DATABASE DESIGN

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Design a database for a chemist laboratory.
You are given the following information.
A laboratory has several chemists who work on one or more projects. While working on these projects a chemist may use different laboratory equipment.
The laboratory needs to know the following information about its chemists, projects and equipment.
A chemist has an employee ID, name (first and last), date of birth, age and several phone numbers. A project has a unique project ID (identifier), name, and a project start, and finish date. Equipment information which includes a serial number (unique), name, and cost. The laboratory wishes to record the date when a given piece of equipment is assigned to and returned by a particular chemist. The laboratory also wishes to record the hours a chemist works on a project.
The laboratory also has the following business rules. A chemist must be assigned to at least one project and one equipment item. A given piece of equipment need not be assigned, and a given project need not be assigned either to a chemist. [Hint partial and full participation.

Conceptual
• Using draw.io tool, produce an ER Diagram of your database requirements (using CHEN notation).

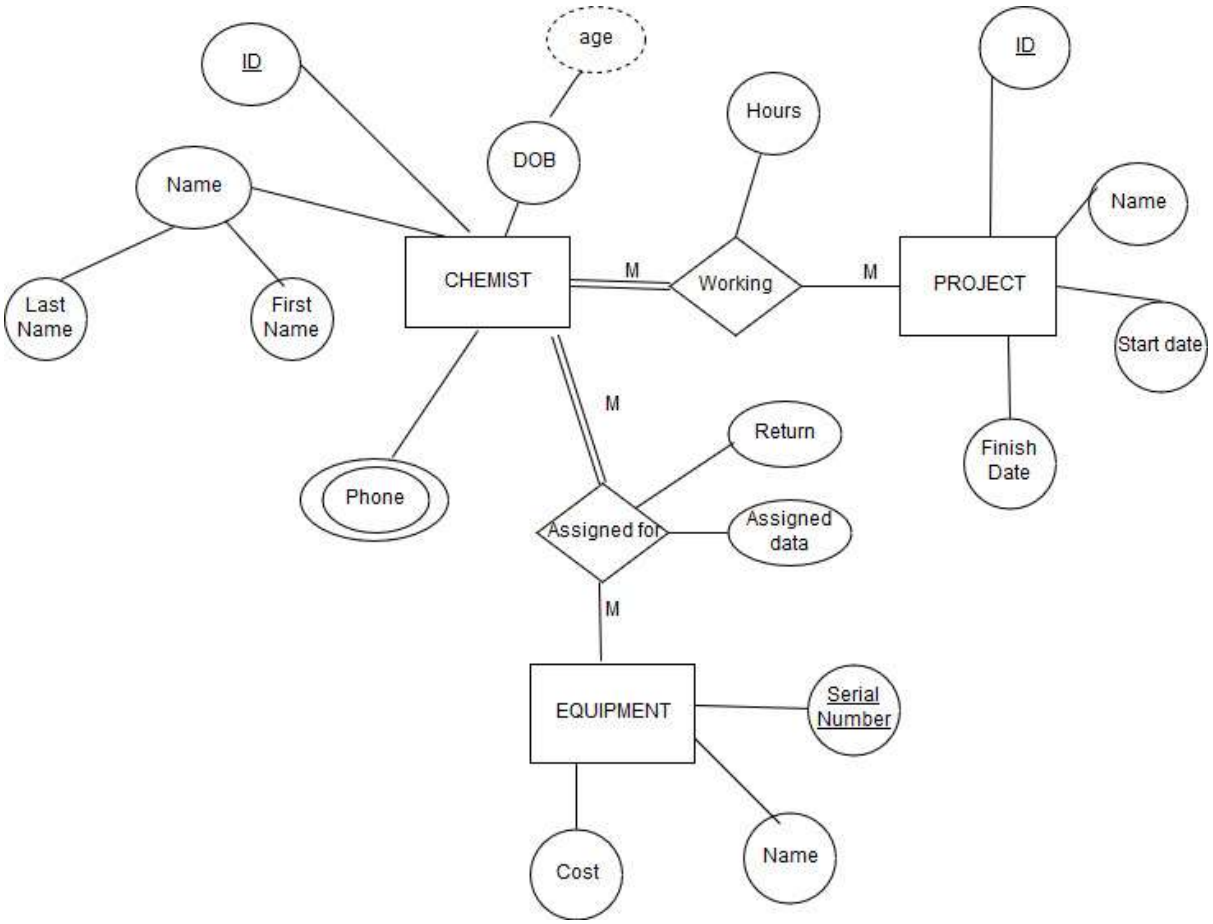

Figure 1

Logical

• Transform the ER Model to Relational Model

State the steps you used to transform your ER diagram to a relational Model.

