Tutorial 6

Part 1

1) Atemporal predicates are: $water(x), bottle(x), cup(x)$ and $teabag(x)$.
Fluent predicates are: $hot(x), empty(x)$ and $inside(x, y)$ where inside means x is inside y.

2) Initial state would be: $water(w) \wedge bottle(b) \wedge inside(w, b) \wedge kettle(k) \wedge cup(c) \wedge teabag(t) \wedge empty(k) \wedge empty(c)$.

3) Goal state would be: $water(w) \wedge cup(c) \wedge inside(w, c) \wedge teabag(t) \wedge inside(t, c) \wedge hot(w)$.

4) The actions would be the following:
$Action(Pour(x, from, to),$
Precondition: $water(x) \wedge inside(from, to) \wedge empty(to) \wedge \neg inside(x, to)$,
Effect: $inside(x, to) \wedge \neg empty(to) \wedge \neg inside(x, from) \wedge empty(from))$

$Action(AddTeaBag(t, c),$
Precondition: $cup(c) \wedge teabag(t) \wedge \neg inside(t, c)$,
Effect: $inside(t, c))$

$Action(WaterBoil(w, k),$
Precondition: $water(x) \wedge kettle(k) \wedge inside(w, k) \wedge \neg hot(w)$,
Effect: $hot(w))$

Part B

A partial order plan consisting of two routes would be:

$START \rightarrow AddTeaBag(t, c) \rightarrow END$

$START \rightarrow Pour(w, b, k) \rightarrow WaterBoil(w, k) \rightarrow Pour(w, k, c) \rightarrow END$

By combining these routes from start to end it would result in a complete plan to the goal.

An advantage of using partial-order planning over state-space search is that partial order planning allows more flexibility in terms of in which order the actions may be carried out.