



# Metabolism of Carbohydrates-Lipids-Proteins

## Glucose metabolism

Intake:



Storage:  
Glycogen



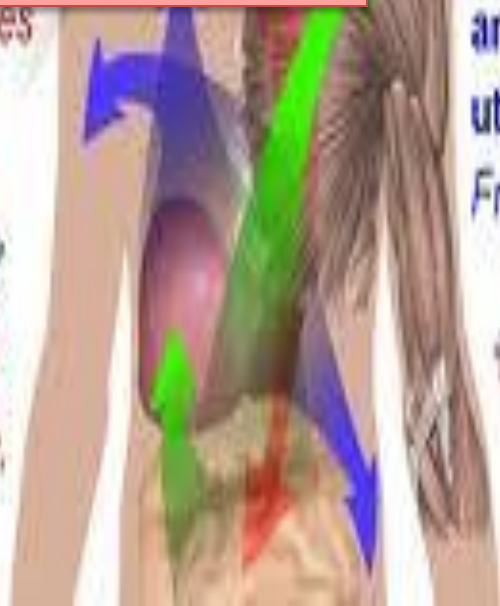
Distribution and utilization:  
Free glucose



Disaccharides

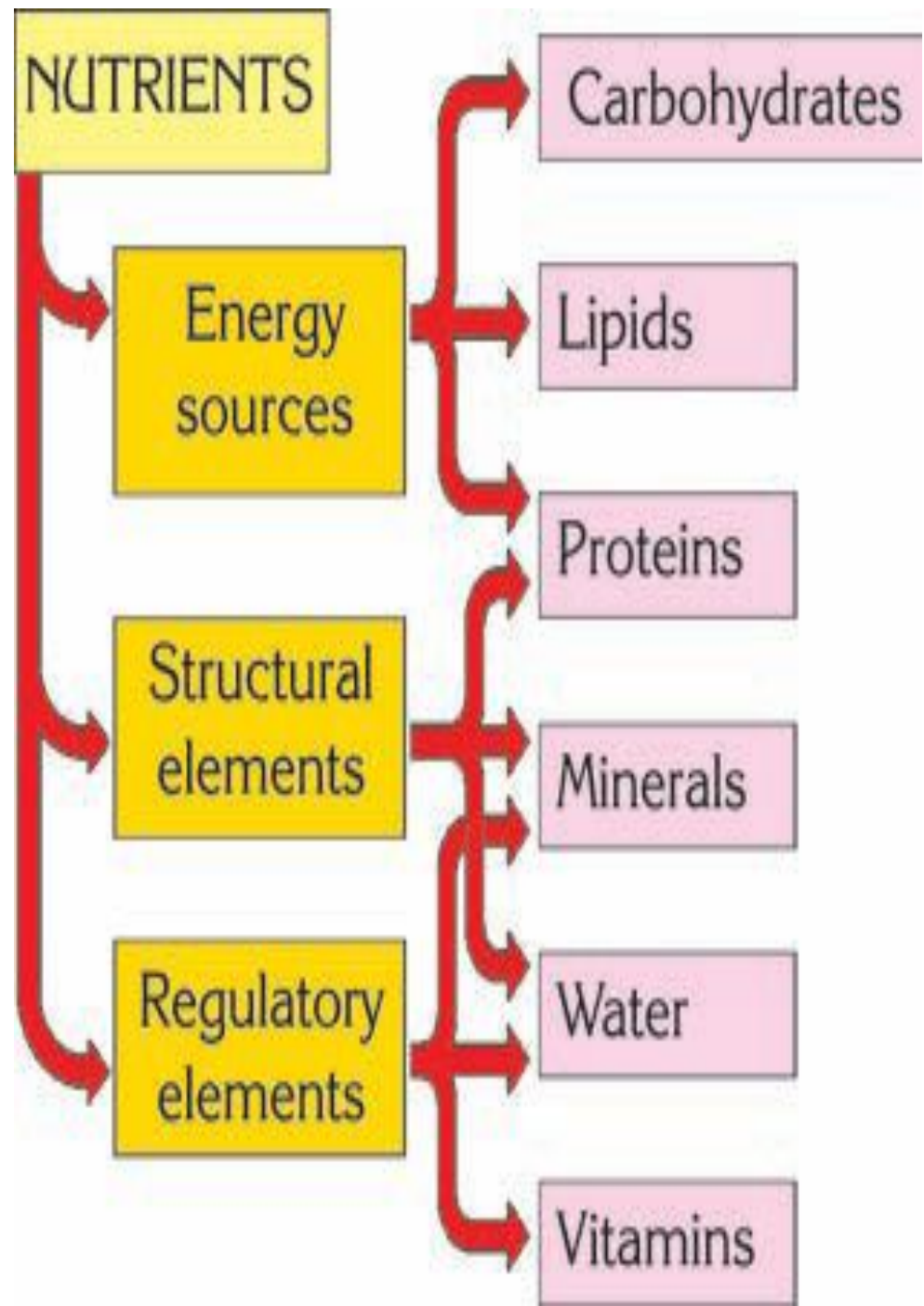


Monosaccharides  
(glucose, fructose,  
galactose)



# Nutrition

- ***Nutrition*** is the utilization of ingested substances by a healthy individual for life.
- Food can be divided into six groups:
  - - carbohydrates
  - - lipids
  - - proteins
  - - vitamins
  - - minerals
  - - water