CHEMIST

employee_ID	name	fname	lname	phone	date of birth	age

PROJECT

Project_ID	name	Startdate	Finishdate

EQUIPMENT

serialnumber	name	cost

WORK On

employee_ID	hours	project_ID

Assigned for

employee_ID	serialNumber	return data	assigned data

Validate the Relational Model using Normalisation.

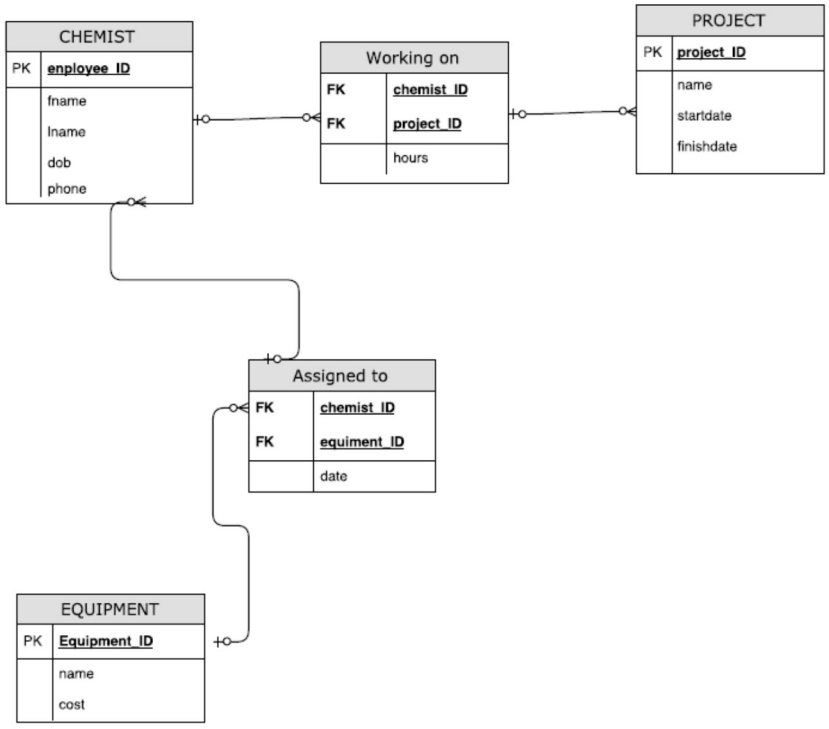

Figure 2

Table chemist:

Employee_ID	***Fname***	***Lname***	***Phone***	***age***	***Dateof birthday***
ch1	maria	*silva*	1234587	*39*	1978/08/05
ch2	*Benjamin*	*johnson*	8577767	*35*	1982/08/31
ch3	*Flavia*	*Silva*	899758051	*37*	*1980/05/30*
ch4	*Laura*	*Tome*	76845694,	*29*	*1985/06/06*
ch5	*Greg*	*South*	87689779	*36*	*1981/09/06*

There is a problem in that table because the field phone can have more than one number a land line, work phone or mobile phone.

Solving this issue, we should create another table just to store another type of phone number as table below:

Create table phone_ID:

Employee_ID	areacode	phonenumber
ch1	nul	9899-0008
ch2	353	8997-8999
ch3	353	6775-9087
ch4	353	5567-9870
ch5	null	6754-0008

Produce a Data Dictionary for each Relation:

TABLE NAME	ATTRIBUTE NAME	CONTENTS	TYPE	FORMAT	RANGE	REQUIRED	PK OR PK	FK REFERENCED TABLE
CHEMIST	C_EMPLOYEE_ID	employee number	CHAR(4)	XXXXXXXXXX	N/A	Y	PK	
	C_FNAME	first name	VARCHAR(50)	XXXXXXXXXX	N/A	Y		
	C_LNAME	last name	CHAR(35)	XXXXXXXXXX	N/A	Y		
	C_AREACODE	area code	CHAR(3)	999	N/A	Y		
	C_PHONE_ID	phone number	CHAR(8)	999-9999	N/A	Y	FK	
	C_PHONE	Other phone number contact	CHAR(8)	999-9999	N/A	Y		
	C_DOB	date of birth	DATE	DD/MM/YYYY	N/A	Y		
	C_AGE	age	INT(3)	XXXXXXXXXX		N		
PHONE_ID	C_EMPLOYEE_ID	employee number	CHAR(4)	XXXXXXXXXX	N/A	Y	PK	EMPLOYEE TABLE
	C_AREACODE	area code	CHAR(3)	999	N/A	Y		
	PHONE	phone number	CHAR(8)	999-9999	N/A	Y		
PROJECT	P_PROJECT_ID	project number	CHAR(8)	XXXXXXXXXX		Y	PK	
	P_NAME	project name	VARCHAR(50)	XXXXXXXXXX		Y		
	P_STARTDATE	project starting date	DATE	XXXXXXXXXX	DD/MM/YYYY	Y		
	P_DATEFINISH	project final date	DATE	XXXXXXXXXX	DD/MON/YYYY	Y		
EQUIPMENT	E_EQUIPMENT NUMBER	Equipment number	CHAR(8)	#####	N/A	Y	PK	
	E_SERIALNUMBER	serial number	INT(25)	#####	1000-9999	Y		
	E_NAME	equipment name	VARCHAR(50)	XXXXXXXXXX	N/A	Y		
	E_COST	equipment price	DECIMAL(8,2)	XXXXXXXXXX	####.##	Y		
ASSIGNED	C_EMPLOYEE_ID	employee number	CHAR(4)	XXXXXXXXXX	N/A	Y	PK	CHEMIST TABLE
	E_SERIALNUMBER	serial number	INTEGER(25)	#####	1000-9999	Y	PK	EQUIPMENT TABLE
	A_DATE	assigned date	DATE	XXXXXXXXXX	DD/MM/YYYY	Y		
WORK ON	P_PROJECT_ID	project number	CHAR(8)	XXXXXXXXXX		Y	PK	PROJECT TABLE
	C_EMPLOYEE_ID	employee number	CHAR(4)	XXXXXXXXXX	N/A	Y	PK	EMPLOYEE TABLE
	HOUR	Amount of hours worked	INT(3)	XXXXXXXXXX	N/A	Y		

