**Objective 1: Demonstrate Writing Hibernate Query Language (HQL) and Native Query**

Hibernate and Spring Data JPA provide different ways to query data:

**HQL (Hibernate Query Language)** – A SQL-like language that uses entity class names and properties.

**JPQL (Java Persistence Query Language)** – The standardized version specified by JPA; very similar to HQL.

**Native Query** – Direct SQL statements executed against the underlying database.

**1. HQL / JPQL Basics**

These queries are written using entity class and field names:

@Query("SELECT e FROM Employee e WHERE e.salary > :minSalary")

List<Employee> findEmployeesWithSalaryAbove(@Param("minSalary") double minSalary);

"Employee” is the entity class.

"salary” refers to the Java field.

This is portable across databases, unlike SQL.

**2. HQL with FETCH Keyword**

@Query("SELECT d FROM Department d JOIN FETCH d.employees WHERE d.name = :deptName")

Department findDepartmentWithEmployees(@Param("deptName") String deptName);

JOIN FETCH ensures that associated employees are retrieved in the same query.

**3. HQL Aggregate Functions**

@Query("SELECT AVG(e.salary) FROM Employee e")

Double findAverageSalary();

Supported functions: COUNT(), SUM(), AVG(), MAX(), MIN().

**4. Native Query Example**

Sometimes, we need raw SQL queries, especially for performance or complex DB-specific queries:

@Query(value = "SELECT \* FROM employee WHERE salary > ?1", nativeQuery = true)

List<Employee> findHighSalaryEmployees(double minSalary);

Use nativeQuery = true to indicate that this is raw SQL.

Table and column identifiers must exactly match your schema.

**Objective 2: Explain the Need and Benefit of Criteria Query**

Sometimes, we need to build queries dynamically based on user input or application logic. Writing raw HQL/JPQL in such cases can get messy. That’s where **Criteria API** comes in.

Dynamic query building (e.g., filters based on input fields).

Type-safe queries at compile-time.

No need to construct long string-based queries.

Easily reusable and maintainable.

**Core Components of Criteria Query:**

1. **CriteriaBuilder** – Factory for creating criteria queries.
2. **CriteriaQuery<T>** – Represents the query object.
3. **Root<T>** – Defines the main entity/table being queried.
4. **TypedQuery<T>** – Final query to be executed.

**Example: Find employees with dynamic salary range**

CriteriaBuilder cb = entityManager.getCriteriaBuilder();

CriteriaQuery<Employee> query = cb.createQuery(Employee.class);

Root<Employee> root = query.from(Employee.class);

query.select(root).where(cb.between(root.get("salary"), 30000, 60000));

TypedQuery<Employee> typedQuery = entityManager.createQuery(query);

List<Employee> result = typedQuery.getResultList();

This avoids manual string construction.

Fields like "salary" are checked by the compiler, reducing runtime errors.