
dv = (q/m) * cross(v,B);
v = v + dv;
end
```

Result

MATLAB program for the equation of motion of a moving particle has been written and executed.

LASER – Determination of wavelength of LASER using grating

Exp No :

Date :

Aim:

To determine the wave length of the given laser source of light using grating

Apparatus Required;

He – Ne laser (or) Semi conductor, Grating, Screen, Paper& pencil

Formula:

Wave length of the given laser source of light

$$\lambda = \frac{\sin\theta}{Nn} metre$$

Where

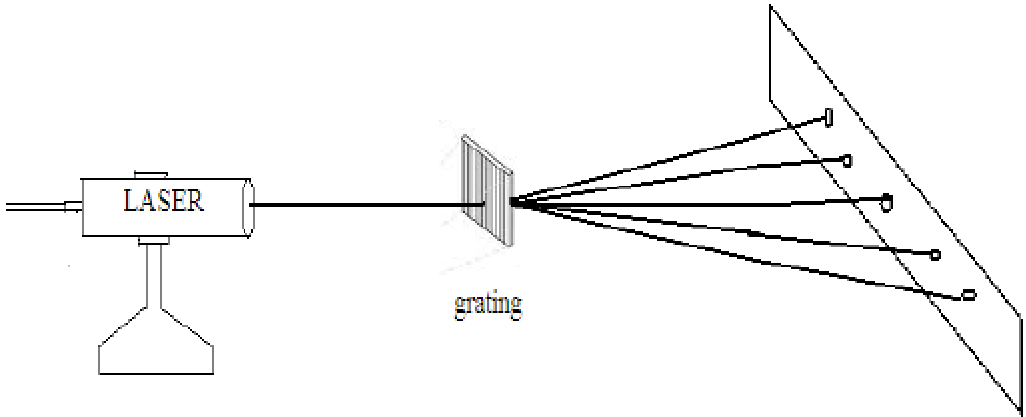
θ → Angle of diffraction in degrees

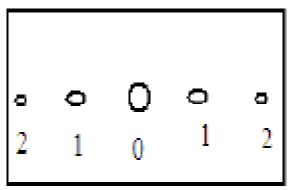
n → Order of diffraction

N → Number of lines in the grating per metres

Procedure:

He-Ne laser or Semiconductor laser is kept horizontally and switched on. The grating is held normal to the laser beam. This is done by adjusting the grating in such way that the reflected laser beam coincides with beam coming out of the laser source. After adjusting for normal incidence, the laser light is exposed to the grating and it is diffracted by it. On the other side of the grating on the screen, the diffracted laser spots are seen. The distances of different orders from the centre spot (Xn) are measured. The distance between the grating and screen (D) is measured. Using the formula, 'θ' is calculated. The wave length of the laser light is calculated using the formula





Determination of wave length of laser light –Readings

Distance between grating and laser source (D) = ………………metres

Number of lines in the grating per metres = 5 X 10^5 lines/m

S.No.	Order of Diffraction 'n'	Readings for the diffracted image						Mean θ	$\lambda = \frac{\sin\theta}{Nn} metr$
		Left Side			Right Side				
		Distance of the Diffraction order from central spot	Tan θ = X/D	θ = Tan^{-1} (X/D)	Distance of the Diffraction order from central spot	Tan θ = X/D	θ = Tan^{-1} (X/D)		
1									
2									
3									
4									

Mean wave length of the given laser light =…………..

Result:

Wave length of the laser the light source = ------------------- m

Dr. B. Janarthanan
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Laser - Diffraction by wire

Aim:

To find the wavelength of laser using a thin wire of unknown thickness.

Apparatus used:

He-Ne laser with stand and Screen

Formula:

When a thin wire is introduced in the path of the laser beam, the beam undergoes diffraction similar to *the two-slit Fraunhofer diffraction*. If the thickness of the wire is d, then the angular position θ for the 1st minima on either side is given by

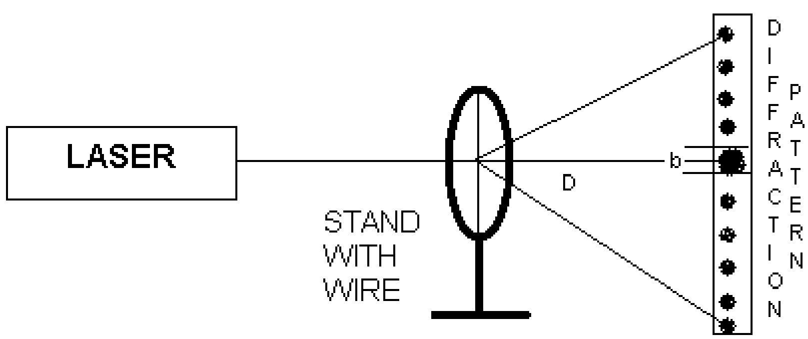
$$d \sin\theta = \lambda/2$$

Now, if the distance between the wire and the screen is D, and the width of the central maxima is b, assuming the angle θ to be small, we can write

$$\sin\theta \cong \theta \cong b/2D$$

Which gives the wavelength of the laser light as:

$$\lambda = \frac{bd}{D}$$



Procedure:

1. Switch on the laser and wait till the beam stabilizes. Align the laser beam horizontally so that it may fall on wire properly.

2. Place the wire symmetrically in the path of the beam. Keep the distance between screen and the wire sufficiently large (≈1m).
3. Place paper on the screen and mark the points corresponding to the maxima.
4. Carefully measure the distance between the points with the help of graph sheet.
5. Repeat the experiment for three different distances between wire and screen.
6. Calculate the wavelength in each case and find the average wavelength of laser beam.

Observation:

Least count of the vernier calipers =

Least count of the measuring scale =

Thickness of the wire d =

Table for finding out the wavelength of laser beam

Sr. No.	Distance of the wire from the screen D	Width of the Central Maxima b	Wavelength of the laser beam $\lambda = \frac{bd}{D}$	Mean Wavelength

Result:

The wavelength of the He-Ne laser is…………….Å