FK - FOREIGN KEY

PK- PRIMARY KEY

INT- INTEGER VALUES ONLY

CHAR - FIXED CHARACTER LENGTH DATA, 1 TO 255 CHARACTERS.

VARCHAR- VARIABLE CHARACTER LENGTH DATA 1 TO 20000

DECIMAL- NUMERIC DATA

DATE- VARIOUS FORMATS ACCEPTED 'DD-MM-YYY', 'DD-MON-YYYY', 'MM/DD/YYYY' OR 'MM/DD/YY'.

Physical

• Produce MySQL create statements for each relation (Note, be sure to include constraints i.e. both Primary and Foreign Keys)

Create table chemist(employee_ID char(4) not null,

fname varchar(50) not null,

lname char(35) not null,

areacode char(3) ,

phone_ID char(9) ,

phone char(9),

dob date,

age int(3),

primary key (employee_ID, phone_ID));

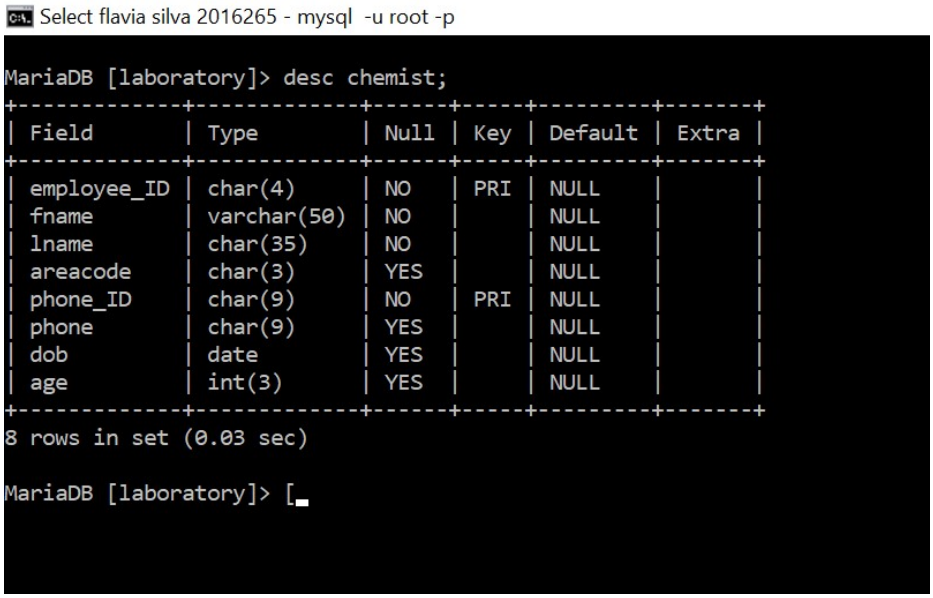

Figure 3

Create table phone_ID(employee_ID char(3) not null,

areacode char(3) ,

phone char(9) ,

 primary key(employee_ID));

```
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| employee_ID | char(3) | NO   | PRI | NULL    |       |
| areacode    | char(3) | YES  |     | NULL    |       |
| phone       | char(9) | YES  |     | NULL    |       |
+-------------+---------+------+-----+---------+-------+
3 rows in set (0.01 sec)

MariaDB [laboratory]> desc phone_ID;
+-------------+---------+------+-----+---------+-------+
| Field       | Type    | Null | Key | Default | Extra |
+-------------+---------+------+-----+---------+-------+
| employee_ID | char(3) | NO   | PRI | NULL    |       |
| areacode    | char(3) | YES  |     | NULL    |       |
| phone       | char(9) | YES  |     | NULL    |       |
+-------------+---------+------+-----+---------+-------+
3 rows in set (0.02 sec)
```

