**Molecular Clouds**

The stability of a molecular cloud against gravitational collapse is a function of the cloud’s temperature and density, as given by the following formula. In the formula, T is the temperature in degrees Kelvin, and n is the number of atoms and molecules per cubic centimeter.

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## (This comes from setting the pressure force equal to the gravitational force.)

## This relationship is shown in the adjacent graph for three temperatures, 10, 30, and 50 Kelvin.

## For mass and density below the line for the cloud’s temperature, a cloud will be pushed apart by pressure, but if the mass and density of the cloud fall above the line, it will collapse gravitationally. A point exactly on the line will be stable, and will neither collapse nor expand.

## Four small molecular clouds are listed in the table below. For each determine if the cloud is stable against gravitational collapse. You can use either the graph or the equation, but be sure to plot each point on the graph above.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Cloud | Temperature | Density | Mass | Stable? |
| Lynds 1014 | 20 K | 1.2 x 106 cm-3 | 3.6 solar masses |  |
| Barnard 68 | 16 K | 2 x 105 cm-3 | 2 solar masses |  |
| Lynds 694-2 | 12 K | 5.5 x 103 cm-3 | 3 solar masses |  |
| G2 Coalsack | 12 K | 3 x 103 cm-3 | 10 solar masses |  |

Which clouds are likely to be collapsing to form new stars?