Database CA2

Laboratory

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DATABASE CA2.

Summary

ER Diagram

L.Name

ID

Date_Birth

Age

F.Name

Name

Chemist

Phone_Numbers

M

M

Check_in

Assigned_To

Work_on

Hours_Worked

Check_out

N

N

ID

Equipment

Project

End_Date

Name

Cost

ID

Name

Start_Date
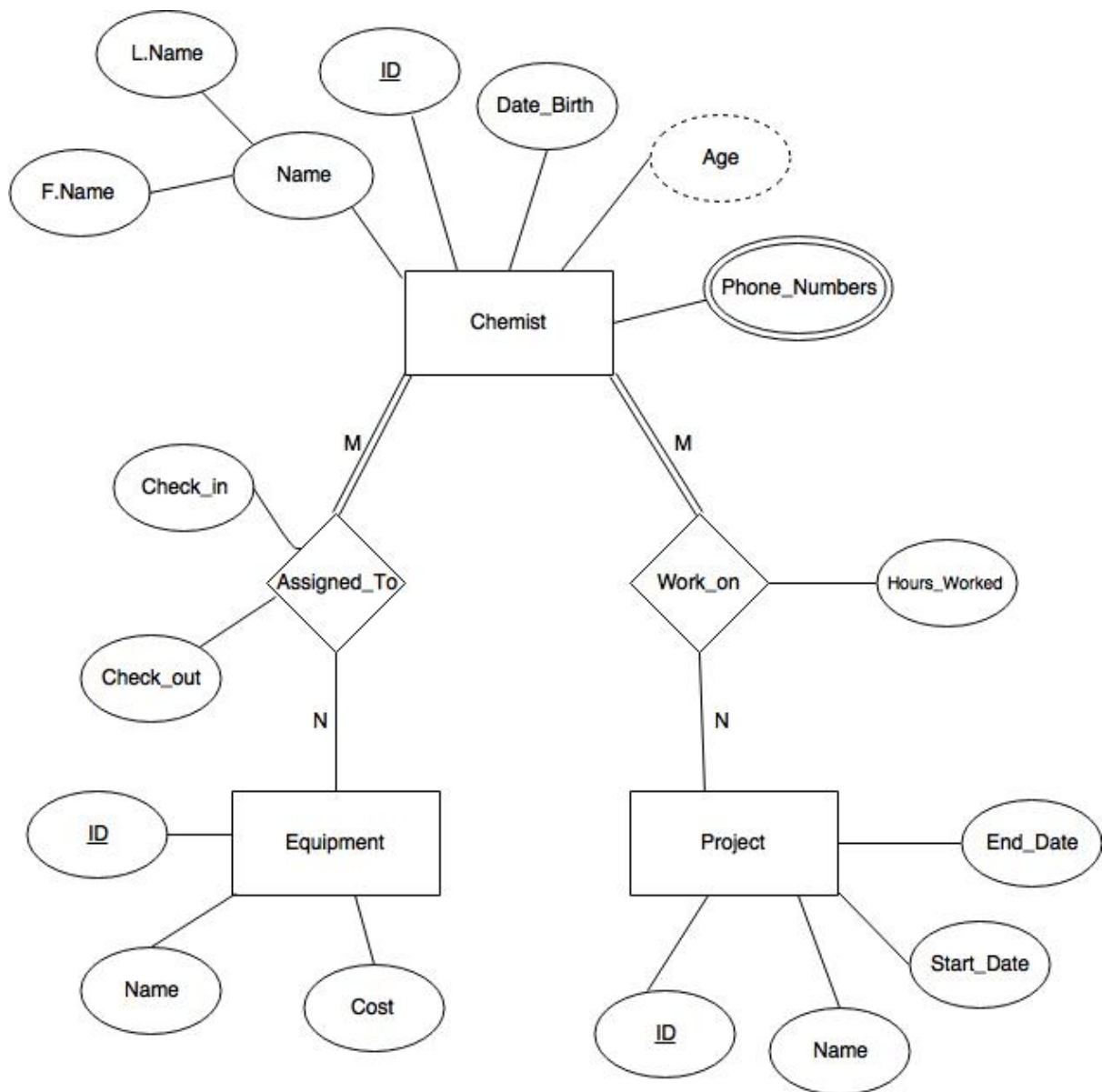
Relation Model

In this example, I have chosen my strong entity type, creation the relation that include all the simple attributes of my ER Diagram.

