# **Multiple Choice Questions**

1. Which statement is NOT CORRECT?
   1. The file approach to data management causes the same information to be stored separately for different applications.
   2. In a file approach to data management, the data definitions are included in each application separately.
   3. In a file approach to data management, different applications could be using older and newer versions of the same data.
   4. **In a file approach to data management, a change in the structure of a data file is easily handled because each application has its own data files.**
2. Which statement is NOT CORRECT?
   1. In a database approach, applications don’t have their own files, but all applications access the same version of the data by interfacing with the DBMS.
   2. **In a database approach, the data definitions or metadata are stored in the applications accessing the data.**
   3. In a database approach, there is typically less storage needed compared to the file approach.
   4. In a database approach, maintenance of data and metadata is easier.
3. Which of the following statements is NOT CORRECT?
   1. A file-based approach to data management will easily lead to inconsistent data.
   2. **A file-based approach to data management facilitates concurrency control.**
   3. A file-based approach to data management incurs a strong dependency between the applications and the data
   4. A file-based approach to data management causes duplicate information, which leads to a waste of storage resources.
4. Which statement is NOT CORRECT?
   1. In a file-based approach, every application had its own query and access procedures, even if they wanted to access the same data.
   2. SQL is a database language to manage DBMSs without having to write a substantial amount of programming code.
   3. **SQL is a database language that focusses on how to access and retrieve the data.**
   4. SQL is a database language that allows different applications to access different subsets of the data necessary for each application.
5. Which of the following statements is correct?
   1. It is more cumbersome to query a database system than a file-based system.
   2. The file-based approach uses metadata to define the data. These definitions are then stored in a catalog.
   3. **A database approach to data management uses the available storage in a more efficient manner.**
   4. The maintenance of a file-based system is much easier than the maintenance of a database system.
6. Which statement is NOT CORRECT?
   1. In a conceptual data model, the data requirements from the business should be captured and modeled.
   2. **A conceptual data model is implementation dependent.**
   3. A logical data model translates the conceptual data model to a specific implementation environment.
   4. Examples of implementations of logical data models are hierarchical, CODASYL, relational or object-oriented models.
7. Which of the following statements is correct?
   1. To communicate with the business user, mainly the logical data model is used.
   2. A database state contains the description of the database data and is stored in the catalog.
   3. The logical data model is implementation independent.
   4. **The internal data model represents the data’s physical storage details.**
8. Complete the following sentence, choosing the right words on place **A** and **B**. A …**A**… data model is the mapping of a …**B**… data model to a model that describes which data is stored where and in what format.
   1. **A: internal, B: logical**
   2. A: conceptual, B: internal
   3. A: logical, B: internal
   4. A: logical, B: conceptual
9. What concept specifies the various data items, their characteristics and relationships, constraints, storage details, etc. and is specified during the database design?
   1. **Database model**
   2. Catalog
   3. Database state
   4. None of the above
10. Which statement is right about the database state?
    1. The database state represents the data in the database when the database is first created.
    2. **The database state changes when data is updated or removed.**
    3. The database state specifies the various data items, their characteristics and relationships and is specified during the database design.
    4. The database state is stored in the catalog.
11. Which of the following statements is NOT CORRECT?
    1. **The external layer of a database contains the logical and conceptual data model.**
    2. Changes in any of the layers in the three-layer architecture should minimally impact the other layers.
    3. The internal data model is situated in the internal layer.
    4. Views can be defined for a particular application or a user group. This facilitates control of data access and security.
12. Complete this sentence: In the three-layer architecture, between the external layer and the conceptual/logical layer, there is …
    1. Physical data independence
    2. **Logical data independence**
    3. No independence, they are basically the same thing
    4. The internal layer
13. Which of the following statements is NOT CORRECT?
    1. To cater for data independence, interfaces between the three layers of the database architecture should be provided.
    2. Physical data independence means that changes in the data storage specifications should not impact the applications, the defined views nor the logical data model.
    3. **Logical data independence means that changes in the logical or conceptual data model should not impact the data storage specifications.**
    4. Only structured data can be described in a formal logical data model.
14. Statement A: The middle layer of the three-layer architecture consists of both the conceptual data model and the logical data model. The logical data model is physically implemented in the internal layer.

Statement B: The top level of the three-layer architecture is the external layer. Views for one or more applications always offer a window on the complete logical model.

