Endsem

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1 Question 1:

The plasma parameters for various palsmas have been shown below. The x axis corresponds to the number of the length scale in the question.

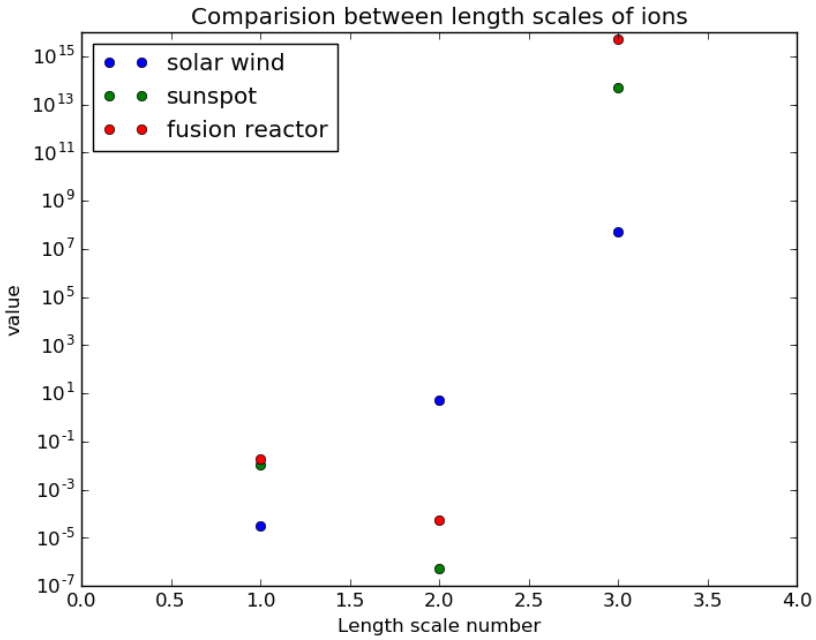

Figure 1: Plasma length scales for ions

The xaxis corresponds to the timescale no. in the question

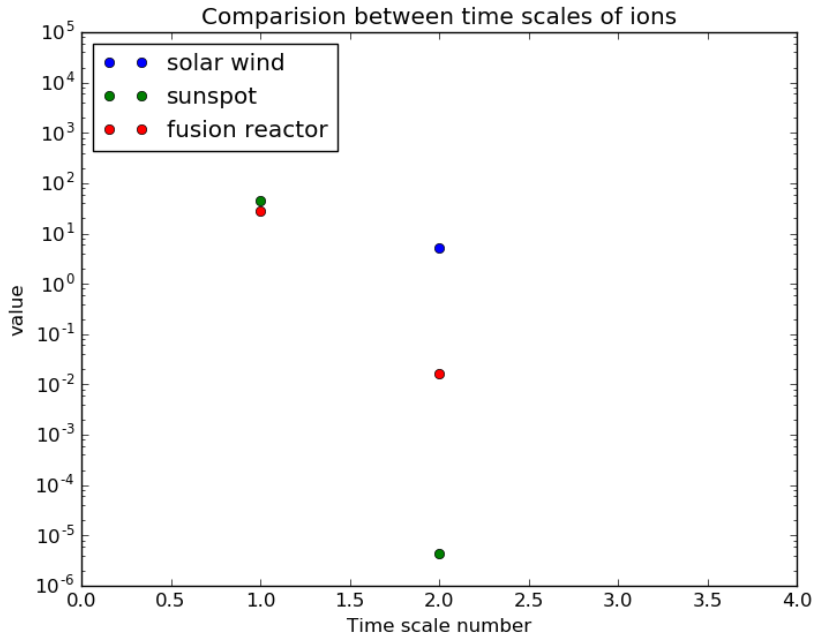

Figure 2: Plasma time scales for ions

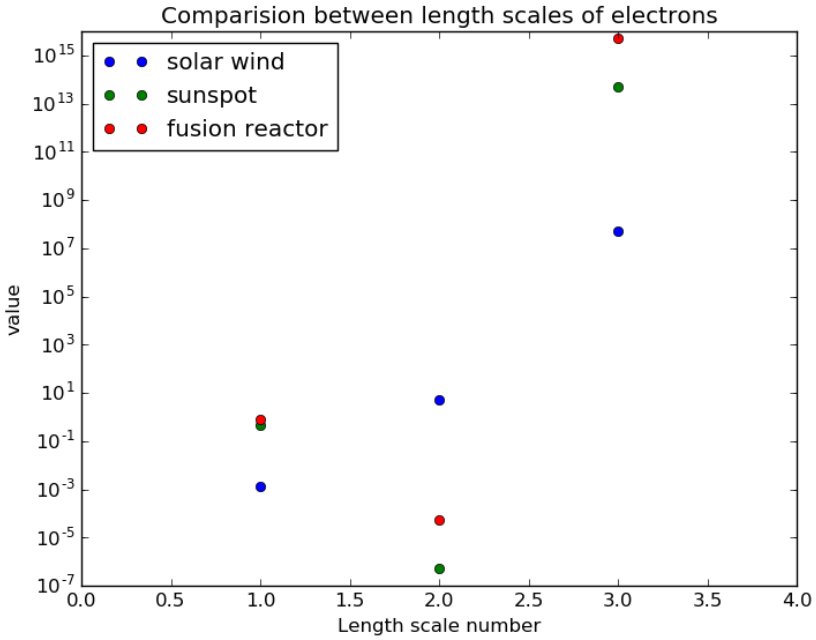