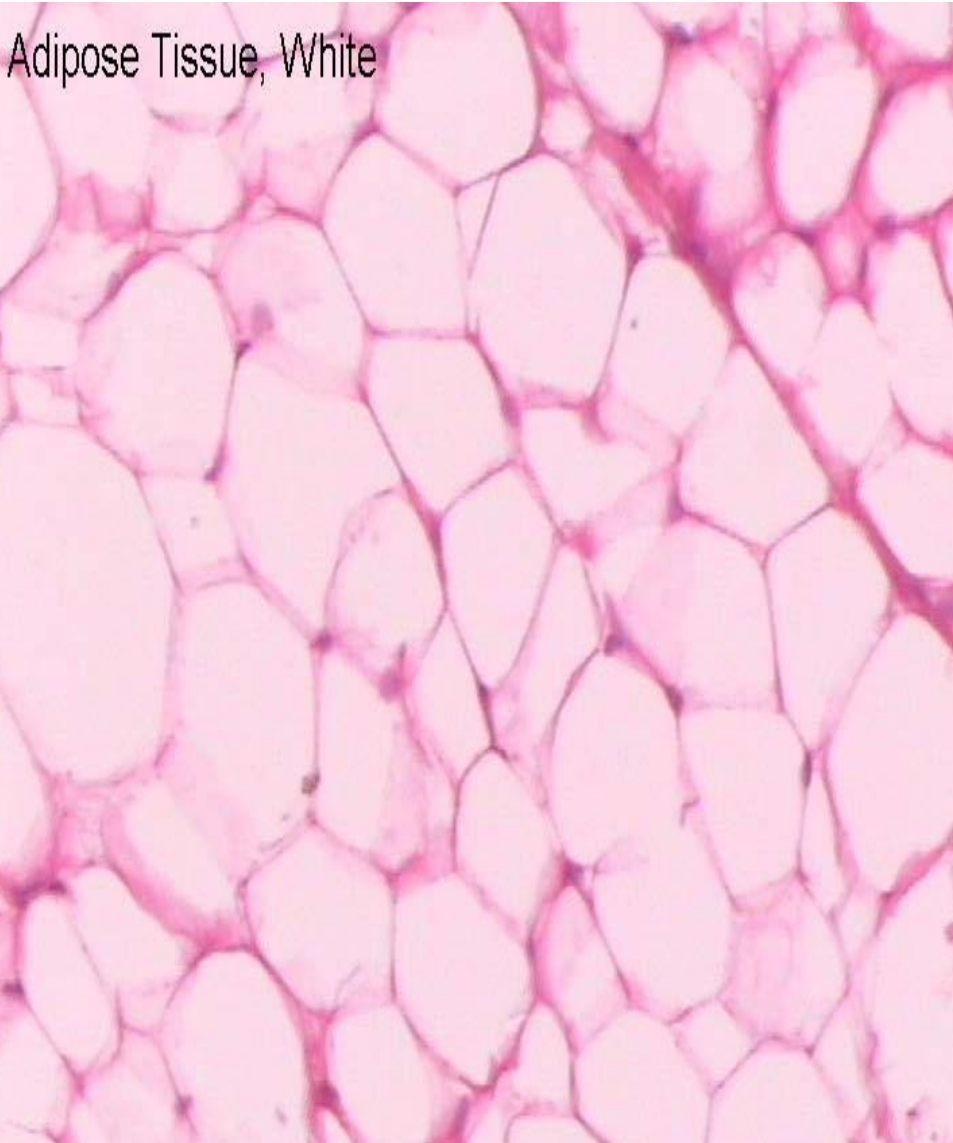


# Carbohydrate

- Carbohydrates are the primary source of energy.
- Carbohydrates are abundant in cereals and their products, vegetables, fruits and legumes.

