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mo = 9.1e-31; %mass in kg
mn = 0.26*mo; %mass of electrons

regionW = [0 200e-9]; %width of region
regionL = [0 100e-9]; %Length of region

T = 300; %in Kelvin
kB = 1.28e-23; %in J/K
vthrms = sqrt((kB*T)/mn); %thermal velocity rms

tmn = 0.2e-12; %mean time between collisions
tstep = 0.01e-12;
mfp = vthrms * tmn; %mean free path

%creating electrons
x = regionW(1,2).*rand(1,1000); %position
y = regionL(1,2).*rand(1,1000);
%ceating velocity
pvx = rand(1,1000).*vthrms; %x and y vector portions
pvy = sqrt(vthrms^2-(pvx.^2));
svx = sign(rand(1,1000)-0.5); %assigning direction of vectors
svy = sign(rand(1,1000)-0.5);
vx = pvx .* svx; %x and y components
vy = pyv .* svy;
vf = sqrt(vx.^2 + vy.^2);
figure('name','Part1')

for n = 1:200
    x = x + vx.*tstep;
    y = y + vy.*tstep;

    %when partile hit bottom or top
    vy(y <= 0) = -vy(y<=0);
    vy(y>=100e-9) = -vy(y>=100e-9);
    %when particle hit sides
    x(x<=0) = x(x<=0)+200e-9;
    x(x>=200e-9) = x(x>=200e-9)-200e-9;

    %creating plot area
    subplot(2,1,1)

    %particles to be graphed
    showx = x(1:10);
    showy = y(1:10);

    %plot of particles
    colours = linspace(1,10,length(showx));
    scatter(showx,showy,50,colours,'.')
    xlim(regionW)
    ylim(regionL)
    title('Particle movement')
    pause(0.001)

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hold on

%plot of tempture
subplot(2,1,2)
temp = (mn/kB)*mean(vf)^2;
scatter(n,temp,400,'r','.')
title('Temperature (K)')
hold on

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end
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