I choose ID as the Primary Key for the relations Chemist. E_ID is set as the Primary Key for the relations Equipment, and P_ID set as the Primary Key for the relations Project.

Chemist

ID	Fname	Lname	Date_Of_Birth	Age	Chem_Numbers

Equipment:

E_ID	Name	Cost

Project:

P_ID	Name	Sart_Date	End_Date

Relation Model

Now I am creating a relation Chem_Number. This relation represents the multivalued attribute Chem_Numbers of Chemist. Whereas CID- as foreign key- also represents the Primary Key of Chemist. Note that the Chem_Number is the combination of CID, which represents the Chemist Primary Key. And C_Number, which are the Chemist number.

Chemist:

ID	Fname	Lname	Date_Of_Birth	Age

Chem_Number:

CID	C_Number

In this example, I am removing the attribute Age from the relation Chemist, the reason is that, Age is a dependent attribute of Date_Of_Birth, which already shows the Chemist's age once its set.

Chemist:

ID	Fname	Lname	Date_Of_Birth

Relation Model

This is step shows the Mapping of Binary M:N Relationship Type, it means that, for the each binary M:N -which means "Many to Many"- we create a new relation. After creating these new relation, I am now including new relations as foreign keys for Work_On relation, whereas CID – as foreign key – represents the Primary Key of Chemist and PID – as foreign key – represents Primary Key of Projects. Note also that I have created the new relation Assigned_To, whereas CID – as foreign key – represents Primary Key of Chemists and EID also – as foreign key – represents Primary Key of Equipment.

Work_On

PID	CID	Hours_Worked

Assigned_To

CID	EID	Check_In	Check_Out

After converting The Laboratory ER Schema into a Relational Database Schema, I created the Relation Model bellow:
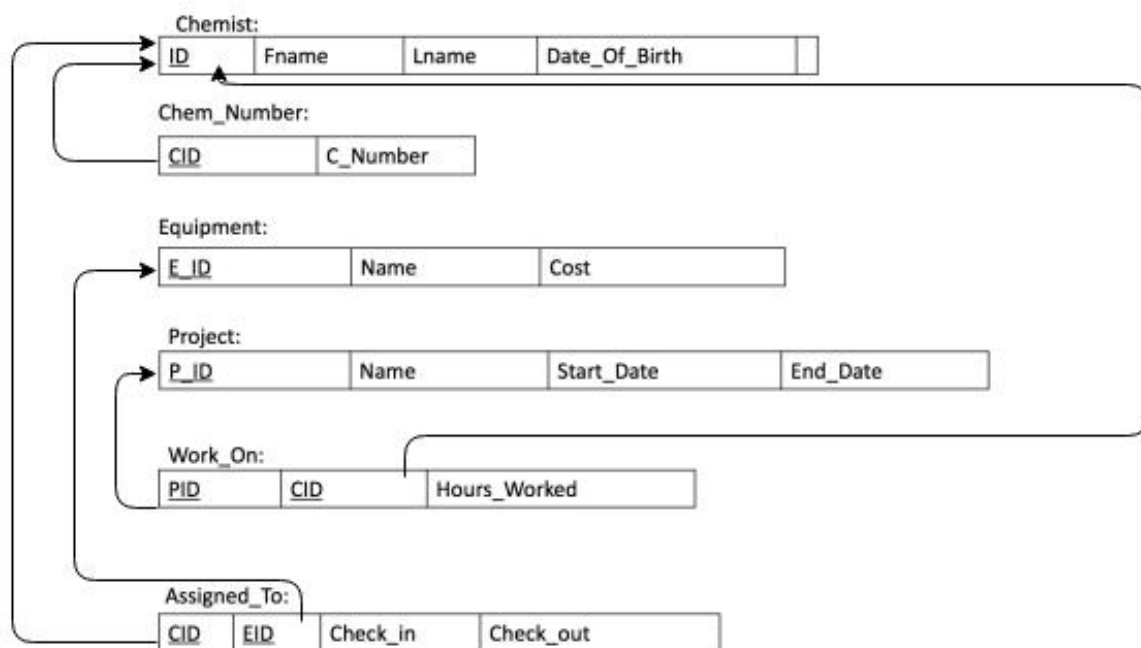
Table Name	Attribute Name	Contents	Type	Format	Range	Required	PK or FK	FK Ref.Table
CHEMIST	ID	Chemist ID	Int(11)	*******	1000.9	Y	PK	
	Fname	Chemist First name	Varchar(20)	Xxxxxx	N/A	Y		
	Lname	Chemist Last name	Varchar(20)	Xxxxx	N/A	Y		
	Date_Of_Birth	Chemist date of Birth	Date	DD-MM-YYY	N/A	Y		
EQUIPMENT	E_ID	Equipment ID	Int(11)	********	1000.9	Y	PK	
	Name	Equipment Name	Varchar(25)	Xxxxxx	N/A	Y		
	Cost	Equipment Cost	Double	99999	99999	Y		
PROJECT	PID	Project ID	Int(11)	*******	1000.9	Y	PK	
	Name	Project Name	Varchar(50)	Xxxxxx	N/A	Y		
	Start_Date	Project Start Date	TimeStamp	9999-99-99 00:00:00	N/A	Y		
	End_Date	Project End Date	TimeStamp	9999-99-99 00:00:00	N/A	Y		
Chem_Number	CID	Chemist ID	Int(11)	********	1000.0	Y	FK	Chemist
	C_Number	Chemist Number	Varchar(20)	Xxxxxx	N/A	y		
Assigned_To	CID	Chemist ID	Int(11)	*********	1000.9	Y	FK	Chemist