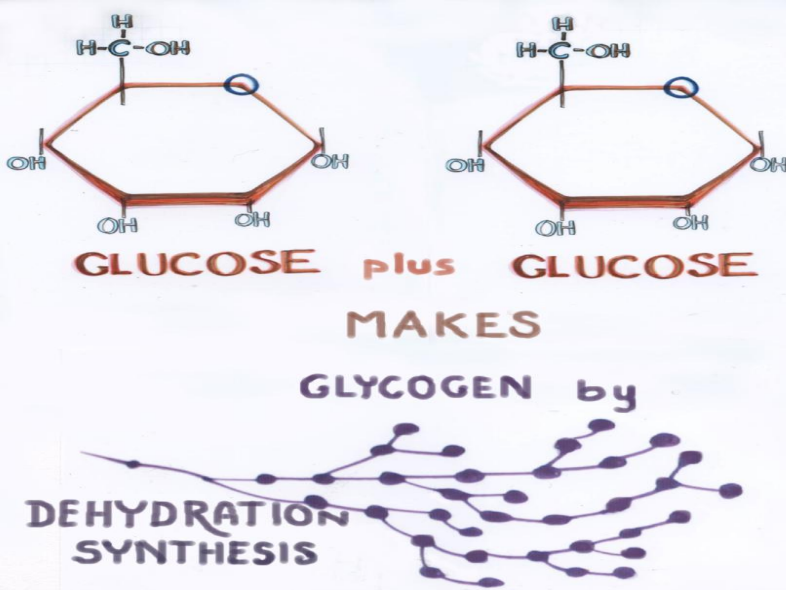


# The Storage of Excess Carbohydrates in Tissues

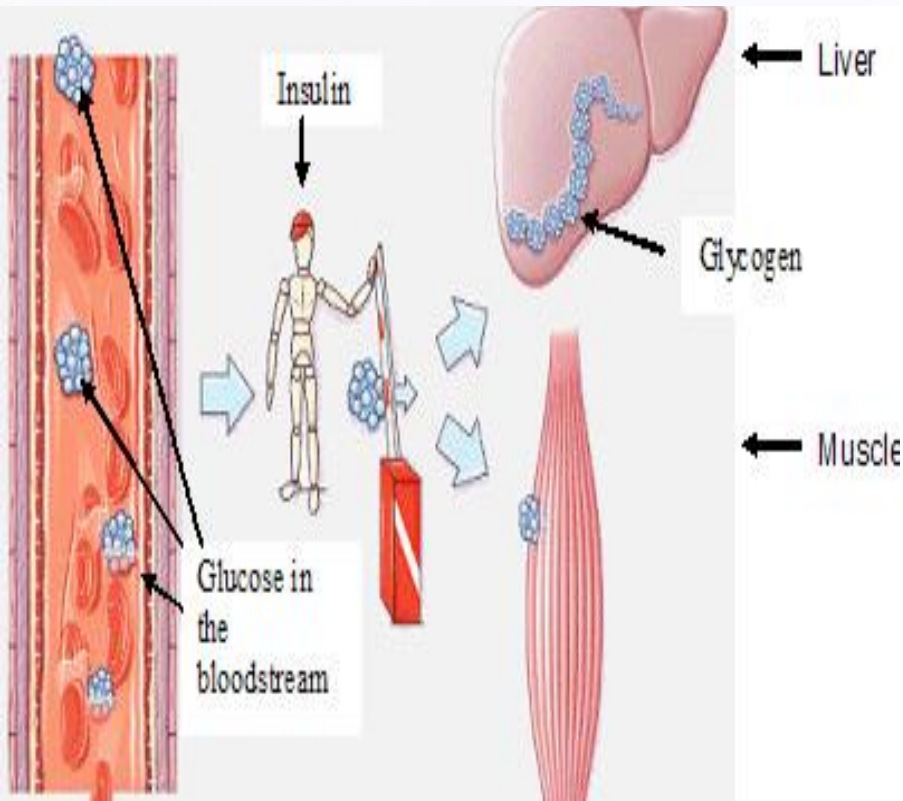


- Excess carbohydrate in the body is converted into lipid, and is stored as adipose tissue, resulting in ***obesity***.
- A diet high in soluble carbohydrates results in ***dental caries***.

# Carbohydrate Metabolism



- Nutrients containing starch and sugar are catabolized into glucose in the digestive system.
- Glucose units are absorbed into the blood from the small intestine.
- Excess glucose is stored in the liver and muscles in the form of ***glycogen***.



# Lipids

- Gives the most energy
- Excess lipid is stored in adipose tissue.
- Lipid sources are olives, nuts and egg, milk, meat



# Proteins



- Some hormones, enzymes, hemoglobin and antibodies are made up of proteins
- Proteins contain 20 different **amino acids**
- Some of them are ***compulsory (vital)*** amino acids that can not be synthesized in the body
- The qualified proteins contain needed amounts of vital amino acids and are easily digested.
- Generally, animal proteins are qualified but plant proteins are nonqualified.

# Minerals

- They are required for health, continuity of metabolism and in the formation of bones and teeth.
