

9.1 Why we Need to Eat

P. 394 - 399

Food for Growth & Maintenance

- Nutrients are the chemicals that an organism needs in order to _____, to build and repair tissues, and to produce _____.
- The nutrients that are important for keeping our bodies healthy are carbohydrates, proteins, lipids (fats), _____, minerals, and vitamins.

Energy Transfer and Use

- The chemical energy produced by plants (in the form of _____) is transferred to herbivores and omnivores.
 - Cells use the energy to fuel biological processes and physical activities such as growth and _____.
- In endothermic (warm-blooded) animals, some of this chemical energy is used to maintain a fairly constant body _____.
 - Because the body temperature of endotherms is normally higher than the surrounding, some thermal energy is _____ to the environment.

Factors that Affect Energy Requirements

- **Endotherms** require _____ energy to regulate their body temperature.
- **Body Size:** Larger animals generally eat _____ than smaller ones. However, small endothermic animals need to _____ than large endothermic animals.
 - For example, a 5000 kg elephant might eat 250 kg of food a day - 5 % of its body mass. A 5 g shrew might have to eat 4 g of food a day - 80 % of its body mass!
- **Metabolic Rate** : the rate at which the body converts stored energy into working energy
 - **Metabolism** : the set of chemical reactions that occur in living organisms necessary to maintain life
 - **Catabolism** - the metabolic reactions that _____ down larger molecules into smaller subunits (e.g. breakdown of nutrients during digestion)
 - **Anabolism** - the metabolic reactions that use energy to _____ larger molecules from smaller subunits (e.g. growth and repair)
 - Factors Affecting Metabolic Rate
 - **Body size** → a _____ body requires more energy
 - **Physical activity** _____ burn more energy than fat
 - **Sex** → males require _____ energy (due to larger size and greater muscle mass)
 - **Age** → _____ with age (since they tend to be larger and have more muscle mass)
 - **Hereditary factors** → due to _____

Measuring Energy & BMR

- Energy is measured using an SI unit: the _____ (J).
 - Joules are small, so we use the _____ (kJ) to refer to the energy requirements of people or the energy stored in foods (1 kJ = 1000 J).
- Another unit is also used - a _____ (small c) is the amount of energy required to raise the temperature of 1 g of water by 1 °C.
 - When referring to _____ energy, Calorie (big C) is used.
 - One Calorie equals _____ calories, or 4180 J.
- **Basal Metabolic Rate:** The rate at which energy is used by an organism when it is _____.

The minimum amount of energy required to keep you alive.

- Calculating BMR:
 - Actual BMR Calculation:
 - based on the consumption of _____
 - a complex process and _____ for everyday use
 - Estimated BMR
 - BMR is generally _____
 - calculation takes into account four variables: height, weight, age, and sex
 - males tend to have a higher BMR than females by about 10 %.
 - energy requirements also depend on your _____ level.
 - Note: estimated BMR does not take into account the ratio of _____ to fat

BMR Calculation

Calculate either your own BMR, or one of a hypothetical scenario to practice using the formula.

Homework

P. 399 # 1, 2, 4 & 5

9.2 What and How Much Do We Need to Eat?

P. 400 - 405

Required Nutrients

- Your body needs six _____ nutrients in order to stay healthy:
 - Carbohydrates
 - Proteins
 - Fats
 - Water
 - Vitamins
 - Minerals
- These are the building blocks of life.
 - If any are absent from your diet for too long, your cells will stop working properly.