	EID	Equipment ID	Int(11)	**********	1000.9	Y	FK	Equipment
	Check_in	Date of Check-in	Date	9999-99-99	N/A	Y		
	Check_out	Date of Check-out	Date	9999-99-99	N/A	y		
Work_On	CID	Chemist ID	Int(11)	*******	1000.9	Y	FK	Chemist
	PID	Project ID	Int(11)	*******	1000.9	Y	FK	Project
	Hours_Worked	Total of hours worked	Time	00:00:00	N/A	y		

Creating Tables

Chemist

```sql
CREATE TABLE `Chemist` (

  `id` int(11) unsigned NOT NULL AUTO_INCREMENT,

 `Fname` varchar(20) DEFAULT NULL,

  `Lname` varchar(20) DEFAULT NULL,

  `Date_Of_Birth` date DEFAULT NULL,

  PRIMARY KEY (`id`)

);
```

Project

```sql
CREATE TABLE `Project` (

  `PID` int(11) unsigned NOT NULL AUTO_INCREMENT,

  `Name` varchar(50) DEFAULT NULL,

  `Start_Date` timestamp NULL DEFAULT NULL,

  `End_Date` timestamp NULL DEFAULT NULL,

  PRIMARY KEY (`PID`)

);
```

Equipment

```sql
CREATE TABLE `Equipment` (

  `E_ID` int(11) unsigned NOT NULL AUTO_INCREMENT,

  `Name` varchar(25) DEFAULT NULL,

  `Cost` double DEFAULT NULL,

  PRIMARY KEY (`E_ID`)     );
```

Chem_Number

```sql
CREATE TABLE `Chem_Number` (

 `CID` int(11) unsigned NOT NULL AUTO_INCREMENT,

 `C_Number` varchar(20) DEFAULT NULL,

  PRIMARY KEY (`CID`),

FOREIGN KEY (`CID`) REFERENCES `Chemist` (`id`)

);
```

Assigned_To

```sql
CREATE TABLE `Assigned_To` (

 `CID` int(11) unsigned NOT NULL AUTO_INCREMENT,

 `EID` int(11) unsigned NOT NULL,

 `Check_in` date DEFAULT NULL,

 `Check_out` date DEFAULT NULL,

  PRIMARY KEY (`CID`),

 FOREIGN KEY (`CID`) REFERENCES `Chemist` (`id`),

 FOREIGN KEY (`EID`) REFERENCES `Equipment` (`E_ID`)

);
```

Work_On

```
CREATE TABLE `Work_On` (

  `CID` int(11) unsigned NOT NULL AUTO_INCREMENT,

  `PID` int(11) unsigned NOT NULL,

  `Hours_Worked` time DEFAULT NULL,

  PRIMARY KEY (`CID`),

FOREIGN KEY (`CID`) REFERENCES `Chemist` (`id`),

 FOREIGN KEY (`PID`) REFERENCES `Project` (`PID`)

);
```