- **Essential minerals** (calcium, phosphorus, sodium, potassium)
- **Nonessential** but recommended minerals (magnesium, iron, copper, zinc and etc)



Nutrition



# Water

- Water constitutes 60-70% of the body of an adult.
- ***Functions of water***
- --Absorption, transport and digestion of food
- --Excretion of metabolic wastes
- --Regulation of body temperature
- --In the absence of water, enzymes can not perform function



# Vitamins

- Vitamins were first discovered in 1890 when the disease beriberi was found to be due to a lack of vitamin B.
- A small amount of vitamins is ingested in food and play important roles in regulation of the metabolism of the body.
- The main source of vitamins is plants. However, animal tissues, especially liver, contain a rich supply of vitamins.



Nutrition

# Vitamins

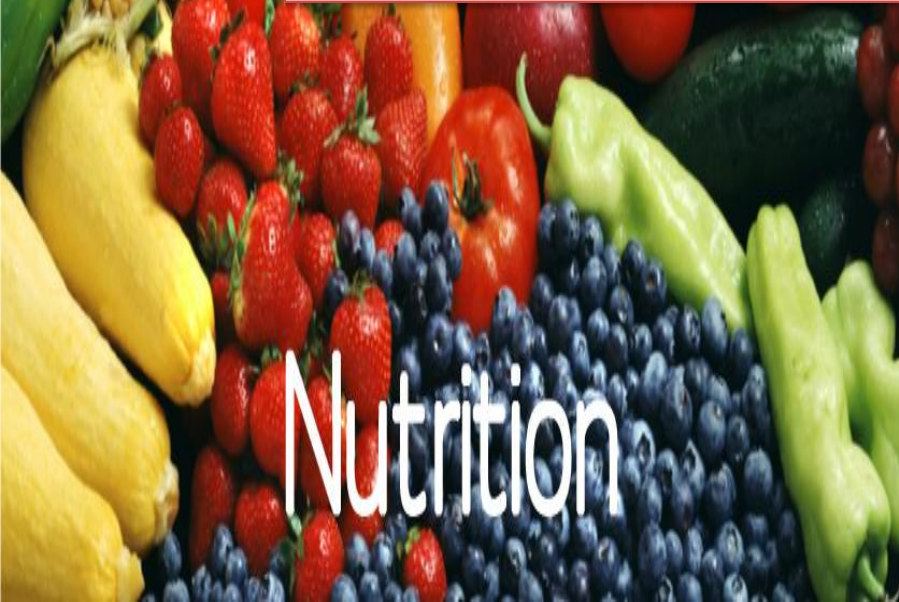
- Overheating of food, therefore, may cause destruction of vitamins.
- ***Functions of vitamins***
- --to give the body resistance to infection.
- --to prevent against bleeding and blood deficiency.
- --to assist in formation, development and rigidity of bone tissue.
- --to regulate growth, development and reproduction.
- --to provide a regular program of nutrition.