Figure 4

Create table project(project_ID char(8) not null,

name varchar(50) not null,

startdate date,

finishdate date,

Primary key(project_ID));

```
flavia silva 2016265 - mysql  -u root -p
+------------+-------------+------+-----+---------+-------+
| Field      | Type        | Null | Key | Default | Extra |
+------------+-------------+------+-----+---------+-------+
| project_ID | char(8)     | NO   | PRI | NULL    |       |
| name       | varchar(50) | NO   |     | NULL    |       |
| startdate  | date        | YES  |     | NULL    |       |
| finishdate | date        | YES  |     | NULL    |       |
+------------+-------------+------+-----+---------+-------+
4 rows in set (0.01 sec)
```

Figure 5

create table equipment(equipment_ID char(8) not null,

serialnumber int(25) not null,

name varchar(50) not null,

cost decimal (8,2) NOT NULL,

PRIMARY KEY(equipment_ID));

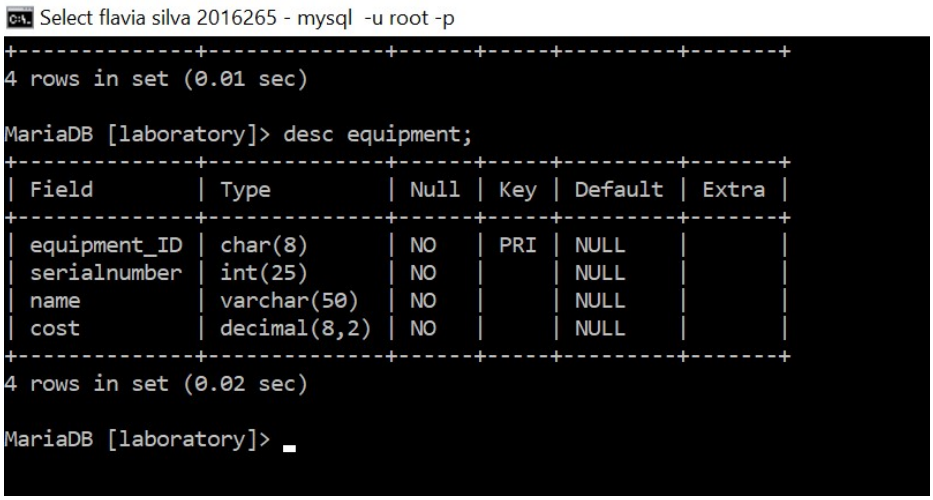

Figure 6

Create table assigned(employee_ID char(4) not null,

equipment_ID char(8) not null,

date date,

Primary key (employee_ID, equipment_ID));

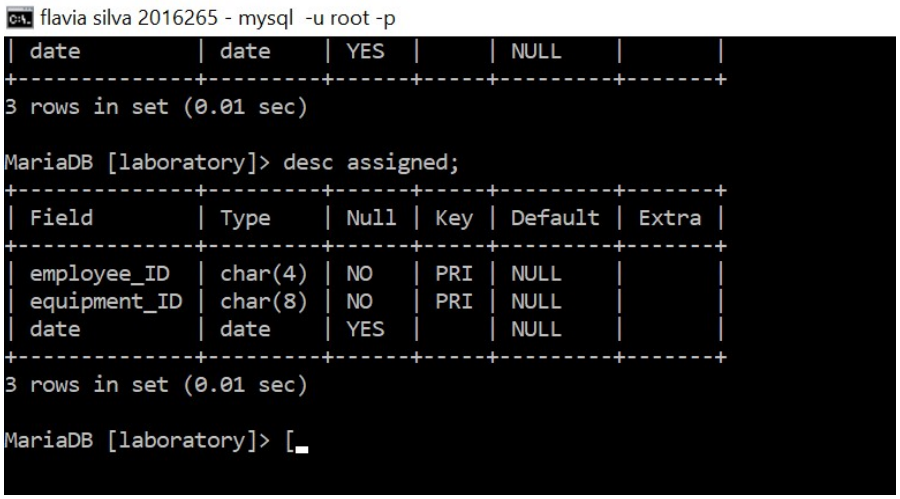

Figure 7

Create table work(employee_ID char(4) not null,

project_ID char(8) not null,

hour int(3) not null,

primary key(employee_ID, project_ID,));

