**1) What is Power BI and how does it differ from Excel?**

* **Power BI** is a business intelligence tool used to connect, transform, and visualize data interactively.
* **Difference from Excel**:
  + Power BI is designed for data analysis and reporting at scale, Excel is primarily a spreadsheet tool.
  + Power BI supports automated refresh, dashboards, and cloud sharing.
  + Power BI handles larger datasets more efficiently compared to Excel.

**2) Explain the concept of data modeling in Power BI.**

* Data modeling is the process of defining **relationships between tables** and creating a logical structure for reporting.
* It involves creating relationships, hierarchies, calculated columns, measures, and ensuring data is in a **star schema** format for best performance.

**3) What are the different types of connections available in Power BI?**

* **Import Mode** – Data is imported and stored in the Power BI file (.pbix).
* **DirectQuery** – Queries data directly from the source without storing it.
* **Live Connection** – Connects live to sources like SQL Server Analysis Services (SSAS).
* **Composite Mode** – Combination of Import + DirectQuery.

**4) How do you handle data transformation in Power BI?**

* Data transformation is handled using **Power Query Editor**.
* Common tasks include:
  + Removing duplicates
  + Changing data types
  + Splitting/merging columns
  + Filtering rows
  + Pivot/unpivot
  + Creating custom columns

**5) What is DAX (Data Analysis Expressions) and why is it important in Power BI?**

* **DAX** is a formula language used to create custom calculations in Power BI.
* It is important because it enables:
  + Measures for KPIs (e.g., Sales = SUM(Sales[Amount]))
  + Time intelligence (YTD, MTD, growth rates)
  + Advanced business logic

**6) Difference between calculated columns and measures in Power BI?**

* **Calculated Column**:
  + Created row by row inside a table.
  + Stored in the model (increases size).
  + Example: Profit = Sales[Amount] - Sales[Cost].
* **Measure**:
  + Calculated at query time (not stored).
  + More efficient, recommended for large datasets.
  + Example: Total Sales = SUM(Sales[Amount]).

**7) How do you handle relationships between tables in Power BI?**

* Define relationships in the **Model View**.
* Types: One-to-Many, Many-to-One, One-to-One.
* Use **primary keys and foreign keys**.
* Set **cross-filter direction** and cardinality properly.
* Use DAX functions (RELATED, USERELATIONSHIP) when needed.

**8) What is the purpose of a Power BI Gateway?**

* Gateway is used to connect **on-premises data sources** to the Power BI Service.
* Types:
  + **Personal Gateway** (individual use).
  + **Enterprise Gateway** (multiple users, scheduled refresh, direct query).

**9) How can you schedule data refresh in Power BI Service?**

* After publishing a report to Power BI Service:
  + Go to **Dataset Settings → Scheduled Refresh**.
  + Configure frequency (daily, hourly).
  + Requires Gateway if source is on-premises.

**10) Explain the concept of row-level security in Power BI.**

* Restricts data access for specific users.
* Implemented using **roles and DAX filters**.
* Example: Region = "North" will restrict users in that role to see only North region data.

**11) What is Power BI Desktop and how does it differ from Power BI Service?**

* **Power BI Desktop**: Windows application for building reports (design, modeling, DAX, transformations).
* **Power BI Service**: Cloud platform for publishing, sharing, collaboration, and scheduled refresh.

**12) Explain the concept of Direct Query in Power BI.**

* DirectQuery doesn’t import data, it queries the source in real-time.
* Pros: Up-to-date data, no storage overhead.
* Cons: Performance depends on source, limited transformations.

**13) What are Power BI templates and how are they useful?**

* Templates (.pbit) store report definitions without data.
* Useful for reusing the same report structure with different datasets.

**14) How do you handle incremental data refresh in Power BI?**

* Incremental refresh loads only **new or changed data** instead of reloading the full dataset.
* Configured in Power BI Desktop (Manage Parameters, Range filters).
* Improves performance for large datasets.

**15) What is the role of Power Query in Power BI?**

* Power Query is the ETL (Extract, Transform, Load) tool in Power BI.
* Used for connecting, cleaning, shaping, and preparing data before loading it into the model.

**16) Difference between calculated columns and calculated tables in Power BI?**

* **Calculated Column**: Adds a new column in an existing table.
* **Calculated Table**: Creates a new table using DAX.
  + Example: SalesSummary = SUMMARIZE(Sales, Sales[Region], "Total", SUM(Sales[Amount])).

**17) How do you create custom visuals in Power BI?**

* Use **Power BI Visuals SDK** with TypeScript + Node.js.
* Alternatively, download from **AppSource marketplace**.
* Custom visuals are used when built-in visuals don’t meet requirements.

**18) Best practices for optimizing performance in Power BI?**

* Use **star schema** instead of snowflake.
* Reduce calculated columns; prefer measures.
* Use **aggregations** and summarization.
* Avoid importing unnecessary columns/rows.
* Enable **incremental refresh** for large datasets.

**19) How can you integrate Power BI with Azure and Office 365?**

* **Azure**:
  + Azure Synapse / Data Lake → Data source.
  + Azure ML → Predictive analytics.
* **Office 365**:
  + Power BI integrates with Excel, Teams, SharePoint, Outlook.
  + Embed dashboards in Teams/SharePoint for collaboration.

**20) Explain the concept of aggregations in Power BI.**

* Aggregations pre-calculate summarized data to improve performance.
* Example: Instead of querying billions of rows, store data aggregated at **month/region level**.
* Power BI uses aggregations first, then detailed data if needed.

**21) How do you handle error handling and data quality in Power BI?**

* Use **Power Query** to detect errors (nulls, wrong types, duplicates).
* Apply validation steps: remove errors, replace missing values.
* Use DAX functions (IFERROR, COALESCE) for handling runtime errors.

**22) What is the purpose of Power BI Embedded and when would you use it?**

* Power BI Embedded allows embedding **reports and dashboards into custom applications**.
* Used by ISVs (Independent Software Vendors) or developers to provide BI features inside apps without requiring users to log in to Power BI Service.