

St.Xavier's College Physics Club

(SXCPC)

## Maitighar, Kathmandu



## **Question Of the Month-November Series**

In a star, hydrostatic equilibrium is an equilibrium maintained between the gravitational pressure ( $P_0$ ) of the star, the gaseous pressure ( $P_g$ ) of the star, and the radiation pressure ( $P_r$ ) of the star. It helps to prevent the star from collapsing under its own gravity and also prevents extreme star flares. The condition of hydrostatic equilibrium is:  $P_g + P_r = P_0$ .

Here  $P_g = \frac{\rho kT}{\mu}$ 

where  $\rho$  is the density of the gas,  $\mu$  is the mean molecular weight, k is the Boltzmann constant, and T is the temperature of the star.

## **Questions:**

a) BAST-01A, a hypothetical star with a mass of 3.282×10<sup>31</sup> kg and a radius of 6.171×10<sup>11</sup> meters, violently exploded, becoming a supernova. If the mean molecular weight of the star constituents was 0.6 and their density was 0.00003334 kg/m<sup>3</sup>, Find the temperature of the star just before the explosion.



b) Explain the process by which a High Mass Star becomes a blackhole or a supernova.