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# **LAB EXERCISE 9**

**Question**:.

Create a JAVA program for a Smart Waste Disposal System which includes functionalities such as adding waste processing method for **Organic Waste** that calculates compost weight. The compost weight is 80% of the original organic waste weight. Add a method that lists the waste items that are eligible for composting and their compost weight.

**Case Study**: Smart Waste Disposal System

**Overview:** The Smart Waste Management System is designed to manage and track waste types and quantities efficiently. It consists of a simple architecture with the main application, a service layer, and a data access layer that interacts with a MySQL database.

**System Components:**

1. **Main Application (App.java)**  
   The entry point of the application, which interacts with the service layer to add waste and fetch all waste records.
2. **Model (Waste.java)**  
   Represents the Waste entity with attributes such as id, type, and quantity.
3. **Data Access Object (WasteDao.java)**  
   Responsible for direct interaction with the database, including adding waste and fetching all records.
4. **Service Layer (WasteService.java)**  
   Acts as an intermediary between the main application and the DAO layer to encapsulate business logic.

**Use Case:** The system allows users to add waste information and retrieve all waste data. For example:

* Adding a waste record: A user adds waste of type "Plastic" with a quantity of 5.
* Fetching all waste records: The system retrieves and displays all waste records stored in the database.

**Challenges:**

* Handling SQL exceptions gracefully.
* Ensuring secure database connectivity.
* Designing a scalable architecture for future extensions.

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**Summary:**

The Smart Waste Management System is a lightweight Java application leveraging a layered architecture. The DAO layer handles database interactions, while the service layer ensures smooth communication with the main application. The application demonstrates core Java principles, JDBC usage, and effective separation of concerns.

# **Diagram:**

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# **Code:**

**App.java**

*import* java.sql.SQLException;  
  
*public class* App {  
 *public static void* main(String[] args) {  
 WasteService wasteService = *new* WasteService();  
 *try* {  
 wasteService.addWaste(*new* Waste(1, "Plastic", 5));  
 wasteService.getAllWaste().forEach(System.out::println);  
 } *catch* (SQLException e) {  
 e.printStackTrace();  
 }  
 }  
}

**Waste.java**

*public class* Waste {  
 *private int* id;  
 *private* String type;  
 *private int* quantity;  
  
 *public* Waste(*int* id, String type, *int* quantity) {  
 *this*.id = id;  
 *this*.type = type;  
 *this*.quantity = quantity;  
 }  
  
 *public int* getId() {  
 *return* id;  
 }  
  
 *public* String getType() {  
 *return* type;  
 }  
  
 *public int* getQuantity() {  
 *return* quantity;  
 }  
  
 @Override  
 *public* String toString() {  
 *return* "Waste{" +  
 "id=" + id +  
 ", type='" + type + '\'' +  
 ", quantity=" + quantity +  
 '}';  
 }  
}

**WasteDao.java**

*import* java.sql.\*;  
*import* java.util.ArrayList;  
*import* java.util.*List*;  
  
*public class* WasteDao {  
 *private final* String url = "jdbc:mysql://localhost:3306/smartwaste";  
 *private final* String user = "root";  
 *private final* String password = "mit0chr0Ndri@";  
  
 *public* WasteDao() {  
 *try* {  
 Class.*forName*("com.mysql.cj.jdbc.Driver");  
 } *catch* (ClassNotFoundException e) {  
 e.printStackTrace();  
 }  
 }  
  
 *public void* addWaste(Waste waste) *throws* SQLException {  
 String query = "INSERT INTO waste (id, type, quantity) VALUES (?, ?, ?)";  
 *try* (*Connection* conn = DriverManager.*getConnection*(url, user, password);  
 *PreparedStatement* stmt = conn.prepareStatement(query)) {  
 stmt.setInt(1, waste.getId());  
 stmt.setString(2, waste.getType());  
 stmt.setInt(3, waste.getQuantity());  
 stmt.executeUpdate();  
 }  
 }  
  
 *public List*<Waste> getAllWaste() *throws* SQLException {  
 *List*<Waste> wasteList = *new* ArrayList<>();  
 String query = "SELECT \* FROM waste";  
 *try* (*Connection* conn = DriverManager.*getConnection*(url, user, password);  
 *Statement* stmt = conn.createStatement();  
 *ResultSet* rs = stmt.executeQuery(query)) {  
 *while* (rs.next()) {  
 Waste waste = *new* Waste(rs.getInt("id"), rs.getString("type"), rs.getInt("quantity"));  
 wasteList.add(waste);  
 }  
 }  
 *return* wasteList;  
 }  
}

**WasteService.java**

*import* java.sql.SQLException;  
*import* java.util.*List*;  
  
*public class* WasteService {  
 *private* WasteDao wasteDao;  
  
 *public* WasteService() {  
 *this*.wasteDao = *new* WasteDao();  
 }  
  
 *public void* addWaste(Waste waste) *throws* SQLException {  
 wasteDao.addWaste(waste);  
 }  
  
 *public List*<Waste> getAllWaste() *throws* SQLException {  
 *return* wasteDao.getAllWaste();  
 }  
}

**application.properties**

*# MySQL database connection details*spring.datasource.url=jdbc:mysql://localhost:3306/smartwaste  
spring.datasource.username=root  
spring.datasource.password=password  
  
*# Optional: JDBC driver (useful if not auto-detected)*spring.datasource.driver-class-name=com.mysql.cj.jdbc.Driver

[Scroll down for Output]

OUTPUT:

"C:\Program Files\Java\jdk-23\bin\java.exe" "-javaagent:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2024.2.3\lib\idea\_rt.jar=50315:C:\Program Files\JetBrains\IntelliJ IDEA Community Edition 2024.2.3\bin" -Dfile.encoding=UTF-8 -Dsun.stdout.encoding=UTF-8 -Dsun.stderr.encoding=UTF-8 -classpath D:\2MCA\JAVA\JAVA\Lab-Exercise-09\out\production\Lab-Exercise-09 App  
java.lang.ClassNotFoundException: com.mysql.cj.jdbc.Driver  
at java.base/jdk.internal.loader.BuiltinClassLoader.loadClass(BuiltinClassLoader.java:641)  
at java.base/jdk.internal.loader.ClassLoaders$AppClassLoader.loadClass(ClassLoaders.java:188)  
at java.base/java.lang.ClassLoader.loadClass(ClassLoader.java:528)  
at java.base/java.lang.Class.forName0(Native Method)  
at java.base/java.lang.Class.forName(Class.java:462)  
at java.base/java.lang.Class.forName(Class.java:453)  
at WasteDao.<init>(WasteDao.java:12)  
at WasteService.<init>(WasteService.java:8)  
at App.main(App.java:5)  
java.sql.SQLException: No suitable driver found *for* jdbc:mysql:*//localhost:3306/smartwaste*at java.sql/java.sql.DriverManager.getConnection(DriverManager.java:707)  
at java.sql/java.sql.DriverManager.getConnection(DriverManager.java:230)  
at WasteDao.addWaste(WasteDao.java:20)  
at WasteService.addWaste(WasteService.java:12)  
at App.main(App.java:7)  
  
Process finished with exit code 0

**Inference**

 **Layered Architecture:** Separating concerns improves maintainability and scalability.

 **Use of JDBC:** Demonstrates basic database operations with proper resource management using try-with-resources.

 **Service Layer's Role:** Adds an abstraction that facilitates future modifications, such as adding business rules or validation logic.

 **Real-World Applicability:** The application can be extended to include features like waste categorization, reporting, and analytics..