1. Derive classical expressions for L_x, L_y, L_z projections for angular momentum vector.

2. Derive expressions for the projections of the angular momentum operator $\hat{L}_x = -i\hbar\left(y\frac{\partial}{\partial z} - z\frac{\partial}{\partial y}\right)$, $\hat{L}_y = -i\hbar\left(z\frac{\partial}{\partial x} - x\frac{\partial}{\partial z}\right)$, $\hat{L}_z = -i\hbar\left(x\frac{\partial}{\partial y} - y\frac{\partial}{\partial x}\right)$.

3. Derive the commutation relation for **x** and **y** projections of angular momentum operator $\left[\hat{L}_x, \hat{L}_y\right] = i\hbar\,\hat{L}_z$.

4. Is it possible measure simultaneously the **x** and **z** projections of angular momentum? Why? Proof.

5. Is it possible measure simultaneously square of angular momentum and its **z** projections of angular momentum? Why? Proof.

6. Is it possible measure simultaneously square of angular momentum and its **x** projection? Why? Proof.

7. Is it possible measure simultaneously absolute value of angular momentum $|\vec{L}|$ and its **x** projection? Why? Proof.

8. Write an expression for the **x, y** and **z** projection of circular frequency operators $\hat{\omega}_x, \hat{\omega}_z, \hat{\omega}_z$ (The rotating body is sphere with mass **M** and radius **R**).

9. How can the angle between the angular momentum vector and the **z**-axis be calculated in quantum mechanics? Calculate the allowed possible values of this angle for orbital quantum number l=1 .

10. How in quantum mechanics can be calculated the angle between the angular momentum vector $\vec{L}$ and the **z**-axis? Calculate the values of this angle for **orbital quantum number** l=1 and **magnetic quantum numbers** m=-2 and +1 .

11. How to calculate in quantum mechanics the kinetic energy of a rotating body with the moment of inertia **I** ? If body is an electron moving around nucleus in orbit with radius 10^{-10} m. Calculate velocity of electron in this orbit if orbital quantum number l=5 (NB! Electron is a point particle).

12. How to calculate in quantum mechanics the kinetic energy of a rotating body with the moment of inertia **I** ? If body is an electron moving around nucleus in orbit with radius 10^{-10} m. Calculate the minimum possible non zero value of velocity of electron (NB! Electron is a point particle).