1. a) to find s.i.d of suppliers who supply all blue parts:

→ get a table with all possible combinations of sid and (all of pid) (of blue)

→ subtract above with catalog table to get tuples which are missing from catalog to make it complete (s.t. those suppliers supply all blue parts).

→ Now ~~pid of~~ sid of ~~them~~ above table (we subtract) should not be present from list of all possible sid, which gives us suppliers who supply all blue parts.

$$\pi_{sid}(catalog) - \pi_{sid}\left(\pi_{sid}(catalog) \times \pi_{pid}\left(\sigma_{color='blue'}(Parts)\right) - \pi_{sid,pid}(catalog)\right)$$

~~b) select (sname~~

b) select (select sname from Suppliers as s where s.sid = x.sid),
x.min-price
from (select sid, count(pid) as num-parts, min(price) as min-price
from catalog
group by sid) as x
where x.num-parts >= 2;

c) Let (A1, B1, C1) mean (sid, sname, address) in Suppliers
(A2, B2, C2) mean (pid, pname, color) in Parts
(A3, B3, C3) mean (sid, pid, price) in Catalog.

$$\{\langle B1, C2\rangle \mid \exists A1, A2 \left(\exists C1 \langle A1, B1, C1\rangle \in Suppliers \wedge \exists B2 \langle A2, B2, C2\rangle \in Parts \wedge \exists C3 \langle A1, A2, C3\rangle \in Catalog\right)\}$$

d) Let us say that supplier A and B are related if they supply at one part with same pid. or there exists supplier C such that (A & C) and (B & C) are related respectively. Now given two suppliers, check if they are related.

The above query cannot be translated to SQL as a strict upper bound doesn't exist (i.e) it is based on the Parts and Suppliers Table.

// Assumption: I gave argument to show it satisfies but not in detail proof as question only says write "such f2 and f3".

2) Let F2 : BC → A and F3 : D → C

a) F2 and F3 are not derivable from F1 through armstrom axioms

b) F1 is in BCNF as : ~~A is~~

A → BCDEF

⇒ A → ABCDEF ⇒ A is candidate key.

so A → BCDEF is in BCNF.

BC → A. is also non-trivial. as A is candidate key. BC are also a candidate key.

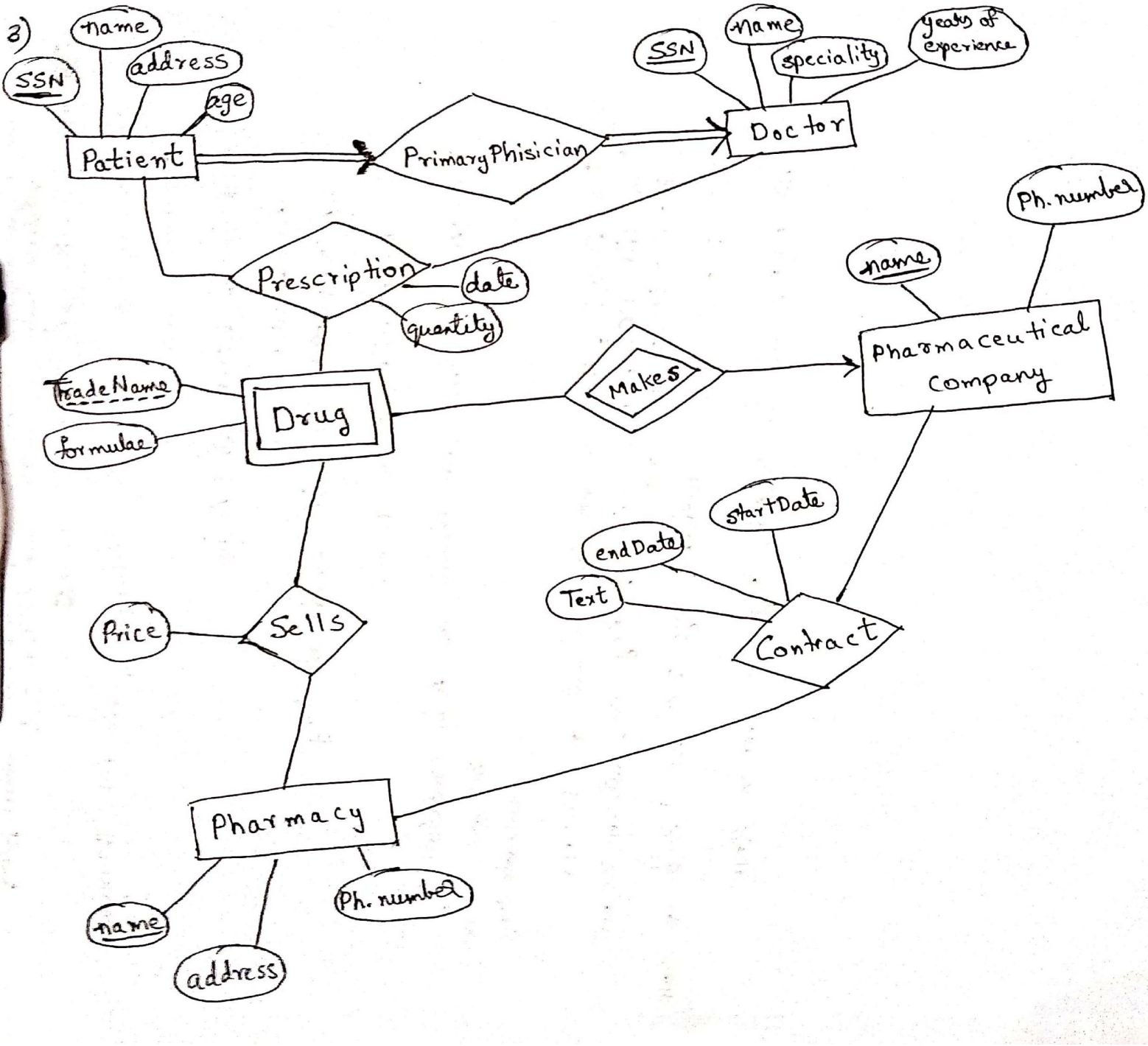
c) F3 : D → C, ~~there is no~~ this is not in BCNF.

D^+ is still DC which is not superkey. So, not in BCNF.

~~D - C = D is in cand~~

C - D = C is in candidate key BC so F3 is in 3NF.

∴ F1, F2 are in BCNF, they are also in 3NF.



b) Instead of date as an attribute of prescriptions. we can create an entity "DATES" and link it to Prescription to make it a *-way relationship.