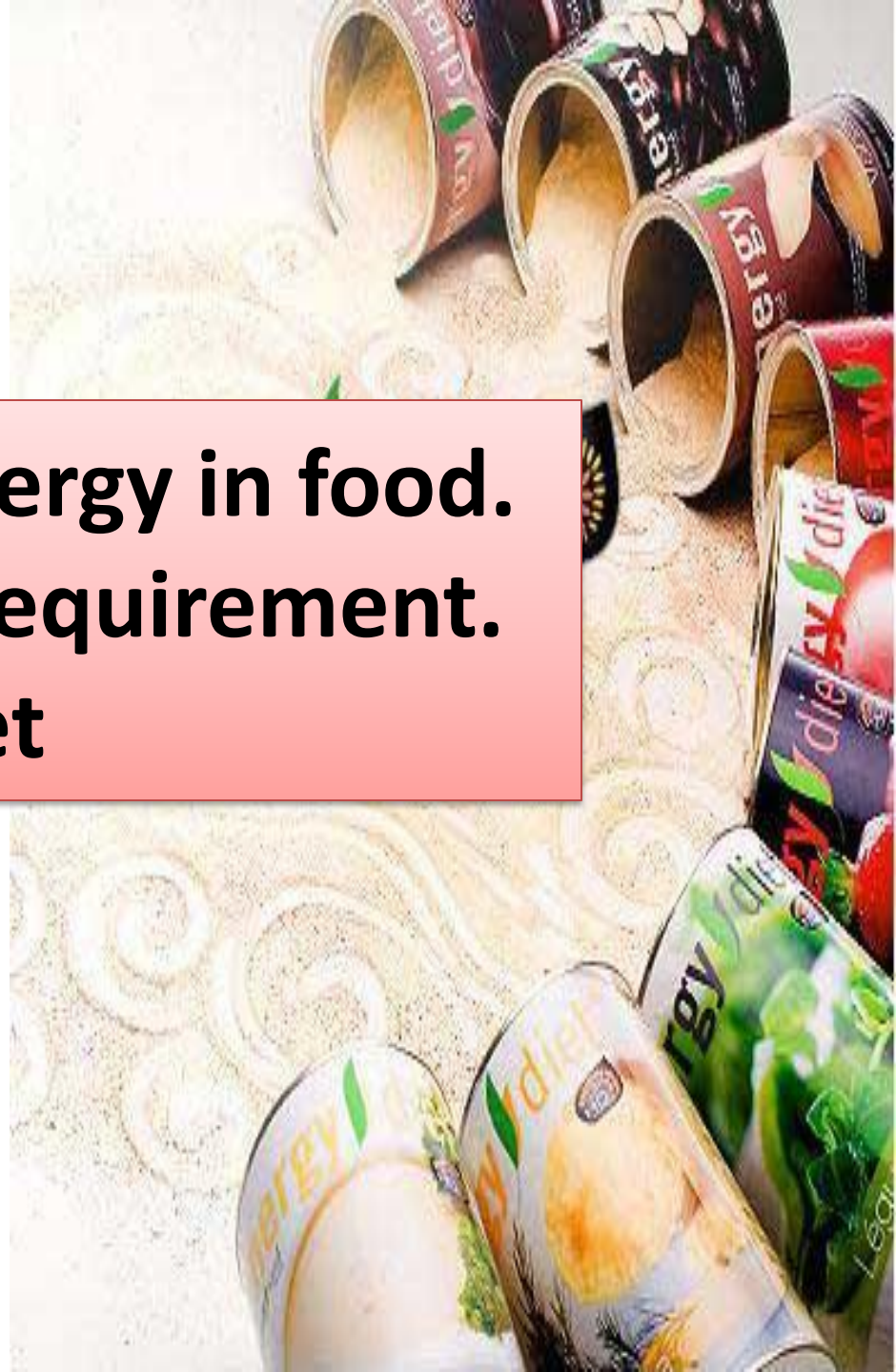
Nutrition



**Capacity of energy in food.  
Daily energy requirement.  
Diet**



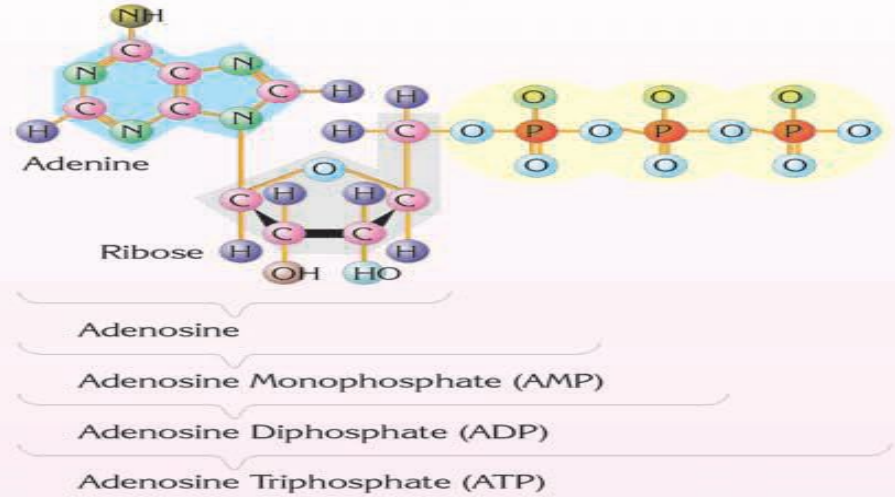
