



Essential nutrients	Non-essential nutrients
Those which cannot be synthesized by the body and must be derived from the diet	Those which can be synthesized from other compounds by the body or may be derived from the diet.

Macronutrients	Micronutrients
Carbohydrates: they are converted by the body to glucose and other monosaccharides which can be absorbed and utilized as a source of energy (by the process of glycolysis, TCA and respiratory chain) or stored as glycogen in liver and muscles to be used later when needed	Water-soluble vitamins: they include vitamin C, B-complex (thiamin, riboflavin, niacin, pyridoxine, folic acid, cobalamin, biotin and pantothenic acid)
Proteins: they are converted to smaller peptides and amino acids. Notice that infants need more protein in their diet (due to faster growth velocity)	
Fats: they are broken down into fatty acids and glycerol which are stored in adipose tissue and can be used as a source of energy when the body is depleted from glucose and glycogen has been used	Fat-soluble vitamins: A, D, K and E
	Minerals: sodium, chloride, potassium, calcium, phosphorus, magnesium, iron, iodine, zinc, chromium and copper

- **Malnutrition:**

• **Marasmus:**

- ✓ It is the most common energy depletion state.
- ✓ It is characterized by near starvation from protein and non-protein deficiencies.
- ✓ The patient is typically thin from loss of muscle and body fat (especially in buttocks, thigh and arm muscles). Notice that the facial fat mass is the last to be lost.
- ✓ Other features include: wrinkled skin and prominent ribs.



• **Kwashiorkor:**

- ✓ It is less common than marasmus and is seen in parts of the world in which starches are the main dietary staple *الأغذية الأربعة الأساسية*
- ✓ This protein-deficient state is characterized by generalized edema, abdominal distention (hepatomegaly), changes in skin pigmentation, thin sparse hair, bulging eyes and swollen moon face.

