Tutorial Sheet-6 (Even Semester, 2020) [Physics-2 (15B11PH211)]

1. Verify that the rms speed of an ideal-gas molecule is about 9 percent greater than its average speed.
   [CO3]
2. Find the rms speed of nitrogen molecules at 0 $^{\circ}$C ?
   [CO2]
3. Differentiate between the Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac distribution functions? Find the condition when Bose-Einstein and Fermi-Dirac distribution functions converge to that of Maxwell-Boltzmann?
   [CO1]
4. At what temperature would one in a thousand of the atoms in a gas of atomic hydrogen be in the n=2 energy level ?
   [CO2]
5. An assembly has only two particle and there are only two quantum states to be occupied. Find out the various possible arrangements in (i) MB (ii) BE & (iii) FD statistics.
   [CO2]
6. The density of zinc is 7.13 g/cm^3 and its atomic mass is 65.4 u. The effective mass of an electron in zinc is 0.85 m_e. Calculate the Fermi Energy in zinc.
   [CO4]

7. Show that the most probable speed of gaseous molecule $= \upsilon_p = \sqrt{\frac{2kT}{m}}$.
   [CO2]

8. An electron gas at temperature T has Fermi energy ε_F. At what energy is there a 5% probability that a state of that energy is occupied?
   [CO3]