(P) Yumology (1/6) [15 Points]

To understand a piece of text, it can be extremely helpful to have some background knowledge about the items discussed in the text: What properties do the items have, and how are they related to each other? This problem deals with the important question of how we can represent such information in a way that a computer can use.

As part of an initiative to increase their nation's health, the Yaldish government has decided to list the mineral potassium (which is abbreviated as K) on their nutrition labels. To ensure proper labeling, the Yaldish Unified Ministry (YUM) maintains a Food Database of Compositions (FDC), but prior to the recent update in requirements, they were not tracking potassium. Obtaining this information for each food listed in the database through lab testing would be time-intensive and costly. The Yaldish have thus hired *NacLabs* to develop a method to supplement the YUM FDC with the English-Language (EL) FDC, which has more complete nutritional information.

The main challenge that *NacLabs* faces is that the food descriptions in the YUM FDC are written in Yaldish. Even though they are also translated into English, the descriptions are not exactly the same as the descriptions of similar foods in the EL FDC (which are described only in English). The following demonstrates these kinds of differences:

Closest matches in YUM FDC, English translations (left) and EL FDC (right):

Chuck roast, uncooked, minced	*Beef, ground, 20% fat, raw*
Puréed vine tomatoes, pasteurized and packaged	*Tomato sauce, canned*

Furthermore, not all foods in the YUM FDC are listed in the EL FDC.

Taking these limitations into account, *NacLabs* has developed an algorithm that automatically fills in potassium for YUM foods. On the next two pages are the YUM FDC (containing the automatically-estimated K values), the EL FDC, and a set of food classification charts. Within each FDC, foods are classified based on four facets plus a fifth "extra facet." The food classification charts illustrate relationships between some of the facets. If you are unfamiliar with any of the food terms in the EL FDC, see the glossary on Pages 5 and 6 of this problem.

P1. Two foods in the EL FDC are missing part of their description (**(a)** and **(b)**). Fill in the missing information. Word order does not matter as long as the desired meaning is clear.

P2. Three foods in the YUM FDC are missing their "Estimated K mg/100g" values (**(c)**, **(d)**, and **(e)**). Fill in the missing values. Note that the "extra facet" is not involved in determining these values.

EL FDC

EL ID	Description	K mg/100 grams	Facets	Extra facet
E01	Apple, raw, with skin	107	B1245; C0121; E0151; F0003	A2003
E02	Pineapple rings, homemade, oven-dried from fresh, unsweetened	778	B1484; C0126; E0133; F0013	A2001
E03	Applesauce, canned baby food, unsweetened, no ascorbic acid	74	B1245; C0126; E0215; F0013	A2003
E04	Beet greens, raw	762	B1423; C0240; E0151; F0003	A2003
E05	Bacon	565	B1136; C4545; E0133; F0001	A2003
E06	Bacon, raw	201	B1136; C4545; E0133; F0003	A2003
E07	Bacon, meatless, pan-fried or broiled	170	B1452; C0120; E0133; F0013	A2003
E08	Raisins, golden	746	B1275; C0121; E0151; F0001	A2001
E09	Coconut water, from a coconut	250	B1530; C0339; E0114; F0003	A2003
E10	Beetroot powder, red or golden	2400	B1423; C0140; E1152; F0001	A2001
E11	Pumpkin, canned purée	209	B1534; C0126; E0215; F0013	A2003
E12	Potato **(a)**_____	274	B3544; C0140; E0310; F0013	A2003
E13	Pumpkin **(b)**_____	919	B1534; C0120; E0151; F0013	A2002

YUM FDC

YUM ID	Estimated K mg/100g	Facets	Extra facet
Y1	201	B1136; C4545; E0133; F0003	A2003
Y2	250	B1530; C0339; E0115; F0003	A2003
Y3	250	B1484; C0339; E0114; F0013	A2003
Y4	107	B1245; C0126; E0133; F0003	A2001
Y5	189.5	B1430; C0120; E0215; F0013	A2002
Y6	170	B1430; C0120; E0310; F0013	A2002
Y7	**(c)**	B1423; C0140; E1152; F0001	A2001
Y8	**(d)**	B1245; C0121; E0151; F0013	A2003
Y9	**(e)**	B2530; C0126; E0215; F0013	A2003

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Food classification charts

B1297	B3391	B2002	
		B1136	
	B2299		
	B3399		
B1347	B1140	B1599	B1245
			B1344
		B1139	B1275
		B1024	B4270
			B1530
			B1484
	B1141	B1160	B1534
			B2530
			B3530
		B1165	B1423
			B3542
		B1170	B3544
		B1263	B1430
			B1452
B1438			

