Jim Needs His Coffee

In this project you will help save Jim from caffeine withdrawal. Unfortunately Jim requires a special blend of coffees and other ingredients to make his caffeinated drink. Thinking ahead, Jim sent his TAs throughout Ames to find and collect these ingredients, but unfortunately for Jim, once they find the ingredient they are all invited to a party and leave the ingredients at the locations they found them. A last special ingredient (Ingredient Plugh) is known to Jim, which is where Jim is located. Your job is to help Jim get his caffeinated drink as soon as possible. Below is a list of the known last locations of the TAs before they went to the party,

Important Location IDs

Ingredient A: 1055

Ingredient B: 371

Ingredient C: 2874

Ingredient D: 2351

Ingredient E: 2956

Ingredient F: 1171

Ing G & Jim: 1208

You: 2893

These ingredients are quite special. For example, ingredient G is at Jim's location because it is quite susceptible to shock and cannot be moved. The dependencies on the order of how these ingredients must be picked up is below.

Ingredient A must be picked up before ingredients B and E

Ingredient B must be picked up before ingredients C and D

Ingredient D must be picked up before ingredients E and F

All other ingredients must be picked up before ingredient G (G is always the last ingredient to pick up)

You are currently at location ID: **2893** and receive a phone call from Jim. Your task is as follows:

1. Generate a sorting of the ingredients that satisfies the constraints above. Note that you expect Jim to have this problem again, therefore your algorithm must work for an arbitrary dependency graph of arbitrary size.

2. Given an ordering of ingredients, find the shortest path to collect all the ingredients and get back to Jim. Once again you expect for Jim to have this problem in the future and it should work for an arbitrary ordering of n ingredients.

BONUS Jim is worried about how long it will take and demands you find *the shortest possible* path over all valid orderings of the ingredients and return them to him.

Jim was kind enough to provide you with a set of interfaces to help you accomplish this task along with a file containing the map information of the city of Ames. You must use these interfaces to solve the problem and turn in all of your code. Your code will be tested on this problem along with many other instantiations of the problem.