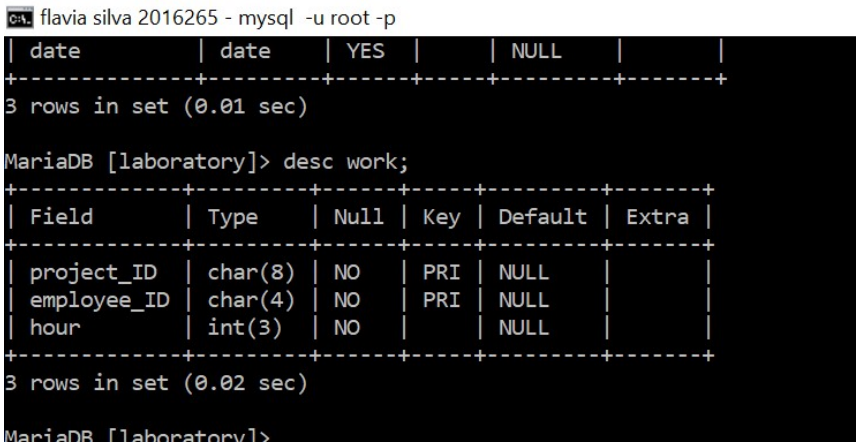

Figure 8

Implementation
Insert Statements:
Provide the SQL statements used to insert data into your relations. Each relation (table) should contain a **minimum of 5 rows**.
Your report will include the insert statements (text format) and a screen shots of your tables showing its contents. (ensure ALL screenshots show your name/student number in title bar).

Table chemist:

insert into chemist values('ch1', 'maria', 'silva', 353, 1234587, ’9899-0008’,'1978/08/05', 39);

insert into chemist values(‘ch2’, ‘benjamin’, ‘johnson’, 353, 8577767, ‘8997-8999’, ‘1982/08/31’,35);

insert into chemist values (‘ch3’, ‘flavia’, ‘silva’, 353, 899758051, ’6775-9087’, ‘1980/05/30’,37);

insert into chemist values(‘ch4’, ‘Laura’, ‘Tome’, 353, 76845694, ’5567-9870’, ‘1985/06/06’,29);

insert into chemist values(‘ch5’, ‘Greg’,’south’, 353, 87689779, ’6754-0008’, ‘1981/09/06’, 36);

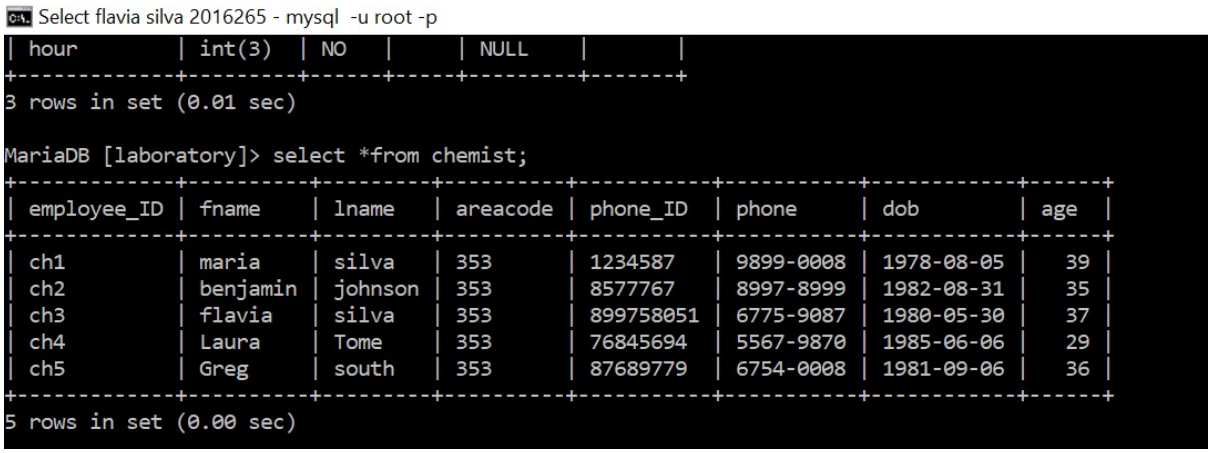

Figure 9

Table Phone_ID:

Insert into phone_ID values(‘ch1’,’null’,’9899-0008’);

Insert into phone_ID values(‘ch2’,353,’8997-8999’);

Insert into phone_ID values(‘ch3’,353,’6775-9087’);

Insert into phone_ID values(‘ch4’,353,’5567-9870’);

Insert into phone_ID values(‘ch5’,’null’,’6754-0008’);

