Evil Robot has almost completed his Evil Plan for the total destruction of the human race. He has two nasty chemicals, which he has imaginatively called $A$ and $B$ and which are currently stored in containers 1 and 2 respectively. All he has to do now is mix them together in container 3. His designer—an equally evil computer scientist—has equipped Evil Robot with a propositional planning system that allows him to reason about the locations of particular things and about moving a thing from one place to another.

(a) Explain how this problem might be represented within a propositional planning system. Give specific examples of the way in which the start state and goal can be represented. [5 marks]

(b) Describe in detail an algorithm that can be used to find a plan using this form of representation. [5 marks]

(c) Give a specific example of a successor-state axiom using the representation you suggested in part (a). [2 marks]

(d) Explain why in this particular planning problem it might be necessary to include one or more precondition axioms and give an example of such an axiom using your representation. [2 marks]

(e) Explain why in this particular planning problem it might be necessary to include one or more action exclusion axioms and give an example of such an axiom using your representation. Suggest why it might be unwise to include too many axioms of this type, and explain how a reasonable collection of such axioms might be chosen in a systematic way. [4 marks]

(f) Explain how in this problem it might be possible to include state constraints as an alternative to action exclusion axioms, and give a specific example of such a constraint using your representation. [2 marks]