For Problems 7–9

The electrons in a H-atom kept at rest, jumps from the mth shell to the nth shell ($m > n$). Suppose instead of emitting electromagnetic wave, the energy released is converted into kinetic energy of the atom. Assume Bohr's model and conservation of angular momentum are valid. Now, answer the following questions:

7. What principle is violated here?
   - **a.** Laws of motion
   - **b.** Energy conservation
   - **c.** Nothing is violated
   - **d.** Cannot be decided

8. Calculate the angular velocity of the atom about the nucleus if I is the moment of inertia
   - **a.** $\frac{(m+n)}{6.28}\frac{h}{I}$
   - **b.** $\frac{(m+n)}{1.57}\frac{h}{I}$
   - **c.** $\frac{(m-n)}{6.28}\frac{h}{I}$
   - **d.** $\frac{(m-n)}{1.57}\frac{h}{I}$

9. If the above comprehension be true, what is not valid here?
   - **a.** $F = ma$
   - **b.** $\tau = I\alpha$
   - **c.** $F = dp/dt$
   - **d.** All of them

7. a. Internal forces act between electron and proton, then how can the atom get an acceleration.

8. c. Change in angular momentum $= I\omega$

$$\Rightarrow \quad \frac{mh}{2\pi} - \frac{nh}{2\pi} = I\omega \quad \Rightarrow \quad \omega = \frac{(m-n)h}{6.8I}$$

9. d. Since no external force and torque act on the atom, still it gets an acceleration and angular acceleration. So, none is true.