These are a list of basic things you need to know for the final. Do you recall the basic formulas?

- Draw proper free-body diagrams
  - Choose wisely the coordinate axes and draw the forces.
  - Identify the action/reactions pairs of the problem.
- Description of movement
  - Position, velocity and acceleration
    - 1-D: Can you get them from a plot of X Vs T as in Exam 1?
    - N-D: Can you get them from a plot of X Vs Y as a function of t as in Quiz 1?
  - Circular motion, definition
    - Relationship between linear and angular acceleration and velocity.
- Equations of motion
  - Sum of external forces = ma = dP/dt
  - Sum of external torques = I alpha = dL/dt
  - (may also need v=R, or a=alphaR)
- Kinetic energy,
  - Units
  - Translational
  - Rotational
- Work-energy theorem
  - Units
  - When is the mechanical energy conserved
  - Potential energies
    - Relationship with their force
    - Relation between potential energies and work of forces
- Linear momentum P:
  - Definition and Units
  - Calculation of P in several problems
    - What is P for a particle?
    - What is P for a system of particles?
    - What is P for a rigid body?
  - Relationship to forces
  - When is momentum P conserved?
- Moment of Inertia
  - Definition and units
  - For a particle
  - For a rigid body
  - Parallel axis theorem
- Angular momentum L:
  - Definition and units
• Calculation of L in several problems (you should be able to answer these for any choice of coordinate system)
  ▪ What is L for a particle moving with a given velocity?
  ▪ What is L for an object moving with a given velocity?
  ▪ What is L for an object rotating around its center of mass?
  ▪ What is L for an object that has translational and rotational components?
• Relationship to torques
• When is angular momentum L conserved?
• Collisions: Elastic/Inelastic
  ▪ What quantities are conserved?
• Gravitation
  ▪ Forces
    ▪ In what situation the force between two solids objects is exactly the force between to particle-objects?
  ▪ Potential
    ▪ In the surface of a planet
    ▪ In the long distances
    ▪ What’s the range of movement of a planet with given mechanical energy E? What does it mean that an object has energy >0? and what that E<0?
    ▪ Find the escape velocity for objects at distance r from a sun.
• Kepler’s laws.
  ▪ Know the three laws.
  ▪ Understand the ellipses, and the relation between position of foci and eccentricities.
  ▪ Know qualitatively how a planet orbits around a sun.
  ▪ Can you use the second law in such a way to predict the angular velocity of a planet around the sun depending on the position on the orbit?
• Periodic Motion(pendulum, etc)
  ▪ What is the typical equation and what is the solution
  ▪ How do you determine the constants of Amplitude and phase?
• Waves.
  ▪ Characteristic equation
  ▪ Solution to equations.