Consider the following relational schema:

\[
\begin{align*}
\text{Suppliers}(\text{sid}, \text{sname}, \text{address}) \\
\text{Parts}(\text{pid}, \text{pname}, \text{color}) \\
\text{Catalog}(\text{sid}, \text{pid}, \text{cost})
\end{align*}
\]

The underlined attributes are keys for their relations. The \textit{Catalog} relation lists the prices charged for \textit{Parts} by \textit{Suppliers}. Write the following queries in SQL:

\(\text{(a) Find the \textit{pname}s of parts for which there is some supplier.}\)

\textbf{(solution)}

\[
\begin{align*}
\text{SELECT DISTINCT P.pname} \\
\text{FROM Parts P, Catalog C} \\
\text{WHERE P.pid = C.pid}
\end{align*}
\]

\(\text{(b) Find the \textit{sid}s of suppliers who supply only red parts.}\)

\textbf{(solution)}

\[
\begin{align*}
\text{SELECT C.sid} \\
\text{FROM Catalog C} \\
\text{WHERE NOT EXISTS ( SELECT *} \\
\text{FROM Parts P} \\
\text{WHERE P.pid = C.pid AND P.color <> \text{Red})}
\end{align*}
\]

\(\text{(c) Find the \textit{sname}s of suppliers who supply every part.}\)

\textbf{(solution)}

\[
\begin{align*}
\text{SELECT S.sname} \\
\text{FROM Suppliers S} \\
\text{WHERE NOT EXISTS (( SELECT P.pid} \\
\text{FROM Parts P) EXCEPTS} \\
\text{(SELECT C.pid} \\
\text{FROM Catalog C} \\
\text{WHERE C.sid = S.sid))}
\end{align*}
\]

\(\text{(d) Find the \textit{sid}s of suppliers who charge more for some part than the average cost of that part (averaged over all the suppliers who supply that part).}\)

\textbf{(solution)}

\[
\begin{align*}
\text{SELECT C.sid} \\
\text{FROM Catalog C} \\
\text{WHERE C.cost > ( SELECT AVG (C1.cost) } \\
\text{FROM Catalog C1} \\
\text{WHERE C1.pid = C.pid )}
\end{align*}
\]

\(\text{(e) For each part, find the \textit{sname} of the supplier who charges the most for that part.}\)
(solution)
SELECT P.pid, S.sname
FROM Parts P, Suppliers S, Catalog C
WHERE C.pid = P.pid
AND C.sid = S.sid
AND C.cost = (SELECT MAX (C1.cost)
FROM Catalog C1
WHERE C1.pid = P.pid)

(f) Find the snames of suppliers that provide some parts.

(solution)
SELECT DISTINCT S.sname
FROM Suppliers S, Catalog C
WHERE S.sid = C.sid

(g) Find the sids of suppliers who supply a red part and a green part.

(solution)
SELECT DISTINCT C.sid
FROM Catalog C, Parts P
WHERE C.pid = P.pid AND P.color = Red
INTERSECT
SELECT DISTINCT C1.sid
FROM Catalog C1, Parts P1
WHERE C1.pid = P1.pid AND P1.color = Green

(h) Find the pnames of parts supplied by Acme Widget Suppliers and no one else.

(solution)
SELECT P.pnam
FROM Parts P, Catalog C, Suppliers S
WHERE P.pid = C.pid AND C.sid = S.sid AND S.sname = Acme Widget Suppliers
AND NOT EXISTS ( SELECT *
FROM Catalog C1, Suppliers S1
WHERE P.pid = C1.pid AND C1.sid = S1.sid AND S1.sname <> Acme Widget Suppliers )

(i) Find the pids and minimum costs of parts whose maximum costs are less than $100 and their color is red.

(solution)
SELECT P.pid, MIN(C.cost)
FROM Catalog C, Parts P
WHERE C.pid = P.pid AND P.color = Red
Group by P.pid
Having MAX(C.cost) < 100