Insert Statements

Chemist:

INSERT INTO `Chemist` (`id`, `Fname`, `Lname`, `Date_Of_Birth`) VALUES ('1', 'Ronaldo', 'Tavares', '24/11/1986');

INSERT INTO `Chemist` (`id`, `Fname`, `Lname`, `Date_Of_Birth`) VALUES ('2', 'Rafael', 'Tenorio', '1992-04-13');

INSERT INTO `Chemist` (`id`, `Fname`, `Lname`, `Date_Of_Birth`) VALUES ('3', Felipe, Santos, 28-08-1992);

INSERT INTO `Chemist` (`id`, `Fname`, `Lname`, `Date_Of_Birth`) VALUES ('4', 'Gustavo', 'Torres', '1990-05-09');

INSERT INTO `Chemist` (`id`, `Fname`, `Lname`, `Date_Of_Birth`) VALUES ('5', 'Henrique', 'Correia', '1985-12-10');

Phone Number:

INSERT INTO `Chem_Number` (`CID`, `C_Number`) VALUES ('1', '089955-8998');

INSERT INTO `Chem_Number` (`CID`, `C_Number`) VALUES ('2', '087554-8567');

INSERT INTO `Chem_Number` (`CID`, `C_Number`) VALUES ('3', '086838-4748');

INSERT INTO `Chem_Number` (`CID`, `C_Number`) VALUES ('4', '089923-4567');

INSERT INTO `Chem_Number` (`CID`, `C_Number`) VALUES ('5', '089345-5865');

Equipment:

INSERT INTO `Equipment` (`E_ID`, `Name`, `Cost`) VALUES ('1', Buret, 20);

INSERT INTO `Equipment` (`E_ID`, `Name`, `Cost`) VALUES ('2', 'Pipe Stem', '30');

INSERT INTO `Equipment` (`E_ID`, `Name`, `Cost`) VALUES ('3', 'Scoopula/Spatula ', '30');

INSERT INTO `Equipment` (`E_ID`, `Name`, `Cost`) VALUES (4L, Evaporating Dish, 15);

INSERT INTO `Equipment` (`E_ID`, `Name`, `Cost`) VALUES ('5', 'Graduated Cylinder', '10');

Project:

INSERT INTO `Project` (`PID`, `Name`, `Start_Date`, `End_Date`) VALUES ('1', Cosmetic Science: Testing Lip, 2017-12-26 12:00:00, 2017-12-27 11:00:00);

INSERT INTO `Project` (`PID`, `Name`, `Start_Date`, `End_Date`) VALUES ('2', 'Saturated Solutions: Measuring', 2018-01-25 12:00:00, 2018-01-27 13:00:00);

INSERT INTO `Project` (`PID`, `Name`, `Start_Date`, `End_Date`) VALUES ('3', 'Saturated Solutions: Measuring', '2018-01-25 10:00:00', '2018-01-26 11:00:00');

INSERT INTO `Project` (`PID`, `Name`, `Start_Date`, `End_Date`) VALUES ('4', 'Oscillating Clock Color Change Chemical Reactions', '2018-02-30 12:00:00', '2018-03-01 09:00:00');

INSERT INTO `Project` (`PID`, `Name`, `Start_Date`, `End_Date`) VALUES ('5', 'Minding your Mummies: The Science of Mummification', 2018-03-01 11:00:00, 2018-03-03 12:00:00);

Assigned_To:

INSERT INTO `Assigned_To` (`CID`, `EID`, `Check_in`, `Check_out`) VALUES ('1', '3', '2017-12-18', '2017-12-20');

INSERT INTO `Assigned_To` (`CID`, `EID`, `Check_in`, `Check_out`) VALUES ('2', '4', '2017-12-20', '2017-12-22');

INSERT INTO `Assigned_To` (`CID`, `EID`, `Check_in`, `Check_out`) VALUES ('3', '1', '2017-12-23', '2017-12-24');

INSERT INTO `Assigned_To` (`CID`, `EID`, `Check_in`, `Check_out`) VALUES ('4', '5', '2017-12-21', '2017-12-22');

INSERT INTO `Assigned_To` (`CID`, `EID`, `Check_in`, `Check_out`) VALUES ('5', '2', '2017-12-22', '2017-12-23');

Work_On:

