**1. Java Collections Framework (JCF)**

* **Map Interface**
  + HashMap, TreeMap, LinkedHashMap
  + How hashCode() and equals() affect HashMap behavior
  + Collision handling in HashMap
  + Why overriding equals() incorrectly can cause unexpected results
* **List & Set**
  + ArrayList, LinkedList
  + HashSet, TreeSet, LinkedHashSet
  + Difference between List, Set, and Queue

**2. Java 8 Features (Streams & Functional Programming)**

* **Streams API**
  + groupingBy(), mapping(), averagingDouble(), maxBy(), collect()
  + Sorting using sorted(Comparator.comparing())
* **Lambdas & Functional Interfaces**
  + Function<T, R>, Predicate<T>, Consumer<T>, Supplier<T>
* **Optional Class**
  + Handling null values in Java 8+

**3. Object-Oriented Programming (OOP) Concepts**

* **Encapsulation, Inheritance, Polymorphism, Abstraction**
* **Overriding hashCode() and equals() correctly**
* **How HashMap works internally**
* **Immutability and why String is immutable in Java**

**4. Java Memory Management & Performance**

* **Garbage Collection (GC)**
  + How HashMap keys are stored in memory
* **Primitive vs Reference Types**
* **Memory Leaks & Performance Optimization**
  + Why overriding equals() incorrectly causes problems

**5. Algorithmic Thinking & Problem Solving**

* **Sorting Algorithms**
  + How sorting works using Comparator
* **Time Complexity Analysis**
  + Why HashMap provides O(1) lookup and O(n) worst case

**6. SQL & Database Concepts (for Problem 2)**

* **Aggregate Functions**
  + AVG(), MAX(), GROUP BY
* **Indexing and Performance Optimization**

**7. Practical Hands-on**

* **Implementing custom Comparator**
* **Writing unit tests for groupingBy operations**
* **Handling concurrency in Collections (ConcurrentHashMap, Synchronized List)**