Carbohydrates

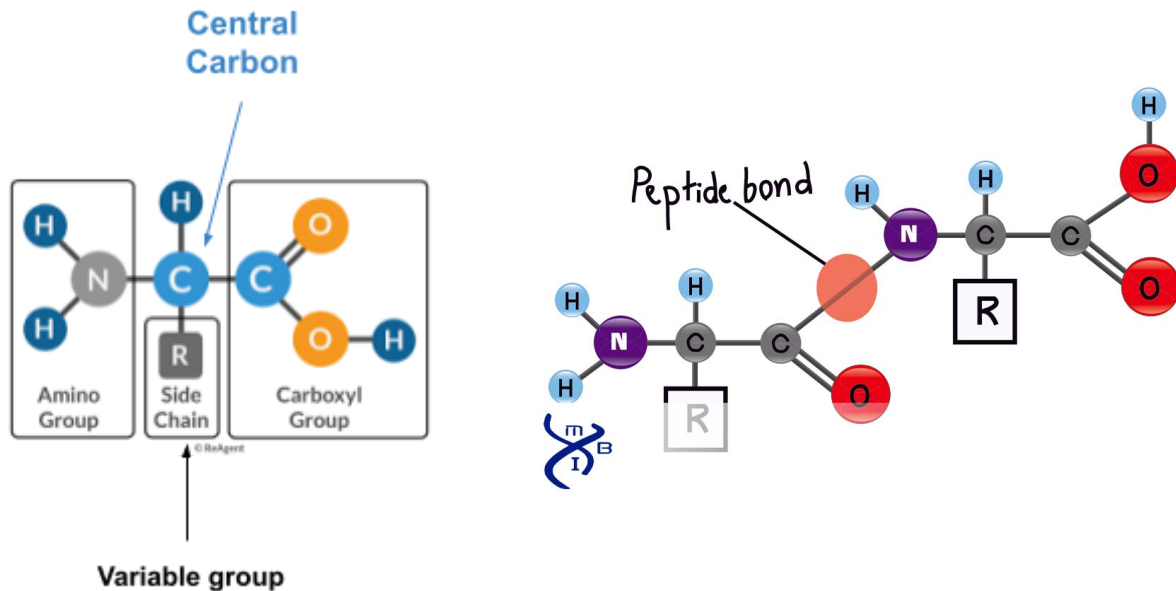
- Main source of _____ for the body
- Composed of ____, ____, and ____ atoms
- Three main types:
 - **Monosaccharides:** one sugar (e.g. glucose and fructose)
 - **Disaccharides:** two sugars joined (e.g. sucrose)
 - **Polysaccharides:** many sugars _____ (e.g. cellulose)
- Polysaccharides
 - **Starch** (amylose):
 - made by plants for energy storage
 - made of branched _____ molecules
 - **Cellulose**
 - made and stored in plants, found in _____
 - structural molecules, straight rigid shape
 - we cannot digest cellulose, but it provides bulk (fiber) in our diet
 - **Glycogen**
 - made in _____ cells (stored in the liver and muscles) for energy
 - in glycogen, glucose subunits are more highly _____ compared to starch molecules
 - when energy is needed in the body, glycogen is broken down into usable glucose

Proteins

- key building blocks of cells
- important structural molecules
- involved in all _____ activities, and are used to generate motion.
- some proteins serve as _____ — chemical messengers released by cells in the body that influence cellular activity in another part of the body.

Protein Structure

- Proteins are the most _____ of all nutrients and are made up of long chains of smaller molecules called amino acids and are highly variable in size and shape.
- There are _____ different amino acids that organisms use to build proteins.



Protein Sources - Animal vs Plant

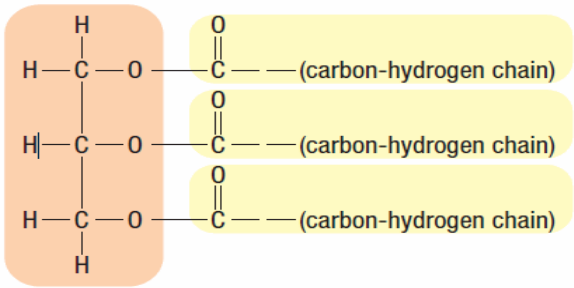
- Animal proteins contain all _____ essential amino acids
- Most plant proteins lack _____ one essential amino acid.
 - People who do not eat animal products must eat plant foods in combination to obtain all the amino acids they need.
- Animal muscle has a _____ concentration of protein than plant material
 - You have to eat a greater mass of plant material to obtain an equivalent amount of protein
- Protein Sources in our Diet:
 - Animal sources high in protein: meat, eggs, fish and cheese
 - Plant sources high in protein: beans, lentils, seeds and nuts
 - Your body separates the proteins you consume into individual amino acids so they can be rearranged and used as building blocks for _____ proteins

Lipids

- Provide a _____ source of energy for the body
- They help _____ fat soluble vitamins, are a main component of cell _____, and serve as _____ for the body
- Certain hormones, including sex hormones (e.g. estrogen and testosterone), are lipids

Lipid Structure

- Fats and oils are made up of triglycerides
- Each triglyceride is made up of three fatty acids _____ to a glycerol molecule



triglyceride

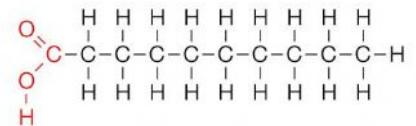
- Triglycerides can be either saturated or unsaturated, depending on the structure of their fatty acid chains.

