I

a. $\{X/\text{mary}\}$

b $\{X/a, Y/b, Z/b\}$

c. Thoese pairs can't be unified. (Y can't equal b and c).

d. $q(Y, g(a,b))$ and $q(g(X,X), Y)$

    ↓ substitude because Y is in both of the pair.

$q(V, g(a,b))$ and $q(g(X,X), Y)$

$\{V/g(X,X), Y/g(a,b)\}$

e. $\{Y/\text{John}, X/Y\}$

$\{Y/\text{John}, X/\text{John}\}$

II

The working memory won't change as we will use backward chaining.

a. WM:

patient (john)
hasFever (john)
coughs (john)
hasBackache (john)
CultureResult (john, positive)

---

1. ~~goal stack~~ ~~stack~~: Current goal stack:

has Pneumonia (john)

Rules:

1. ~~Hit. has Pneumonia (john)~~ current goal = has Pneumonia (john)

    Rules tried: 1

1. Hit. ~~~~ 1. Hit { P/john }

goal stack changes:

has Backache (john)
~~infectiontype (john, bacterial)~~ coughs (john)
~~has Pneumonia (john)~~ infectiontype (john, bacterial)
~~has Pneumonia (john)~~

---

2. Current goal stack:

has Backache (~~john~~ john)
coughs (~~john~~ john)
infectiontype (~~john~~ john, bacterial)

current goal: ~~hasPneumonia~~ hasBacktache (john)

This goal is in the ~~was~~ WM. ~~{P/john}~~

---

3. Current goal stack:

coughs(~~P~~ john)

infectionType (~~P~~ @john, bacterial)

Current goal: ~~has~~ coughs(~~P~~ john)

This goal is in the WM ~~{P~~ ~~{P/john}~~

4. current goal stack:

infectionType (~~P~~ john, bacterial)

Current goal: infectiontype (~~P~~ @john, bacterial)

1. No hit
2. No hit
3. Hit   { P / john }

goal stack changes:

cultureResult(~~P~~ john, positive)
has Infection (~~john~~)

---

3. current goal stack

cultureResult (john, positive)
hasInfection (john)

Current goal: cultureResult (john, positive)

This goal is in the WM

6. current goal stack:

has_Infection (john)

Current goal: has_Infection (john)

1. No hit
2. No hit
3. No hit
4. No hit
5. Hit.   { P/john }

6 goal stack changes:

has_Fever (john)
_____

7. current goal stack:

has_Fever (john)

Current goal: has_Fever (john)

This goal is in the WM.
_____

8. current goal stack:

<empty>

The goal stack is empty so the original goal
statement holds for the rules given.