Quiz 7.6 – Rotational Motion

Name: _____

New Coordinate Systems

For rotations (and other systems, later) we will use non-cartesian coordinate systems. For cylindrical and spherical polar coordinates give:

- The Laplacian operator (∇^2)
  - Cylindrical:
  - Spherical Polar:
- The Jacobian (infinitesimal volume element)
  - Cylindrical:
  - Spherical Polar:
- An integral of function $F(\tau)$ over all space, with the correct limits of integration and Jacobian
  - Cylindrical:
  - Spherical Polar:

Rotation and Quantum Numbers

Quantum mechanical states are labeled by their *quantum numbers*. Give the symbol, name, and relation to observable properties for the quantum numbers in the following systems:

- Particle on a Ring
- Rigid Rotor

Rigid Rotor

Consider a 3-dimensional rigid rotor with a moment of inertia $I = 7.4 \times 10^{-47}\ kgm^2$

- Give the energy (in J) and total angular momentum of the $l = 2$ energy level

- List all of the allowed values for the z-component of the angular momentum

- List all the observables of a rigid rotor which we can know simultaneously

- List all pairs of observables for which there exists an uncertainty relationship

Holy Sonnets: Death, be not proud

By John Donne

Death, be not proud, though some have called thee
Mighty and dreadful, for thou art not so;
For those whom thou think'st thou dost overthrow
Die not, poor Death, nor yet canst thou kill me.
From rest and sleep, which but thy pictures be,
Much pleasure; then from thee much more must flow,
And soonest our best men with thee do go,
Rest of their bones, and soul's delivery.
Thou art slave to fate, chance, kings, and desperate men,
And dost with poison, war, and sickness dwell,
And poppy or charms can make us sleep as well
And better than thy stroke; why swell'st thou then?
One short sleep past, we wake eternally
And death shall be no more; Death, thou shalt die.