Saturated vs. Unsaturated Lipids

• Saturated Fats

- Fatty acids contain _____ bonds only (dense structure)
- Usually _____ at room temperature (E.g. butter)
- Considered to be less healthy

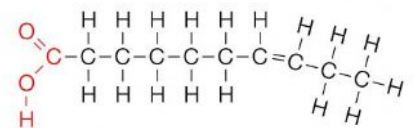
Saturated



• Unsaturated Fats

- Fatty acids contain _____ bond(s) (bent/loose structure)
- Usually liquid at room temperature (E.g. Vegetable oil)
- Considered to be _____ healthy

Unsaturated



Steroids

- A special group of lipids called steroids include:
 - Sex hormones: (e.g. testosterone and estrogen) control the development of male and female sex characteristics
 - Cholesterol is a key component of all _____ cell membranes; cholesterol has “good” and “bad” forms
 - Low-density lipoprotein (bad) can build up inside arteries, increasing risk of heart disease and stroke
 - High-density lipoprotein (good) absorbs cholesterol from blood to be eliminated

Water

- We need about _____ of water per day
- Our bodies are 55 - 60 % water
- Water is needed by our bodies:
 - for chemical reactions
 - to digest food
 - to eliminate waste prod _____
 - to regulate _____ temperature
 - to keep skin moist

Vitamins

- Organic molecules that the body requires in _____ amounts as essential nutrients
- Function: regulate cell functions, growth, and development
- Are either fat soluble (will dissolve in fats) or water soluble (will dissolve in water)

Vitamins: Storing and Eliminating

- **Fat soluble vitamins** can be stored in the body's fatty tissues for future use and are therefore not easy to _____ from the body if they are in excess (danger of toxicity)
 - A, D, E, and K
- **Water soluble vitamins** cannot be stored in the body, and excess quantities are readily _____ in urine.
 - B and C

Vitamin Sources

We obtain most of our vitamins from food, but vitamins A, D, and K can also be produced in our bodies.

- **Vitamin A**
 - The body can _____ a chemical called beta-carotene (found in green veggies, carrots, egg yolks, liver) into vitamin A.
- **Vitamin D**
 - Formed in the skin when the skin is exposed to _____. Our bodies can produce enough vitamin D from 10 min to 15 min of sunshine three times a week.
- **Vitamin K**
 - Synthesized by special bacteria found in the _____.

Minerals

- Minerals are _____ (e.g. calcium, sodium, oxygen, iron, phosphorus) required by the body in small amounts
- **Function:** play role in cell processes and repair
- Calcium and phosphorus -
 - The most _____ minerals
 - Critical in formation and maintenance of bones -
- Sodium and potassium -
 - Involved in _____ impulse transmission and muscle _____
- Iron -
 - Key component of the blood protein _____ that binds oxygen for transport
- Trace minerals include;
 - Fluorine, zinc, and copper

Body Mass Index

- _____ of a person's height and weight

- General indicator of whether a person has a healthy body weight for their _____

- $BMI = \text{weight (kg)} \div \text{height (m)}^2$

Balanced Eating

- There are three variables in maintaining a healthy dietary lifestyle: level of physical activity, _____ of food consumed, and _____ of food consumed.
- The key to maintaining a healthy weight is to ensure that the energy intake is _____ by the energy output.
- In a large majority of cases, obesity is the result of overeating, an _____ diet, and inactivity but genetics, _____ factors and _____, etc. often play a role.

Eating Disorders

- Eating disorders such as anorexia and bulimia are _____ disorders that can lead to serious physical health risks.
 - In a recent study, 27% of Ontario girls 12-18 years old were reported to be engaged in severely problematic food and weight behaviour.
 - Eating disorders are now the _____ most common chronic illness in adolescent girls.

Homework: P. 405 # 1, 3(b) & 4