C3001	C0760	C0140	
		C0240	
		C0243	
	C0654	C0120	
		C0128	C0121
			C0126
		C0339	
C4322	C2345		
	C2545	C5545	
		C4545	
		C4546	

E0130	E0115	
	E0114	
E0103	E0215	
	E0310	
E0152	E0122	E0132
		E0133
		E1152
	E0151	

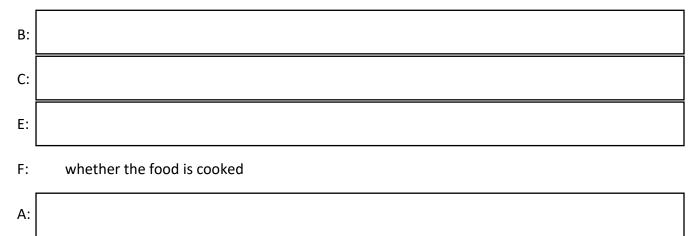| F0013 |
|---|
| F0001 |
| F0003 |

A2001
A2002
A2003

P3. Briefly describe how the "Estimated K mg/100g" values are determined in the YUM FDC. For this question, you do not need to describe what any specific facets mean. As noted above, your answer to this question should not involve the "extra facets."
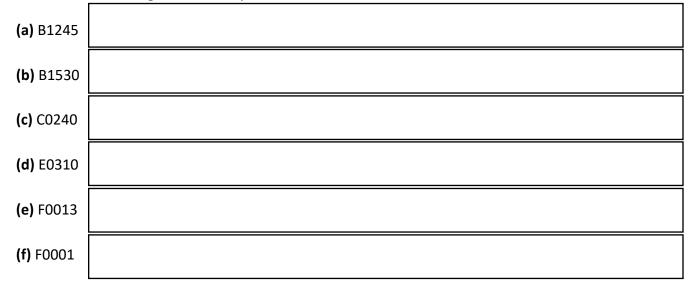
n → a → c → l → o

P4. Each facet starts with a letter (B, C, E, F, or A). The facets that start with F describe whether the food is cooked. What type of information does each other letter correspond to?

B:

C:

E:

F: whether the food is cooked

A:

P5. For each of the following facets, briefly describe what that facet means:

(a) B1245

(b) B1530

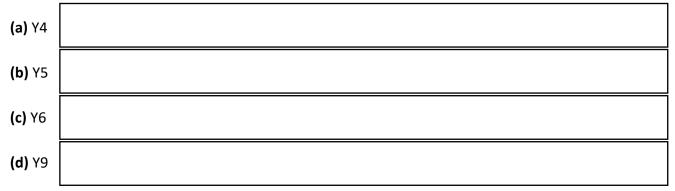(c) C0240

(d) E0310

(e) F0013

(f) F0001

P6. Name a food ingredient that might have the facet B1438.

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P7. For each of the following YUM IDs from the YUM FDC, give a food description that could be associated with that ID (in the style of the descriptions in the EL FDC). There are many possible answers. For full credit, make sure that your answers cover all of the facets listed with each YUM ID:

(a) Y4

(b) Y5

(c) Y6

(d) Y9

P8. Even though they were not previously using it, NacLabs has decided to now include the "extra facet" in determining the "Estimated K mg/100g" values in the YUM FDC. Will this decision make the estimated values more accurate or less accurate? Explain your answer.

Glossary of food terms:

Apples are a fruit grown on a tree, available in red, green, and yellow varieties.

Applesauce is a dish made of apples (with their seeds and skin removed) blended until smooth.

Ascorbic acid is a chemical used to help preserve foods.

Bacon is a sliced breakfast food, typically made of pork but also available in meatless varieties made out of protein extracted from beans, nuts, grains, etc.

Beet greens are the leaves of a beet plant.

Beetroot is the root of a beet plant.

Broiling is a method of cooking in which the heat source comes from above.

Canning is a food preservation process that involves raising the food to a high temperature and then sealing it in a metal can.

Chuck roast is a type of beef.

Coconut water is a clear liquid found inside coconuts.

(glossary continues on the next page)

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(glossary of food terms, continued from the previous page)

Mincing refers to chopping food into very small pieces.

Pasteurization is a process of heating food before packaging it in order to increase its shelf life.

Pan-frying is a method of cooking vegetables and other foods in a pan.

Pineapples are a fruit grown in a shrub.

Potatoes are a root vegetable. They are often served either baked (in which case the whole potato is baked in an oven or microwave) or mashed (in which case the potato is cooked and then pounded with a utensil until it is mostly smooth).

Pumpkins are a type of large orange vegetable that grows on a vine.

Puréeing is the process of blending a fruit or vegetable, often with its seeds and skin removed, into a smooth liquid.

Raisins are dried grapes. They can be dried via heating or by being left out in the air.