# Database Systems

Exercises with MS Access



## **MS** Access

- Relational database management system
- Graphical user interface
- Used for creating and managing databases
- Supports SQL (Structured Query Language)
- All information stored in **one file** with the extension *.mdb*



## Exercise 1

• Make use of the following diagram [1]



## **Exercise 1**

- Complete the *table design* by 8 fields with the *field names* of the physicochemical properties *alithetic*, *aromatic*, *hydrophobic*, *charged*, *polar*, *negative*, *small* (see the diagram) of the *data type yes/no*
- Fill in the values using the data<sup>1</sup> of the diagram

1) the physicochemical properties are useful for reconstructing scoring matrices for the sequence comparison



## **Exercise 2**

- Copy the file *genome.mdb* to your own directory
- Open the copied file and inform about content and design of the table [2] *Genome size* Organism
  Number of Base ratis
  Number of Genes

organiani	Number of Dase pairs	Number of Genes
ФХ-174	5386	10
Human mitochondrion	16569	37
Epstein-Barr virus (EBV)	172282	80
Rickettsia prowazekii	1111523	878
Hemophilus influenzae	1830138	1738
Archaeoglobus fulgidus	2178400	2437
Mycobacterium tuberculosis	4411529	4275
Bacillus subtilis	4214814	4779
Escherichia coli	4639221	4406
Saccharomyces cerevisiae	12100000	5885
Drosophila melanogaster	18000000	13601
Helicobacter pylori	1667867	1589

## Exercise 2

• Complete the *table design* as follows:

Field name	Data type	Description
Organism	Text	Latin name
Kingdom	Text	Kingdom or virus
Number of Base pairs	Number	
Number of genes	Number	
Cause of	Text	Disease
Published	Text	1st publication
Comment	Memo	Further remarks

## Exercise 2

For filling in the values of the field *Kingdom* we create a *dropdown box* with the set of the possible values as follows:

- Switch to Design View
- Select the field you want to alter (*Kingdom*)
- At the bottom select the *Lookup* Tab
- In the Display Control box, select Combo Box
- Under *Row Source Type*, select *Value List*
- Under *Row Source*, enter the values, separated by a semicolon. ("Archaea"; "Bacteria"; "Eukaryota"; "Virus"; )
- Change to the *datasheet view* and you should see the change when you go to the *Kingdom* field.

## Exercise 2

- Complete the **values** of the table as far a possible
- Use your favorite search engine for getting more information
- Create and run a query (as described on the next slide) to get an answer to the following question:

Which bacteria have less than 2 million base pairs and of which diseases they are the cause?

## Exercise 2

- click on the *Queries* tab in the Access main screen
- click on the *New* button and select *Design view*
- Add the wished *table (Genome size)* and *Close* the *Add Table dialog box*
- Select the wished fields (Organism, Kingdom, Number of base pairs, Cause of) by double clicking
- Fill in the wished criteria: Kingdom Bacteria Number of base pairs < 2 000 000</li>
- Run the query by clicking the *Run* button (!) in the tool bar

## **Result Exercise 2**

Organism	Number of Base pairs	Cause of
Human mitochondrion	16569	
Rickettsia prowazekii	1111523	epidemic typhus
Hemophilus influenzae	1830138	middle ear infections
Helicobacter pylori	1667867	stomach ulcers

## **Exercise 3**

- Copy the file *CodonUse.mdb* to your own directory
- Open the copied file and inform about contents and designs of the tables *Codons & Thrips imaginis* [3]

Codon	Amino		Codon	Number	
	acid		TTT	413	
TTT	Phe		TTC	68	
TTC	Phe			00	
TTA	Leu		TIA	255	
TTG	Leu		TTG	40	
тст	Ser		тст	130	
TCC	Ser	1	TCC	12	
TCA	Ser		TCA	107	

## **Exercise 3**

- Open your data base *AminoAcids.mdb* (see exercise 1)
- Copy the tables *Codons* and *Thrips imaginis* from *CodonUse.mdb* into *AminoAcids.mdb* (hint: click in the Access main screen on the table you want to copy, choose *Copy* in the *Edit* menu, change to the data base into which the table should be pasted and choose *Paste* in the *Edit* menu)
- Define suitable *Primary Keys* for each of the 3 tables of the data base *AminoAcids.mdb* as follows

## Exercise 3

#### Definition of a Primary Key for a table

- Switch to *Design View* of the table (*Thrips imaginis*)
- Click on the wished field (*Codon*) with the Right mouse button and choose *Primary Key* from the pop-up menu
   → a small key appears next to the field name on the left side (notice: to remove a primary key, simply repeat this procedure)
- *Save* the table

## Exercise 3

#### Create all possible relationships between the tables

- pull down the *Tools* menu and select the *Relationships* menu item → the blank Relationships screen appears
- display all of the tables on the relationships screen. (right click anywhere on the Relationships screen and select the Show Tables..., highlight all tables and then click on the Add button, click on the Close button to close this dialog box)
- To connect the table *Codons* with the table *Thrips imaginis* to form a relationship, click on the *Codon* field in the *Codons* table and drag it over on top of the *Codon* field on the *Thrips imaginis* table. Upon releasing the mouse button, the *Edit Relationships* dialog box will appear.

## **Exercise 3**

- Access will do its best to determine the Relationship Type (almost always *One-to-Many*). For this example, Access knows that *Codon* is a key of the *Codons* table as well as in the *Thrips imaginis* table, so we get a One-to-One relationship.
- One additional step is the check of the box labeled *Enforce Referntial Integrity*. This option puts constraints into effect such that an *Thrips imaginis* record can not be created without a valid *Codon* and Access will also prevent a user from deleting a *Thrips imaginis* record if a related *Codons* record exists. At this point, click on the *Create* button to create the relationship.



## Literature

- D. Graur and W. H. Li: *Fundamentals of Molecular Evolution*. Sinauer Associates, Inc., 1990
- [2] A. M. Lesk: *Introduction to Bioinformatics*. New York (Oxford Univ. Press) 2002, p. 64
- [3] Journal *Molecular Biology and Evolution*. Volume 20, Number 3, March 2003