Food	Protein	Available Carbohydrate	Fiber	Ash	SNF	Fat	Water
Bakery products							
Whole-meal flour	12.7	66.9	11.8	1.4	**92.8**	**2.0**	**5.2**
White flour (78% extraction)	11.5	72.1	3.1	0.6	**87.3**	1.3	**11.4**
Whole-meal bread	8.1	40.8	5.7	2.0	**56.6**	1.4	**42.0**
White bread	7.3	47.7	2.8	1.9	**59.7**	0.9	**39.4**
Biscuits	7.3	55.2	1.7	0.9	**65.1**	**30.0**	**4.9**
Banana cake	5.3	46.5	1.3	1.1	**54.2**	**13.6**	**32.2**
Chocolate cake	6.4	51.3	1.2	1.0	**59.9**	**20.6**	**19.5**
Short pastry	6.4	62.3	1.9	1.5	**72.1**	**25.6**	**2.3**
Oils and fats							
Pure edible oils and fats	0.0	0.0	0.0	0.0	**0.0**	**100**	**0.0**
Butter	.55	0.62	0.0	1.5	**2.67**	**81.5**	**15.8**
Vegetables							
Silver beet	2.6	0.4	2.9	1.3	**9.3**	0.3	**90.4**
Butternut squash	1.3	9.4	3.5	0.76	**14.9**	0.1	**84.9**
Potato	2.0	15.6	0.9	0.93	**19.4**	0.0	**80.6**
Onion	1.3	8.8	1.7	0.47	**12.3**	0.1	**87.6**
Asparagus	2.4	3.0	1.9	0.74	**8.0**	0.4	**91.9**
Tomato	0.74	2.2	1.1	0.49	**4.5**	0.2	**95.3**
Mushroom	2.4	2.2	1.4	0.80	**6.8**	0.2	**93.0**
Fruits and nuts							
Avocado	1.8	0.7	2.9	3.9	**9.3**	**26.0**	**64.7**
Kiwifruit	0.79	8.5	3.9	0.70	**13.9**	0.8	**85.3**
Apple (Granny Smith)	0.27	10.6	1.9	0.21	**12.9**	0.6	**86.4**
Nectarine	1.1	8.1	1.6	0.65	**11.4**	0.5	**88.0**
Strawberry	0.76	6.6	1.8	0.60	**9.8**	0.4	**89.8**
Cashew	16.9	26.0	4.7	2.5	**50.1**	**45.9**	**4.0**
Peanut	28.1	11.2	4.8	2.4	**46.5**	**49.0**	**4.5**
Peanut butter	29.0	13.4	5.2	2.5	**50.1**	**48.0**	**1.9**
Meat							
Raw whole chicken	17.5%	0.0%	0.0%	0.87%	**18.4%**	**14.1%**	**67.5%**
Chicken breast	22.3	0.0	0.0	1.09	**23.4**	**2.1**	**74.5**
Chicken thigh	17.0	0.0	0.0	0.9	**17.9**	**13.8**	**68.3**
Lean beef	22.2	0.0	0.0	1.0	**23.2**	0.0	**76.8**
Canned corned beef	22.3	0.0	0.0	3.5	**25.8**	**15.7**	**58.5**
Ham	15.5	0.0	0.0	2.9	**18.4**	**49.5**	**32.1**

Food	Protein	Available Carbohydrate	Fiber	Ash	SNF	Fat	Water
Pork sausage	10.7	10.6	0.0	0.8	**14.6**	**11.5**	**73.9**
Whole egg	131.5	0.32	0.0	0.8	**14.6**	**11.5**	**73.9**
Fish							
Cod	17.0	0.0	0.0	-	**17.0**	0.5	**82.5**
Salmon	20.0	0.0	0.0	-	**20.0**	**14.0**	**66.0**
Lobster	21.2	0.0	0.0	-	**21.2**	**3.4**	**75.4**
Pickles and sauces							
Mayonnaise	3.3	11.2	0.0	2.1	**16.6**	**36.0**	**47.4**

Gas in foods

Foods often contain undissolved gas (e.g. CO_2 in breadcrumbs, intracellular air in fruit and vegetable tissues). Gas is not counted as part of the mass composition of a food because the mass of gas will be very, very small compared with the masses of solid and liquid components (in a given quantity of the food). Thus the presence of gas can be ignored in predicting the specific heat, enthalpy change and latent heat of foods. However, gas does form a significant proportion of the volumetric composition of a food, because of its low density. Gas-filled spaces in the food represent porosity, which has to be taken into account in predicting density, thermal conductivity and thermal diffusivity.

3. THE THERMOPHYSICAL PROPERTIES OF FOOD COMPONENTS

Table 2 shows a set of empirical equations that may be used to predict the thermophysical properties specific heat, density, thermal conductivity and thermal diffusivity of the major food components (e.g. proteins, carbohydrate, etc). Each equation is valid for the temperature range -40 to $150°C$.

Values of these properties for the mid-point $(-20°C)$ of the below freezing range $(-40 \text{ to } 0°C)$, the mid-point $(75°C)$ of the above freezing range $(0 \text{ to } 150°C)$ and the mid-point $(55°C)$ of the full range $(-40 \text{ to } 150°C)$ are given in Table 3. With the exception of the properties of water substance for temperatures $\geq 0°C$, these values have been calculated using the equations in Table 2. The properties of water substance for temperatures $\geq 0°C$ are taken from Steam Tables.

All the equations and data in Table 2 and Table 3 respectively will be referred to and used in various ways in the remainder of this document.

All the equations in Table 2, except that for air, are taken from Choi & Okos (1986). The equation for the thermal conductivity of air is taken from Murikami & Okos (1988).