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Average Heat of Combustion and Available Energy of Carbohydrate, Fat and Protein

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Synopsis

The MAP survey data for the earth science teachers showed that 75 percent or more of those teachers identified 13 need statements. Ten of the 13 need statements were associated directly with the planning and implementaton of science instruction. The other three needs were in the closely related areas of better understanding students and use of instructional materials. Inservice activities planned around the 13 need statements presented in this report should be well accepted by large numbers of junior high school and high school earth science teachers. Still, those who arrange inservice activities for earth science teachers should not forget the cardinal principle of inservice education — plan inservice activities based upon the specific needs of participating teachers.

References

Moore, Kenneth D. 1977. Development and validation of a science teacher needs assessment profile. *Journal of Research in Science Teaching. 14*(2): 145-149.

Rubba, Peter A. 1981. A survey of Illinois secondary school science teacher needs. *Science Education 65*(3): 271-276.

AVERAGE HEAT OF COMBUSTION AND AVAILABLE ENERGY OF CARBOHYDRATE, FAT AND PROTEIN

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The food energy of carbohydrate, fat and protein recorded in many nutrition tables is the net available energy. It is equal to 16.7, 37.7, and 16.7 kilojoules per gram respectively. These are not the same as the heat of combustion determined calorimetrically. The relationships between them is shown in the table.

	Calorimetric Heat of Combustion kJ/g (kcal/g)		Available to Body kJ/g (kcal/g)		Atwater Factor*	Net Available Energy or Body Fuel Value kJ/g (kcal/g)	
Carbohydrate	17.2	(4.1)	17.2	(4.1)	0.97	16.7	(4.0)
Fat	39.8	(9.5)	39.8	(9.5)	0.95	37.7	(9.0)
Protein	23.9	(5.7)	18.4	(4.4)**	0.92	16.7	(4.0)

* The Atwater factor is the fraction absorbed from the alimentary canal in a mixed diet.

** The oxidation of protein by the body is incomplete as shown by the presence of certain nitrogen compounds in the urine (e.g. urea, creatinine, uric acid). This is equivalent to 5.4 kJ/g (1.3 kcal/g) of protein. Therefore, $23.8_6 - 5.4_1 = 18.4$ kJ/g ($5.7 - 1.3 = 4.4$ kcal/g).