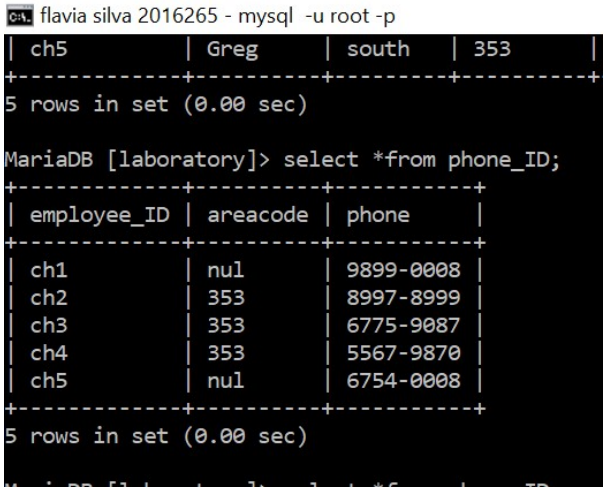

Figure 10

Table project:

insert into project values(‘p567’,'protein biomarkers','2017/01/01', '2017/05/05');

insert into project values(‘p568’, ‘endometrial carcinomas’,’2017/02/02’,’2018/02/02’);

insert into project values(‘p569’, ‘pathology specimens’,’2017/03/02’,’2018/01/01’);

insert into project values('p570','virtual autopsies', '2017/01/01','2017/12/08');

insert into project values('p571','image segmentation', '2017/01/01','2017/03/04');

insert into project values('p572','neuronal anatomy', '2017/02/02','2017/04/04');

insert into project values('p573', 'clinical data', '2017/01/01', '2017/11/09');

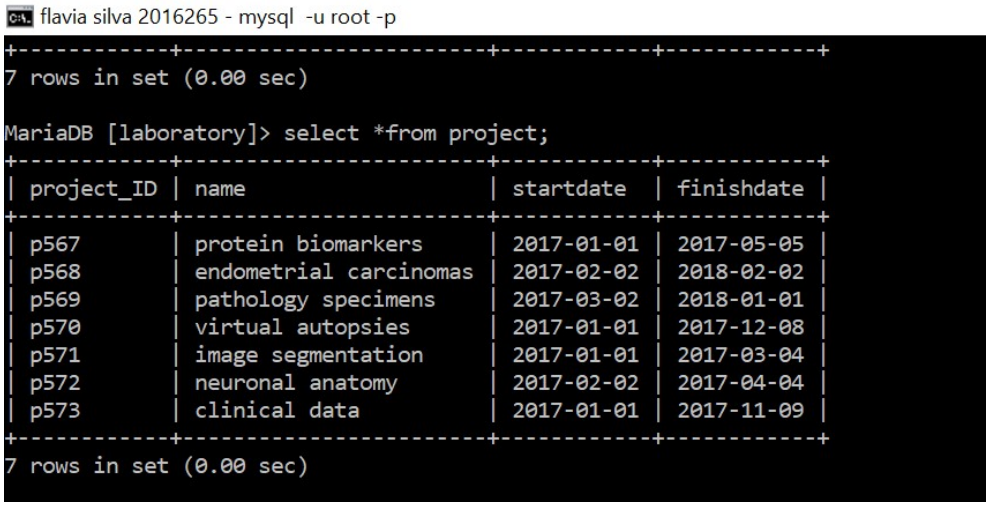

Figure 11

Table equipment:

Insert into equipment values('e1',77687,'laptop',1565.00);

Insert into equipment values('e2',77688,'chemical analyzer',275.00);

Insert into equipment values('e3',77689,'chemical dispenser',10000.00);

Insert into equipment values('e4',77690,'diagnostic products',5689.00);

Insert into equipment values('e5', 77691,'fluorescent proteins antibodies',34567.00);

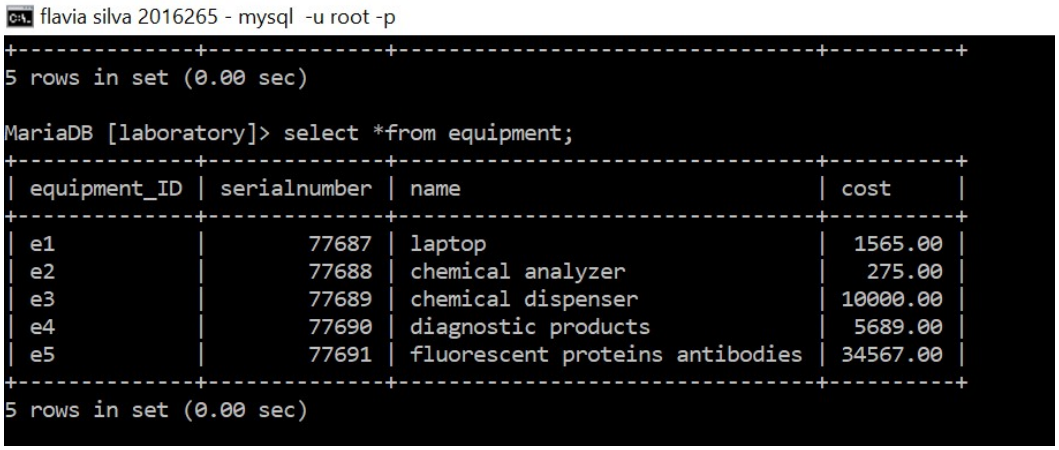

Figure 12

Table assigned:

Insert into assigned values('ch1', ‘p569’, ‘2017/02/02’);

Insert into assigned values(‘ch1’,’p571’,’2017/10/01’);

Insert into assigned values(‘ch1’,’p573’,’2017/03/04’);

Insert into assigned values(‘ch2’,’p567’,’2017/02/02’);

Insert into assigned values(‘ch2’,’p573’,’2017/02/05’);

Insert into assigned values(‘ch2’,’p567’,’2017/06/09’);

Insert into assigned values(‘ch2’,’p569’,’2017/03/07’);

Insert into assigned values(‘ch3’,’p570’,’2017/05/02’);

Insert into assigned values(‘ch3’,’p568’,’2017/03/06’);

Insert into assigned values(‘ch4’,’p572’,’2017/05/07’);

Insert into assigned values(‘ch4’,’p573’,’2017/03/03’);

Insert into assigned values(‘ch5’, ‘p568’, ‘2017/02/02’);

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```
| e5           |        77691 | fluorescent proteins antibodies | 34
+--------------+--------------+---------------------------------+---
5 rows in set (0.00 sec)

MariaDB [laboratory]> select *from assigned;
+-------------+-------------+------------+
| employee_ID | equipment_ID | date       |
+-------------+-------------+------------+
| ch1         | p569         | 2017-02-02 |
| ch1         | p571         | 2017-10-01 |
| ch1         | p573         | 2017-03-04 |
| ch2         | p567         | 2017-02-02 |
| ch2         | p569         | 2017-03-07 |
| ch2         | p573         | 2017-02-05 |
| ch3         | p568         | 2017-03-06 |
| ch3         | p570         | 2017-05-02 |
| ch4         | p572         | 2017-05-07 |
| ch4         | p573         | 2017-03-03 |
| ch5         | p568         | 2017-02-02 |
+-------------+-------------+------------+
11 rows in set (0.00 sec)
```

Figure 13

Table work:

insert into work values(’ch2’,‘p568’,54);

insert into work values(‘ch5’,‘p570’,24);

insert into work values(,’ch3’,‘p568’,44);

insert into work values(’ch4‘,’p573’,34);

insert into work values('ch1','p569',65);

insert into work values('ch1','p572', 59);

insert into work values('ch3' ,'p571',36);

insert into work values('ch4', 'p569',17);

insert into work values('ch5' ,'p573',20);

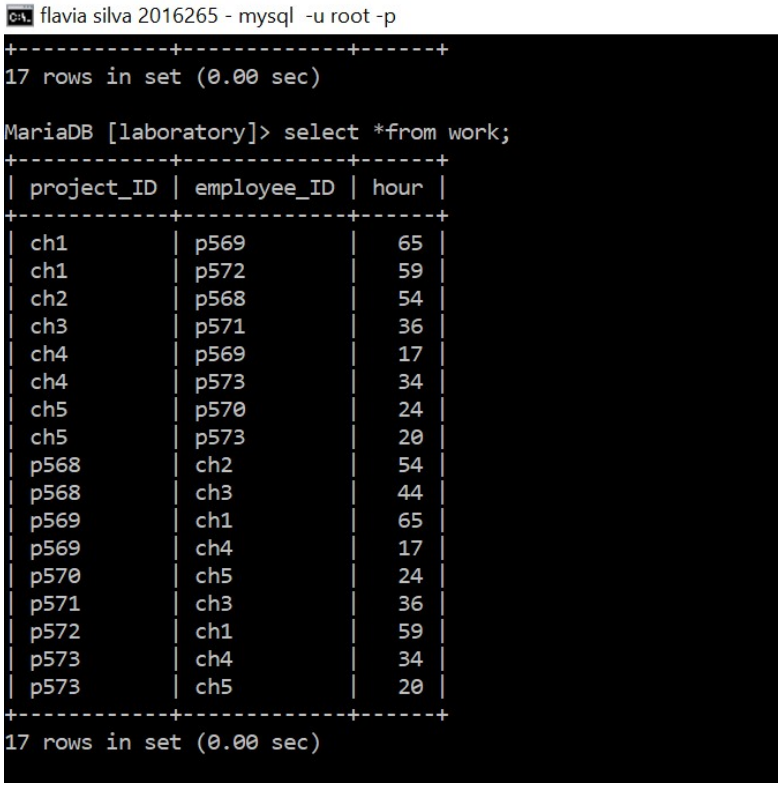

Figure 14

TESTING:

1. A list of all chemists (FIRSTNAME AND LASTNAME ONLY).

Command used to collect information required:

select fname, lname from chemist;

```
MariaDB [laboratory]> select fname, lname from chemist;
+----------+---------+
| fname    | lname   |
+----------+---------+
| maria    | silva   |
| benjamin | johnson |
| flavia   | silva   |
| Laura    | Tome    |
| Greg     | south   |
+----------+---------+
5 rows in set (0.01 sec)
```

Figure 15

2. A list of all projects that started after 2017-01-01.

Command used to collect information required:

select name, startdate from project where startdate >'2017/01/01';

