Solution 1 - Formulate the following queries in SQL.

a) Find the details of all of reefs which have recorded a temperature-reading above 22 degrees.

```
SELECT *
FROM REEF
WHERE reefname IN (
        SELECT reefname
        FROM REEFTEMP
        WHERE temperaturereading > 22)
```

b) Find the details of all reefs which have recorded a temperature-reading below the average temperature-reading across all reefs.

```
SELECT DISTINCT REEF.*
FROM REEF, REEFTEMP
WHERE REEF.reefname = REEFTEMP.reefname
AND temperaturereading < (
        SELECT AVG(temperaturereading)
        FROM REEFTEMP)
```

c) Find names of all reefs that do not have a sample of a coral with name including "Button".

```
SELECT reefname
FROM REEF
WHERE reefname NOT IN (
        SELECT reefname
        FROM CORALSAMPING
        WHERE coralcode IN (
                SELECT coralcode
                FROM CORAL
                WHERE coralname LIKE "%button%"))
```

d) Find the coral that has the highest thermal-threshold.

```
SELECT coralname
FROM CORAL
WHERE thermalthreshold >= ALL (
        SELECT thermalthreshold
        FROM CORAL)
```

Solution 2 - Formulate the following queries in SQL.

a) Retrieve the names of corals which are in ALL reefs.

```
SELECT coralname
FROM CORAL AS A
WHERE NOT EXISTS (
        SELECT *
        FROM REEF AS B
        WHERE NOT EXISTS (
                SELECT *
                FROM CORALSAMPLING AS C
                WHERE A.coralcode = C.coralcode AND B.reefname = C.reefname))
```

b) List reef(s) that have at least all the corals that the reef “Wreck Is.” has.

```
SELECT *
FROM REEF AS X
WHERE NOT EXISTS (
        SELECT *
        FROM CORALSAMPLING
        WHERE reefname = “Wreck Is” AND coralcode NOT IN (
                SELECT coralcode
                FROM CORALSAMPLING AS Y
                WHERE X.reefname = Y.reefname))
```

Alternate solution:

```
SELECT *
FROM REEF AS X
WHERE NOT EXISTS (
        SELECT *
        FROM CORALSAMPLING AS Y
        WHERE reefname = “Wreck Is.” AND NOT EXISTS (
                SELECT *
                FROM CORALSAMPLING AS Z
                WHERE Z.coralcode = Y.coralcode and Z.reefname = X.reefname))
```

(Solution continues onto next page.)

Alternate solution:

```
SELECT reefname
FROM CORALSAMPLING
WHERE coralcode IN (
        SELECT coralcode
        FROM CORALSAMPLING
        WHERE reefname= “Wreck Is.”)
GROUP BY reefname
HAVING COUNT(*) >= (
        SELECT COUNT(distinct coralcode)
        FROM CORALSAMPLING
        WHERE reefname = “Wreck Is.”)
```