Figure 3: Plasma length scales for electrons

The xaxis corresponds to the timescale no. in the question

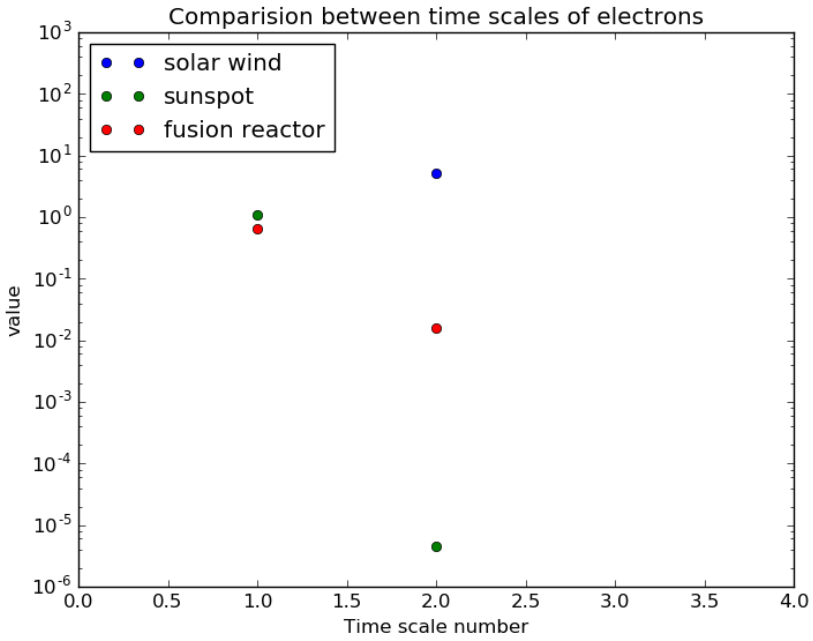

Figure 4: Plasma time scales for electrons

2 Question 2:

2.1 a)

As shwn in the calculations in the answer sheet we see that the magnetic moment is in fact a adiabatic invariant. This can be seen even in the simulation when where is no electric field. We see that the relative error is of the order of $10^{-}12$ which is negligible

