**1. Arduino Board Specifications (e.g., Arduino Uno)**

- **Microcontroller**: ATmega328P
- **Operating Voltage**: 5V
- **Input Voltage (recommended)**: 7-12V
- **Input Voltage (limits)**: 6-20V
- **Digital I/O Pins**: 14 (of which 6 provide PWM output)
- **Analog Input Pins**: 6
- **DC Current per I/O Pin**: 20 mA
- **DC Current for 3.3V Pin**: 50 mA
- **Flash Memory**: 32 KB (of which 0.5 KB used by bootloader)
- **SRAM**: 2 KB
- **EEPROM**: 1 KB
- **Clock Speed**: 16 MHz
- **LED_BUILTIN**: Pin 13
- **USB Interface**: Type B USB (for programming and serial communication)
- **Bootloader**: Pre-installed, allowing direct USB programming via the Arduino IDE
- **Power Supply Options**: USB or external 7-12V power supply
- **Dimensions**: 68.6 mm x 53.4 mm
- **Weight**: Approximately 25g

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**2. DHT11 Sensor Specifications (Temperature and Humidity Sensor)**

- **Sensor Type**: Digital
- **Measurement Range**:
    - **Temperature**: 0 to 50°C
    - **Humidity**: 20% to 90% RH (Relative Humidity)
- **Accuracy**:
    - **Temperature**: ±2°C
    - **Humidity**: ±5% RH
- **Output Type**: Digital signal (1-wire interface)
- **Operating Voltage**: 3.3V to 5V
- **Current Consumption**: 2-3 mA (when measuring), 0.5 mA (when idle)

- **Response Time**: ≤ 1s for humidity, ≤ 2s for temperature
- **Sensor Size**: 15.5mm x 12mm x 5.5mm
- **Operating Temperature**: 0 to 50°C
- **Operating Humidity**: 20% to 90% RH
- **Power Consumption**: Low, ideal for battery-powered applications
- **Libraries/Support**: Supported by the DHT library in Arduino IDE for easy integration

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**3. Arduino Motherboard Specifications (for example, Arduino Uno)**

- **Microcontroller**: ATmega328P (or ATmega16U2 for USB-to-serial conversion)
- **Input/Output**:
    - **Digital I/O Pins**: 14 (6 PWM capable)
    - **Analog Pins**: 6
    - **PWM Pins**: 6
- **Communication**:
    - **Serial Communication**: Through USB (using USB-to-serial converter)
    - **I2C Pins**: Pin A4 (SDA), Pin A5 (SCL)
    - **SPI Pins**: Pin 10 (SS), Pin 11 (MOSI), Pin 12 (MISO), Pin 13 (SCK)
- **Power**:
    - **Input Power Range**: 6V to 20V
    - **Regulated Voltage**: 5V for most operations
- **USB Interface**: USB-B (for serial communication and power)
- **Power Pins**: 5V, 3.3V, GND, Vin, etc.
- **Status LEDs**: Power, TX, RX, and Built-in LED (Pin 13)
- **Size**: 68.6mm x 53.4mm
- **Weight**: 25g

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**4. Microprocessor vs. Microcontroller Specifications**

**Microprocessor (e.g., Intel i7)**

- **Architecture**: 64-bit (x86/x64)
- **Clock Speed**: Typically 2.0 GHz to 5.0 GHz
- **Cores**: Dual-core, Quad-core, Octa-core (depending on the specific model)

- **Cache Memory**: L1, L2, and L3 cache (e.g., 4MB-12MB L3 cache)
- **Instruction Set**: x86-64 architecture (supports complex instructions, multitasking, etc.)
- **Voltage**: 1.0V to 1.4V (depends on the specific CPU model)
- **Power Consumption**: 35W to 125W (depending on the model and usage)
- **Usage**: Typically used in high-performance computers, laptops, and servers
- **External Memory**: Works with DDR4, DDR5 RAM, SSDs, etc.
- **Communication**: High-speed communication interfaces like PCIe, USB, Ethernet, etc.

**Microcontroller (e.g., ATmega328P on Arduino Uno)**

- **Architecture**: 8-bit, 16-bit, or 32-bit (depending on the model, e.g., ATmega328P is 8-bit)
- **Clock Speed**: Typically 8 MHz to 16 MHz (ATmega328P is 16 MHz)
- **Cores**: Single-core
- **RAM**: Typically from 32 bytes to a few kilobytes
- **Flash Memory**: Typically from 32 KB to 256 KB (e.g., ATmega328P has 32 KB)
- **Power Consumption**: Very low (tends to be in the range of a few milliwatts)
- **Input/Output**: Typically 8 to 40 I/O pins with some supporting PWM and analog input
- **Peripherals**: I2C, SPI, UART, PWM, ADC (Analog-to-Digital Conversion)
- **Usage**: Embedded systems, sensors, small automation projects, IoT devices
- **Communication**: Low-speed interfaces like I2C, SPI, and UART

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**5. Microcontroller Example (ATmega328P)**

- **Architecture**: 8-bit AVR
- **Clock Speed**: 16 MHz
- **Flash Memory**: 32 KB (2 KB used by bootloader)
- **SRAM**: 2 KB
- **EEPROM**: 1 KB
- **Input/Output Pins**: 23 (14 digital I/O pins, 6 analog input pins)
- **PWM Channels**: 6
- **ADC Channels**: 10-bit, 6 channels
- **Timers**: 3 (8-bit and 16-bit)
- **I2C**: Yes (via TWI interface)
- **SPI**: Yes (Serial Peripheral Interface)

- **UART**: Yes (Serial Communication)
- **Operating Voltage**: 1.8V to 5.5V (3.3V versions possible)
- **Power Consumption**: Low power consumption, with sleep modes for energy efficiency

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**Conclusion:**

- **Arduino boards** are based on low-power **microcontrollers** like the **ATmega328P**, designed for embedded systems and basic projects.
- **Sensors** like the **DHT11** are tailored for specific tasks like reading temperature and humidity, and they work well with low-power microcontrollers.
- **Microprocessors** (like Intel's i7) are powerful chips used for general-purpose computing, suitable for tasks requiring substantial processing power.
- **Microcontrollers** are optimal for embedded systems and projects where low power consumption and limited computing power are necessary.