**Nutrition**



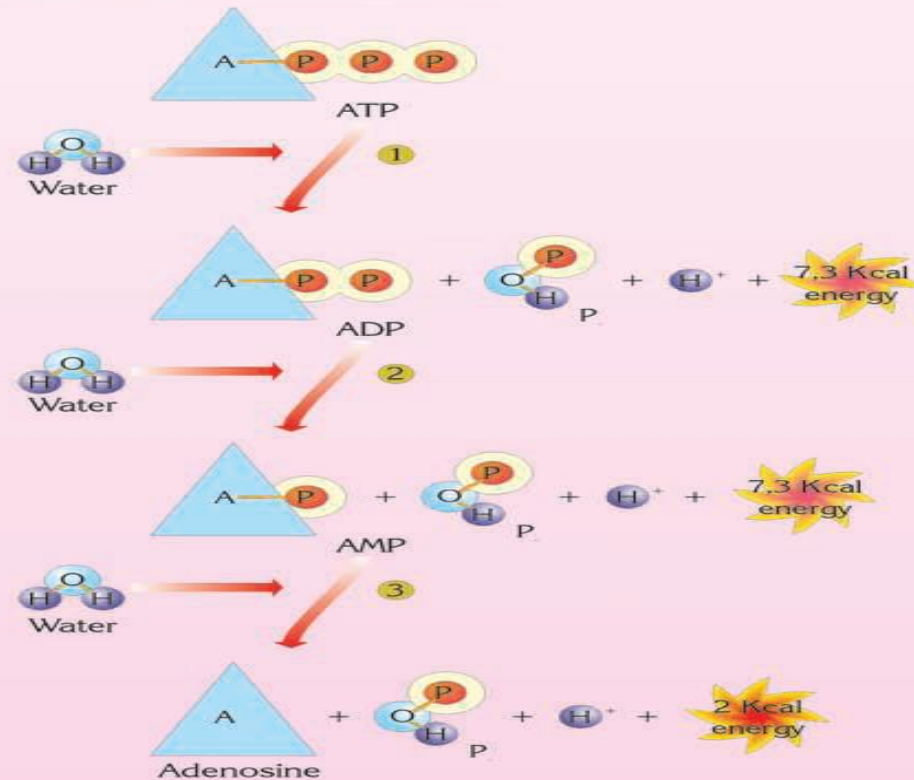
# ENERGY of FOOD

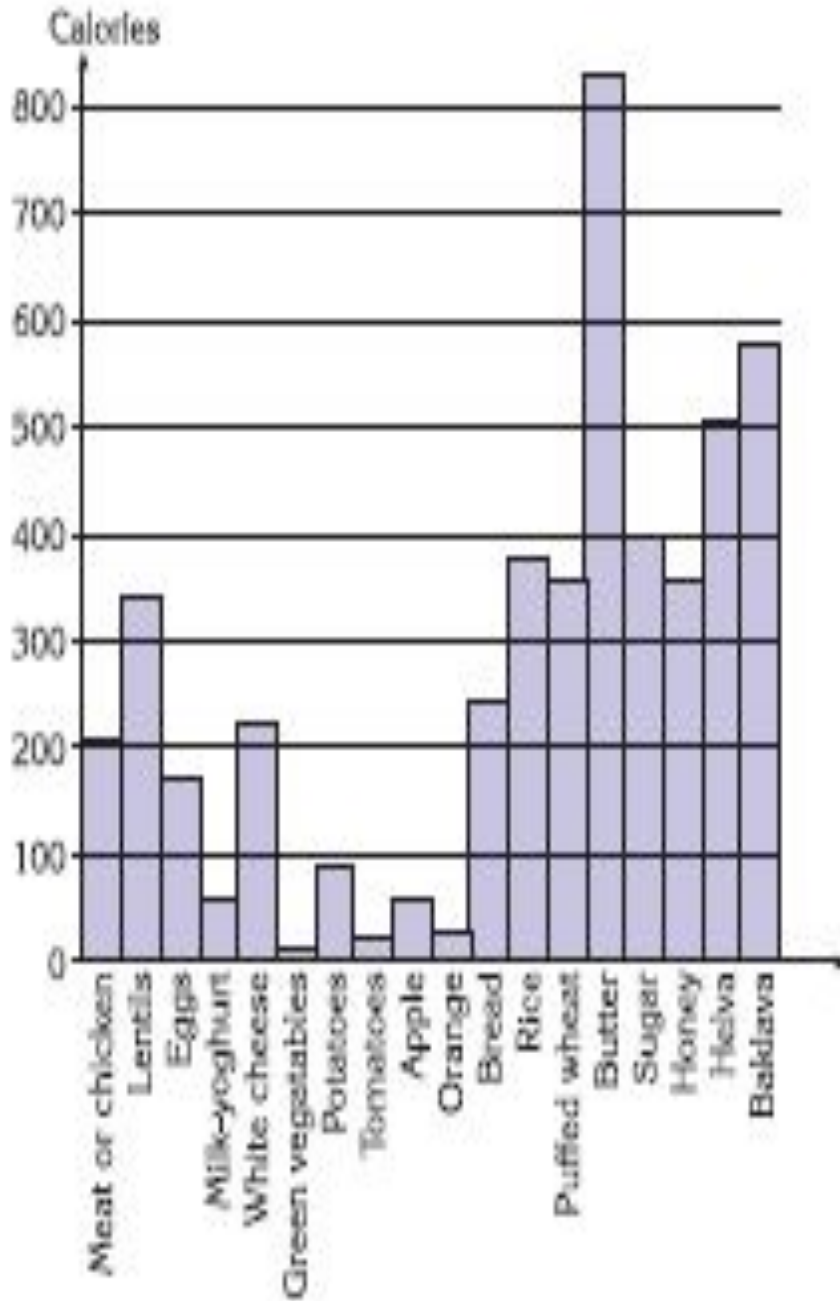
- Half of the chemical energy stored in food is produced by cell respiration and is consumed in the form of ATP.
- The other half is released as heat during these reactions.