INSERT INTO `Work_On` (`CID`, `PID`, `Hours_Worked`) VALUES ('1', '2', 49:00);

INSERT INTO `Work_On` (`CID`, `PID`, `Hours_Worked`) VALUES ('2', '1', '5:00');

INSERT INTO `Work_On` (`CID`, `PID`, `Hours_Worked`) VALUES ('3', '4', '24:00');

INSERT INTO `Work_On` (`CID`, `PID`, `Hours_Worked`) VALUES ('4', '3', '25:00');

INSERT INTO `Work_On` (`CID`, `PID`, `Hours_Worked`) VALUES ('5', '5', '49:00');

Testing My Database

1. List of all chemists (First Name and Last Name) working in the company.

```
● ● ●          🏠 fernandotenorio — Fernando Tenorio 2016198 — mysql -u root -p — 91×19
[MariaDB [Laboratory]> SELECT Fname, Lname FROM Chemist;
+----------+---------+
| Fname    | Lname   |
+----------+---------+
| Ronaldo  | Tavares |
| Rafael   | Tenorio |
| Felipe   | Santos  |
| Gustavo  | Torres  |
| Henrique | Correia |
+----------+---------+
5 rows in set (0.00 sec)
```

2. List of all projects that started after 2017-01-01.

```
● ● ●          🏠 fernandotenorio — Fernando Tenorio 2016198 — mysql -u root -p — 109×19
[MariaDB [Laboratory]> SELECT * FROM Project WHERE Start_Date >="2017-01-01";
+-----+------------------------------------------------+---------------------+---------------------+
| PID | Name                                           | Start_Date          | End_Date            |
+-----+------------------------------------------------+---------------------+---------------------+
|   1 | Cosmetic Science: Testing Lip                  | 2017-12-26 12:00:00 | 2017-12-26 17:00:00 |
|   2 | Saturated Solutions: Measuring                 | 2018-01-25 12:00:00 | 2018-01-27 13:00:00 |
|   3 | Saturated Solutions: Measuring                 | 2018-01-25 10:00:00 | 2018-01-26 11:00:00 |
|   4 | Oscillating Clock Color Change Chemical Reactions | 2018-02-28 09:00:00 | 2018-03-01 09:00:00 |
|   5 | Minding your Mummies: The Science of Mummification | 2018-03-01 11:00:00 | 2018-03-03 12:00:00 |
+-----+------------------------------------------------+---------------------+---------------------+
5 rows in set (0.00 sec)
```

3. Phone numbers for a specific chemist.

```
● ● ●          🏠 fernandotenorio — Fernando Tenorio 2016198 — mysql -u root -p — 121×19
MariaDB [Laboratory]> SELECT Fname,LName, CID, C_NUMBER  FROM Chemist c INNER JOIN Chem_Number n WHERE c.id = n.CID;
+----------+---------+-----+------------+
| Fname    | LName   | CID | C_NUMBER   |
+----------+---------+-----+------------+
| Ronaldo  | Tavares |   1 | 089955-8998 |
| Rafael   | Tenorio |   2 | 087554-8567 |
| Felipe   | Santos  |   3 | 086838-4748 |
| Gustavo  | Torres  |   4 | 089923-4567 |
| Henrique | Correia |   5 | 089345-5865 |
+----------+---------+-----+------------+
5 rows in set (0.00 sec)
```

4. Number of chemists that are working in the company.

```
● ● ●          🏠 fernandotenorio — Fernando Tenorio 2016198 — mysql -u root -p — 121×19
MariaDB [Laboratory]> SELECT COUNT(id) FROM Chemist;
+-----------+
| COUNT(id) |
+-----------+
|         5 |
+-----------+
1 row in set (0.00 sec)
```

5. The amount of equipment that each chemist has checked out from 2017-01-01.

```
Empty set, 1 warning (0.00 sec)

MariaDB [Laboratory]> SELECT EID AS Chem_No, COUNT(Check_out) AS Number_of_Items FROM Assigned_to GROUP BY EID HAVING COUNT(Check_out)<"2017-01-01";
+---------+-----------------+
| Chem_No | Number_of_Items |
+---------+-----------------+
|       1 |               1 |
|       2 |               1 |
|       3 |               1 |
|       4 |               1 |
|       5 |               1 |
+---------+-----------------+
5 rows in set, 1 warning (0.00 sec)
```