**a) What are the parameters that should be considered while calculating maximum angle of inclination in Two wheeled self-balancing robots (TWSBR) ?**

When calculating the maximum angle of inclination for a two-wheeled self-balancing robot (TWSBR), several key parameters need to be considered to ensure stability and proper functioning. Here are the main parameters:

1. Center of Gravity (CoG):
   * The height of the CoG relative to the wheelbase.
   * The lateral position of the CoG, which affects the balance in the sideways direction.
2. Wheelbase:
   * The distance between the two wheels, affecting the stability and the ability to balance.
3. Weight Distribution:
   * The distribution of the robot's weight, ensuring it is balanced around the CoG.
4. Inertia:
   * The moment of inertia of the robot, particularly around the pivot point between the wheels.
5. Motor Specifications:
   * Torque and speed of the motors, as they determine the robot’s ability to correct itself when it starts to tip.
6. Wheel Radius:
   * The size of the wheels, which impacts the robot's ability to climb inclines and navigate uneven surfaces.
7. Sensor Accuracy:
   * The precision and responsiveness of the accelerometers and gyroscopes used for detecting inclination and balance.
8. Control System:
   * The algorithm used (e.g., PID controller) and its tuning parameters, which dictate how quickly and effectively the robot responds to changes in inclination.
9. Surface Conditions:
   * The type of surface the robot is operating on, including factors like friction and slipperiness.
10. Battery and Power Supply:
    * The capacity and voltage of the battery, as well as the power consumption of the motors and sensors, which affect how long the robot can operate and its ability to handle inclines.
11. Environmental Factors:
    * External conditions such as wind, which can affect the robot’s stability.

### Detailed Explanation:

1. Center of Gravity (CoG):
   * Importance: A lower CoG increases stability and makes it easier to balance. If the CoG is too high, the robot will be more prone to tipping over.
   * Calculation: The vertical and horizontal positions of the CoG are critical. They can be determined through physical measurements or calculations based on the distribution of the robot's mass.
2. Wheelbase:
   * Importance: A wider wheelbase provides more stability and allows for greater angles of inclination without tipping over.
   * Calculation: Measured as the distance between the contact points of the two wheels on the ground.
3. Weight Distribution:
   * Importance: Even weight distribution ensures the robot does not lean to one side, which could affect its ability to balance.
   * Calculation: The weight of each component and its position relative to the CoG should be taken into account.
4. Inertia:
   * Importance: The moment of inertia affects how the robot responds to angular accelerations. A higher moment of inertia means the robot is more resistant to changes in its rotational motion.
   * Calculation: Depends on the mass distribution and geometry of the robot.
5. Motor Specifications:
   * Importance: Motors need to provide sufficient torque to counteract the force of gravity when the robot inclines.
   * Calculation: Torque requirements can be calculated based on the weight of the robot, the radius of the wheels, and the desired maximum angle of inclination.
6. Wheel Radius:
   * Importance: Larger wheels can help in navigating over obstacles and inclines but may affect the balance due to increased height of the CoG.
   * Calculation: Directly measured and factored into torque calculations.
7. Sensor Accuracy:
   * Importance: Accurate sensors are essential for detecting the angle of inclination and making precise adjustments to maintain balance.
   * Calculation: Sensor specifications, such as sensitivity and response time, need to be considered.
8. Control System:
   * Importance: The control algorithm determines how the robot responds to deviations from its balanced state.
   * Calculation: Tuning of control parameters (e.g., PID gains) is done through testing and adjustment.
9. Surface Conditions:
   * Importance: Different surfaces offer different levels of grip, affecting the robot's ability to balance and climb inclines.
   * Calculation: Friction coefficients and surface texture can be considered in the design phase.
10. Battery and Power Supply:
    * Importance: Adequate power supply ensures the motors and sensors function correctly, especially when climbing inclines.
    * Calculation: Power requirements based on motor specifications and expected operational duration.
11. Environmental Factors:
    * Importance: Conditions like wind or uneven ground can affect stability.
    * Calculation: Environmental factors are typically considered in robustness testing and design adjustments.

By carefully considering and calculating these parameters, a two-wheeled self-balancing robot can be designed to handle the desired maximum angle of inclination while maintaining stability and proper functionality.