Tutorial 1

1a) The robot vacuum cleaner would be a model-reflex based agent as it is able to keep track of areas that have already been vacuumed and are clean or need those that still need to be vacuumed and cleaned.

The chess playing agent would be a goal-based agent as its goal is to checkmate its opponent and needs to plan as to what actions it might take so it can achieve this goal.

The robot football player agent would be a utility-based agent as it would need to have multiple goals like helping its team to score, prevent opposition from scoring, conserving its energy and avoiding damaging itself.

b) For the robot vacuum agent:

1.

- The agent's environment is partially observable as its sensors would only report as to what is under the agent.
- The agent's environment could be stochastic as its environment is partially observable, but it may depend if actions like movement have the effects that are predicted.
- The agent's environment could either be deterministic or continuous as this would depend on the information that has been received from its sensors.
- The agent's environment would be a single agent as it may be the only agent that is acting on the environment.
- The agent's environment could be sequential as the next place to clean would depend on where the agent has cleaned before or it could be episodic because each individual piece of carpet would mean that the agent's next action would necessarily depend on its previous action.
- The agent's environment would be static as its environment will remaining unchanged while the agent is sensing it.

2. The agent's percept could be its location and whether the floor is clean or dirty.

3. The agent's actions would consist of movement and suck dirt from floor.

4. The agent's internal model would be if the house has been cleaned on the day.

5. The agent will not have a goal as it does not have the goal of cleaning its environment, but it only must behave in such a way so that its environment is kept clean.

6. The agent will not have any utilities.

For the chess playing agent:

1.

- The agent's environment would be fully observable as it would be able to describe the environment state fully through its sensors.
- The agent's environment would be deterministic as its next state would be determined by its current state and actions.
- The agent's environment would be discrete as a finite number of precepts and actions could be performed within it.
- The agent's environment would be a multiple agent.
- The agent's environment would be sequential as the next action would depend its previous action.
- The agent's environment would be static as its environment will remaining unchanged.

2. The agent's percept would be the current state of the board.

3. The agent's actions would consist of moving pieces.

4. The agent's internal model would of the board.

5. The agent's goal will be of trying to checkmate its opponent.

6. The agent will not have any utilities.

For the robot football player agent:

1.

- The agent's environment is partially observable.
- The agent's environment would be stochastic.
- The agent's environment would be continuous.
- The agent's environment would be a multi agent.
- The agent's environment would be sequential as it may have less battery power remaining if it chooses to use its now.
- The agent's environment would be dynamic if another player might take the ball while the agent is trying to decide as to what to do with it.

2. The agent's percept would be sensors for its location.

3. The agent's actions would consist of moving, kicking the ball.

4. The agent's internal model would of the field.

5. The agent's goal will be of trying to score, prevent opposition from scoring.

6. The agent will have utilities like its battery level.

2)

1. To represent the positions you could use a list with the numbers 1 and 2 denoting single or overlapping sticks respectively.

2. Initial state: [1,1,1,1,1,1,1,1]
goal state: [2,2,2,2]

3. Three operators can be used as shown below:

X1111Y => X21Y

X1111Y => X112Y

X121Y => X22Y

The first one moves a single stick over two single sticks to the left and the second also moves a single stick over two single sticks but to the right. The last one moves a single stick over a pair of sticks that are crossed.

4. Depth first search expands 30 nodes and breadth first search expands 49 nodes using the left to right node expansion. Depth first search gets to the goal first by the way we have ordered the search tree, so it is better when there are many terminal states that are deep in the search tree whereas breadth first search will be better when there are less solutions at a shallow depth. Depth first search has a maximum of 11 nodes in its frontier whereas breadth first search has a maximum of 32.