* 1. **Only sentence A is right**
  2. Only sentence B is right
  3. Sentence A and B are right
  4. Neither A or B is right

1. Statement A: DDL is the language used to define the logical data model, but no other data models.

Statement B: SQL is a DML language to retrieve, insert, delete and modify data. It is stored in the catalog.

Which sentence(s) is/are right?

* 1. Only A
  2. Only B
  3. A and B
  4. **Neither A or B**

1. Statement A: Physical data independence implies that neither the applications, nor the views or logical data model must be changed when changes are made to the data storage specifications in the internal data model.

Statement B: Logical data independence implies that software applications are minimally affected by changes in the conceptual or logical data model.

Which sentence(s) is/are right?

* 1. Only A
  2. Only B
  3. **A and B**
  4. Neither A or B

1. Which of the following statements is NOT CORRECT
   1. The three KPIs of a DBMS are response time, throughput rate and space utilization.
   2. **The response time is the time needed to build the conceptual data model**.
   3. The throughput rate is the number of transactions a DBMS can process per unit of time.
   4. Space utilization is the space utilized to store raw data and metadata.
2. Consider the following statements:
   * ‘A book’s ISBN should consist of 13 integers’ is a semantic rule.
   * ‘A book should have at least one author’ is a syntactic rule.

Which of these statements is correct?

* 1. Both statements are correct.
  2. Statement i is correct, but statement ii is not correct.
  3. Statement ii is correct but statement i is not correct.
  4. **Both statements are not correct.**

1. Which of the following statements is NOT CORRECT?
   1. **ACID stands for Availability, Consistency, Isolation and Durability.**
   2. Durability means that effects of each successful transaction can be made permanent.
   3. Consistency assures that the database is consistent at all times.
   4. Isolation ensures that the effect of concurrent transactions should be the same as if they had been executed in isolation.
2. Consider the following two transactions:

|  |  |  |  |
| --- | --- | --- | --- |
| Time | Transaction 1 | Transaction 2 | Balance |
| t1 | Begin transaction |  | $2000 |
| t2 | Read(Balance) | Begin transaction |  |
| t3 | Balance = Balance + $1000 | Read(Balance) |  |
| t4 | Write(Balance) | Balance = Balance + $10 000 |  |
| t5 | End transaction | Write(Balance) |  |
| t6 |  | End transaction | End\_balance |

Assuming these are the only two transactions occurring in the database at the moment, which of the following statements is not correct?

* 1. These transactions result in a lost-update problem.
  2. These transactions are not compliant with the ACID properties.
  3. The ‘End\_balance’ is equal to $12,000.
  4. **The ‘End\_balance’ is equal to $13,000.**

# **Sober Scenario**

(Special thanks to Emma Haentjens)

* Numeric data (time, distance, number)
* Alphanumeric data (name of customer)
* GIS applications (location)
* Sensor (waving movement)

1. Database because of efficiency, consistency and maintenance advantages and the loose coupling between applications and data which avoids redundant or inconsistent data.

Sober App (users: clients)

Databases (users: Sober) management)

Customer service

Operations

∟ name of customer(s)

∟ type

∟ time – duration

∟ location – distance

∟ fee

∟ number of passengers

∟ type of request

∟ date

∟ location

∟ damage amount

∟ name

∟ number

∟ ordered service

∟ duration

∟ distance

∟ paid fee

∟ registered car

EXTERNAL LAYER

*Customer*: name, number, ordered service, registered car, …

*Service*: type, time, duration, location, distance, fee, customers, …

*Accidents*: date, location, damage amount

CONCEPTUAL/LOGICAL LAYER

CUSTOMER BASE

RIDE-HAILING

RIDE-SHARING

INTERNAL LAYER

1. ICT profiles: information architects, database designers, DBA, application developers
2. Yes, the catalog contains metadata which is necessary to define data, store definitions of views, store logical and internal data models and integrity rules

* Syntactical rule: data of accident should be stored as day, month, year
* Semantical rule: number of passengers when type = ride-sharing should be < 10

: number of passengers when type = ride-hailing should be < 6

These integrity rules are stored in the catalog

1. Yes, Sober is storing information of customers and ordered services. Many customers can simultaneously select/insert/update/delete data to/from the database and to avoid conflicts between these operations concurrency control is a necessity.
2. Yes, to identify future trends, characterise and target customers and minimize accidents.

e.g. when you analyse there is a correlation between accidents and longer distances during night time, you can solve these problems, for instance, by navigating your cars towards highly illuminated routes.

e.g. ride-sharing is only popular during daytime 🡪 adapt business model