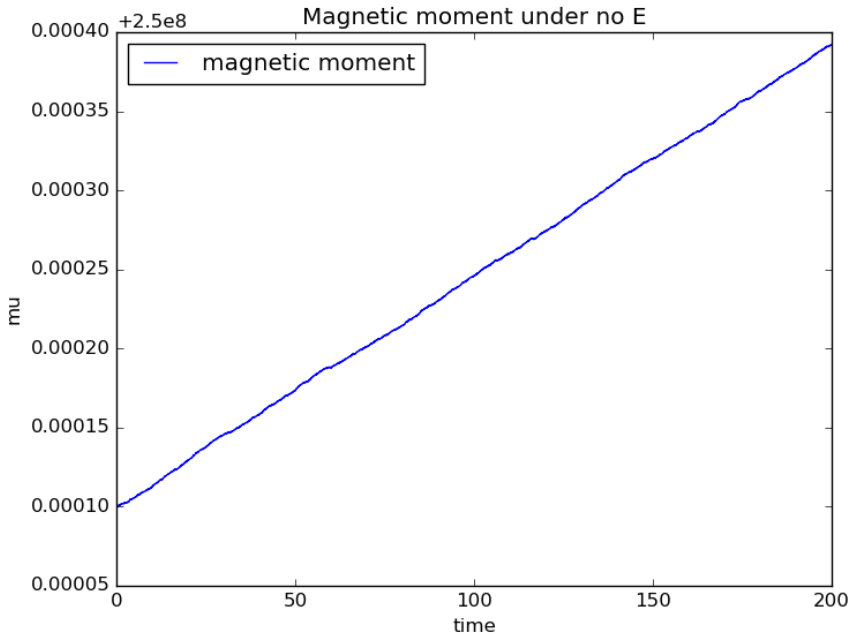

Figure 5: Variation of magnetic moment

When there is a constant electric field of $10^5 N/m$, we see that μ oscillates

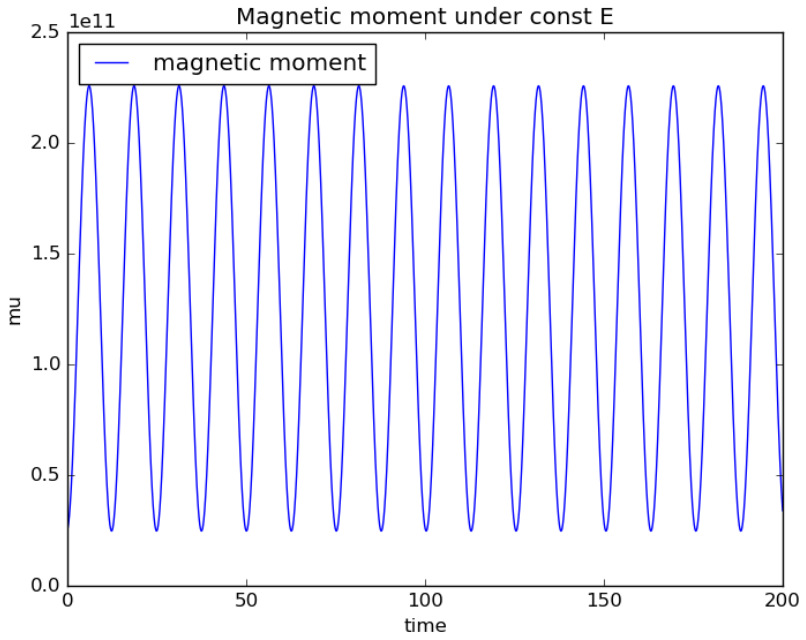

Figure 6: Variation of magnetic moment

2.2 b)

: On solving we get the analytical solution as worked out in the answer booklet. For simulation we used the amplitude of electric field as 10^5 and the frequency as 0.2

