Assignment 4

The due date for submitting this assignment has passed.
As per our record, you have not submitted this assignment.

1. The correct relationship connecting Cartesian coordinates $x$ and $y$, and spherical polar coordinates $r$, $\theta$, $\phi$ is $r = \square$.
   Accepted Answers
   $r = \sqrt{x^2 + y^2}$

2. Periodic boundary condition, used for the $\phi$-dependent part of Schroedinger equation for a rigid rotor, builds upon the requirement of wavefunctions to be
   - continuous
   - normalized
   - single valued
   - orthogonal to each other
   Accepted Answers
   $\text{continuous}$

3. Motion causing change in $\phi$ must require to be taken into consideration for operators $L_x$, $L_y$, $L_z$.
   Accepted Answers
   $L_x$, $L_y$, $L_z$

4. $\phi$-dependent part of the rotational wavefunction is
   - real
   - imaginary
   - an exponential function
   - a polynomial
   Accepted Answers
   $\text{imaginary}$

5. The polynomial functions in rotational wavefunction bear the name of
   - Hermite
   - Lagrange
   - de Bicyle
   - Legendre
   Accepted Answers
   $\text{Legendre}$

6. Degeneracy of 2D rotational levels is ______ fold
   Accepted Answers
   $2$

7. $e_j$ is the energy, in cm$^{-1}$, for the rotational level with quantum number $J$. If \( \frac{\text{Rydberg constant}}{e_j} = 125 \), then $J = \square$
   Accepted Answers
   $J = 125$

8. In a polar plot,
   - the range of angles is 0-360$^\circ$, for $\rho$ as well as $\phi$
   - value of the plotted function of angle is represented by the distance from origin
   - sign of the function is shown by putting in the opposite role of the curve
   - a cusp is obtained when the function is constant with respect to $\phi$ and $\rho$ is the independent variable
   Accepted Answers
   $\text{Legendre}$

9. $\mathbf{L}_j = \left( \begin{array}{c} L_x \\ L_y \\ L_z \end{array} \right) = \left( \begin{array}{ccc} J & 0 & 0 \\ 0 & -J & 0 \\ 0 & 0 & -J \end{array} \right) \mathbf{\hat{r}}$
   Accepted Answers
   $\text{Legendre}$

10. Properties that can be determined simultaneously are
    - $L_x$, $L_y$, $L_z$
    - $L_x$, $L_y$
    - $L_x$, $L_y$, $L_z$
    - $L_x$, $L_y$, $L_z$
    Accepted Answers
    $\text{Legendre}$