a) Structure of ATP



b) Hydrolysis of ATP, ADP, AMP



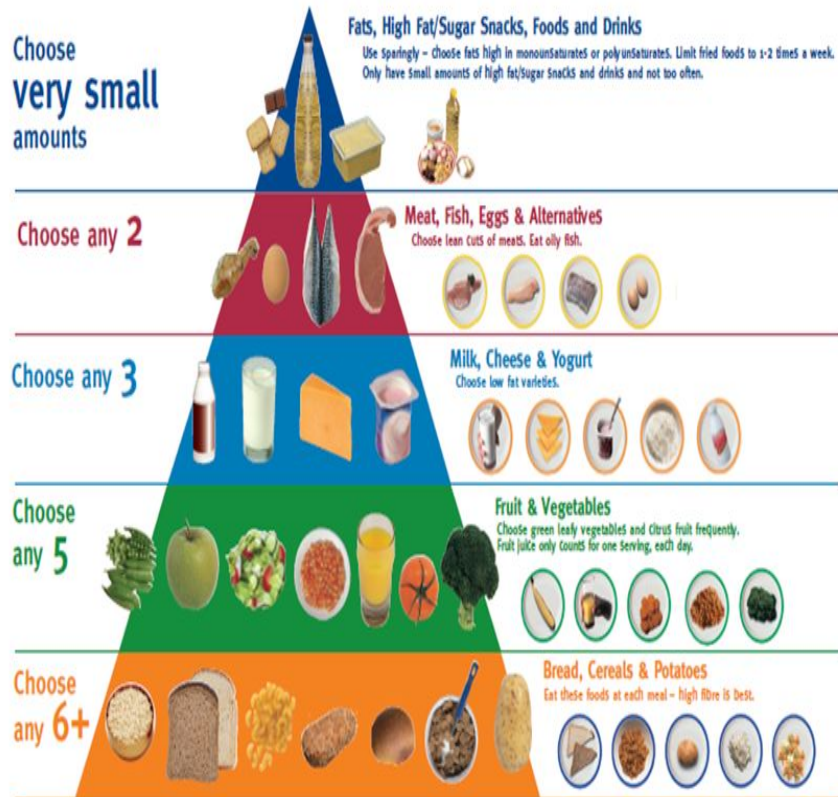


## The capacity of energy in food

- 1g carbohydrate gives 17.6 kJ
- 1g lipid gives 38.9 kJ
- 1g protein gives 17.6 kJ

# Daily energy requirement of an organism

## Healthy Food Pyramid



Drink water regularly - at least 8 cups a day

FOLIC ACID - AN ESSENTIAL INGREDIENT IN MAKING A BABY. YOU CAN GET FOLIC ACID FROM GREEN LEAFY VEGETABLES BUT IF THERE IS ANY POSSIBILITY THAT YOU COULD BECOME PREGNANT THEN YOU SHOULD BE TAKING A FOLIC ACID TABLET (400 MICROGRAMS PER DAY).

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04/05/05

- **Basal metabolism**, the energy requirements of an individual at rest, is determined at room temperature.
- The basal metabolism is approximately 1700 kcal for males and 1600 kcal for females

# Daily Food Requirements For a Balanced Diet



- The recommended daily intake is 500 g of carbohydrate, 70 g of lipid and 70 g of protein.
- The energy requirements of organisms with heavy bodies are obviously greater than organisms with light bodies.



# Daily Food Requirements For a Balanced Diet

**Human**

**Male**

**Female**

At rest

2234 kcal

1770 kcal

Worker

3657 kcal

2876 kcal

# The normal body weight can be calculated as follows

- **B.M.I (Body-Mass index):** It is calculated as 21 for females and 22 for males, but varies according to the individual.
- The minimum is 19-20, and 24-25 is the maximum value.

$$\text{B.M.I.} = \frac{\text{Weight (kg)}}{[\text{Height (m)}]^2}$$

**Example:** Calculate the appropriate weight for a man and a woman who are both 1.60 m in height.

$$\text{for a man } 22 = \frac{\text{weight (x)}}{(1.60)^2} = 56.32$$

$$\text{for a woman } 21 = \frac{\text{weight (x)}}{(1.60)^2} = 53.75$$