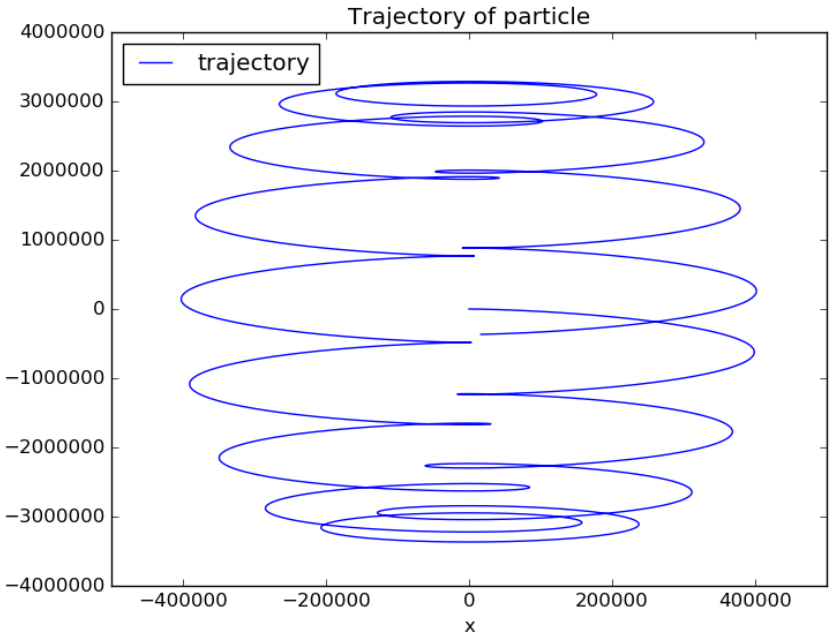

Figure 7: Change in position

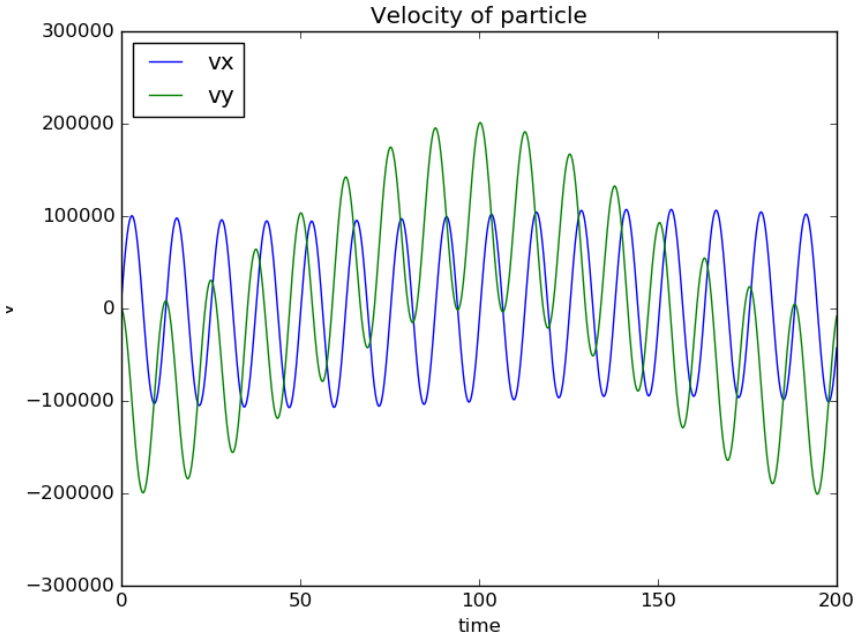

Figure 8: Change in velocity

We see that the change in vx and vy is similar to addition of 2 sine waves which is similar to the nature of the analystical solution (Some problem with the implementation of the exact soln, therefore not able to find the error) Also, since the electric field is oscillating it increases the random motion of the particles. This the conductivity decreases

2.3 c)

Electric field of 10 V/m was used to simulate the result.

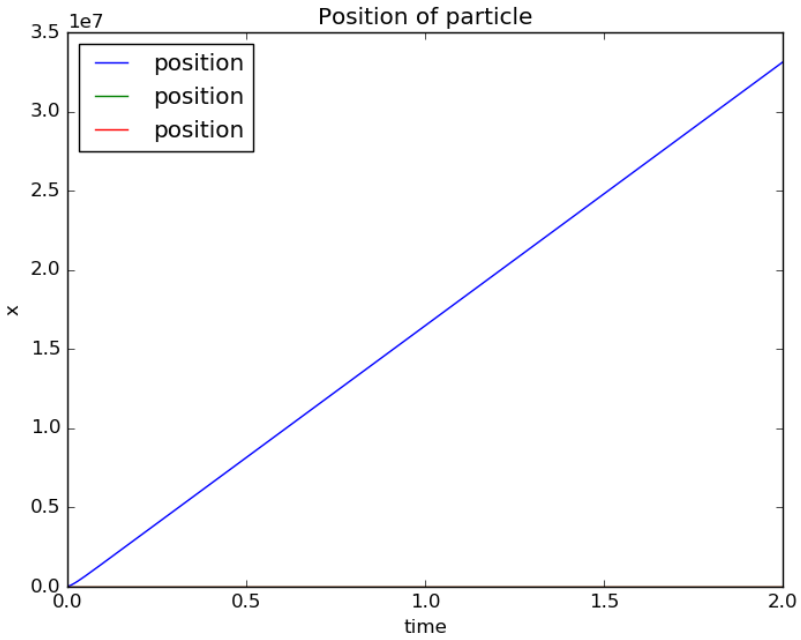

Figure 9: Change in position

Since the particle density of the plasma is high and the temperature is cold, the conductivity of this plasma would be much more than its surroundings

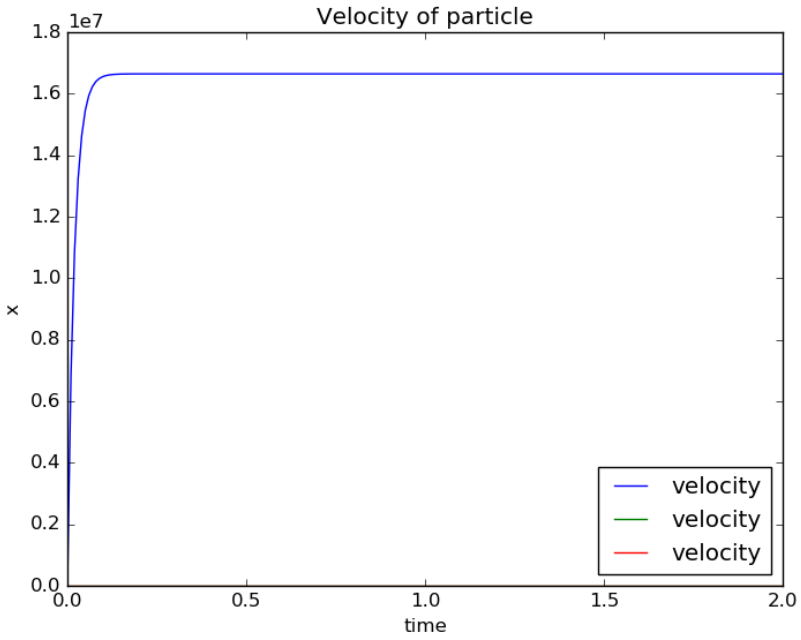

Figure 10: Change in velocity