```
flavia silva 2016265 - mysql  -u root -p

MariaDB [laboratory]> select name, startdate from project where startdate >'2017/01/01';
+-----------------------+------------+
| name                  | startdate  |
+-----------------------+------------+
| endometrial carcinomas | 2017-02-02 |
| pathology specimens    | 2017-03-02 |
| neuronal anatomy       | 2017-02-02 |
+-----------------------+------------+
3 rows in set (0.00 sec)

MariaDB [laboratory]>
```

Figure 16

3. The phones numbers for a specific chemist (e.g. chemist Employee ID 1). You can filter by the Emp_No of the Chemist

Command used to collect information required:

select phone from chemist where employee_id ='ch3';

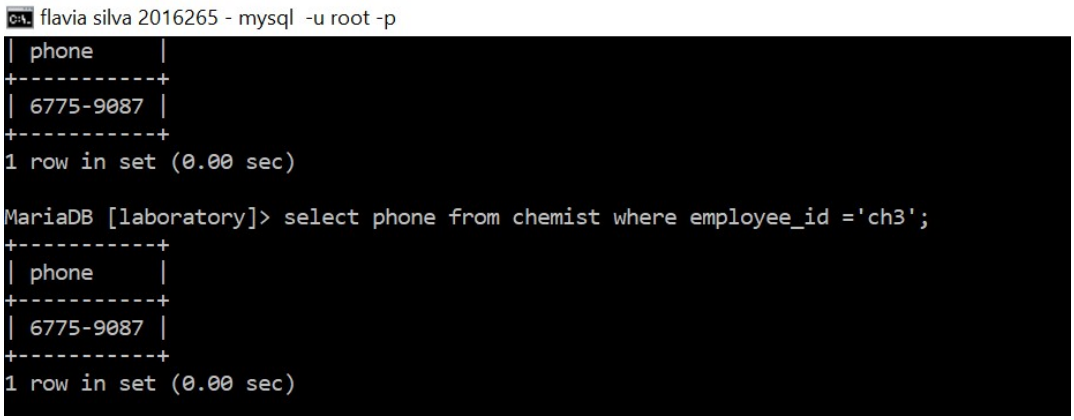

Figure 17

4.Using an SQL function, return how many chemists work in the company?

Command used to collect information required:

select employee_ID from chemist;

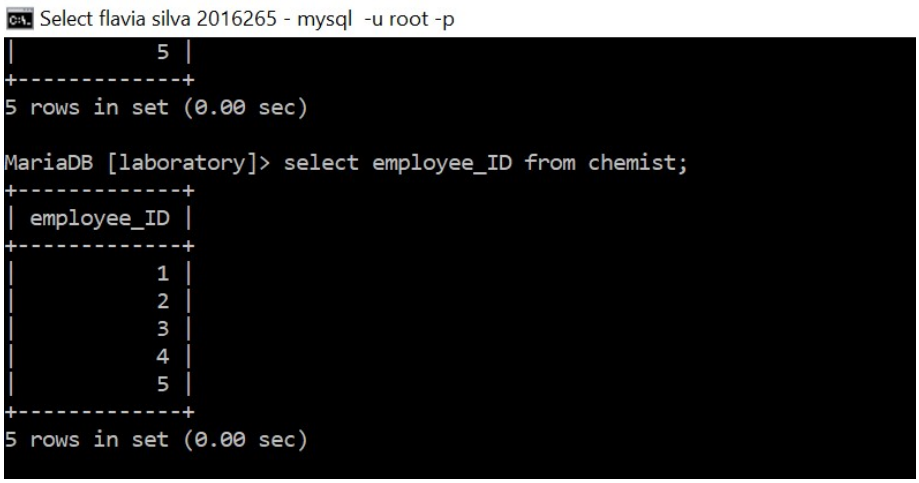

Figure 18

5. For each chemist, the amount of equipment they have checked out this year (I.E. >2017-01-01). [Hint this query will use Group By, and you only need to calculate how many pieces of equipment a chemist has checked out.

select employee_ID, count(*)from assigned group by employee_ID;

flavia silva 2016265 - mysql -u root -p

```
| ch5         |        1 |
+-------------+----------+
5 rows in set (0.00 sec)

MariaDB [laboratory]> select  employee_ID, count(*)from assigned group by employee_ID;
+-------------+----------+
| employee_ID | count(*) |
+-------------+----------+
| ch1         |        3 |
| ch2         |        3 |
| ch3         |        2 |
| ch4         |        2 |
| ch5         |        1 |
+-------------+----------+
5 rows in set (0.00 sec)

MariaDB [laboratory]>
```