

- 8.13** There have been suggestions that the value of the gravitational constant G becomes smaller when considered over very large time period (in billions of years) in the future. If that happens, for our earth,
- (a) nothing will change.
 - (b) we will become hotter after billions of years.
 - (c) we will be going around but not strictly in closed orbits.
 - (d) after sufficiently long time we will leave the solar system.

Sol: (c, d) We know that gravitational force exists between the earth and the sun.

$F_G = G(M_S \times m_e) / r^2$ Where M_S is mass of the sun and m_e is mass of the earth.

This provides the necessary centripetal force for the circular orbit of the earth around the sun. As G decreases with time, the gravitational force F_G will become weaker with time. As F_G is changing with time due to it, the earth will be going around the sun not strictly in closed orbit and radius also increases, since the attraction force is getting weaker.

Hence, after long time the earth will leave the solar system.