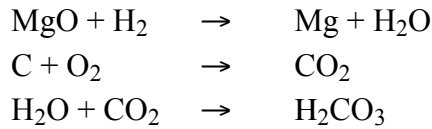


Exercises for Comp & Comp, Spring 2012, Sheet 9+10

Return Friday, May 2, in class.

Problem 1. A nice exercise in formalizing the real world. Assume you have chemical apparatuses at your disposal to synthesize



Assume further that you have the raw chemicals MgO, H₂, O₂ and C available. Show (by a suitable application of the satisfiability check algorithm for Horn formulas from the beginning of Section 11) that you can synthesize H₂CO₃ in your lab! More concretely, (i) find a Horn formula φ whose satisfiability (or unsatisfiability!) is equivalent to synthesizability of H₂CO₃ in your lab, and (ii) use the satisfiability check algorithm to actually verify whether φ is satisfiable or not.

Problem 2. A *linear-time reduction* R must complete its output $R(x)$ in time $O(|x|)$. Show that there are no **P**-complete problems under linear-time reductions.

Problem 3. The problem SET PACKING has instances consisting of a finite collection C of finite sets and of a positive integer $K \leq |C|$. The question to be decided is whether C contains at least K disjoint sets. – The problem CLIQUE has instances consisting of an undirected graph $G = (V, E)$ and a positive integer $K \leq |V|$. The question to be decided is whether G contains a *clique* of size at least K , that is, a subset $V' \subseteq V$ such that every two vertices in V' are joined by an edge in E . Reduce SET PACKING to CLIQUE. Don't forget to demonstrate that your reduction can be done in polynomial time!