

Biology 1400

Fundamentals of Nutrition

Course Outcomes

1. Identify the six classes of nutrients and their relationship to health.
2. Indicate function and requirements of carbohydrates, lipids and proteins.
3. Identify the vitamins and minerals and give their role in nutrition.
4. List the major organs of digestion and give their function.
5. Understand the relationship between energy balance and weight control at different times in the life cycle.
6. Identify proper storage and handling of food and the ecology of the world's food supply.

Units

1. Introduction to Nutrition and Nutrition Tools
2. Overview of Body Systems and Digestion
3. Macronutrients
4. Water and Micronutrients
5. Alcohol and Eating Disorders
6. Energy Balance and Fitness
7. Life Cycle Nutrition
8. Food Safety and World Nutrition

Unit 1 - Introduction to Nutrition and Nutrition Tools

On completion of this unit the student should be able to:

1. Utilize a vocabulary containing the following terms:

Adequate intake	Energy density	Nutrient
Adipose tissue	Enriched	Nutrient density
Alcohol	Enzyme	Nutrition
Amino acid	Fatty acid	Organic
Anthropometric assessment	Fiber	Osteoporosis
Appetite	Fortified	Overnutrition
Balance	Functional food	Phytochemical
Biochemical assessment	Ghrelin	Placebo
Carbohydrate	Glucose	Protein
Cardiovascular disease (CVD)	Hormone	Recommended dietary allowance (RDA)
Cholesterol	Hunger	Risk factor
Chronic	Hypothalamus	Satiety
Clinical assessment	Infectious disease	Saturated Fatty Acid
Control group	Inorganic	Serotonin
Daily value	Kilocalorie (kcal)	Trans Fatty Acid
Degenerative disease	Leptin	Triglyceride
Diet	Lipid	Undernutrition
Dietary assessment	Macronutrient	Unsaturated Fatty Acid
Dietary reference intake	Malnutrition	Upper level
Double-blind study	Megadose	Variety
Economic assessment	Metabolism	Vitamin
Electrolytes	Micronutrient	Water
Endorphins	Mineral	
Energy	Moderation	

2. Describe how factors such as early experience, customs, advertising and economics can affect our food choices.
3. List the functional roles of nutrients in the body.
4. List six classes of nutrients and identify food choices that represent each class.
5. Identify which of the classes of nutrients are considered organic and which are inorganic.
6. State the function of each class of nutrients listed above.
7. State the unit of energy associated with food and list the caloric yield from each class of nutrients.
8. State the nutritional information required on a food label.
9. State the health claims and label descriptions allowed by the FDA.
10. State the goal of the food pyramid and the groups that comprise it.
11. Discuss the current Dietary Guidelines for Americans.
12. Discuss the importance of serving size.
13. Discuss ways nutrition can affect health.
14. Differentiate between nutrient-dense and energy-dense.
15. Describe the characteristics of a healthy diet.
16. Describe the methods of nutritional assessment.

Unit 2 - Overview of Body Systems and Digestion

On completion of this unit the student should be able to:

1. Utilize a vocabulary containing the following terms:

Absorption	Epithelial tissue	Neurotransmitter
Antacid	Esophagus	Organ
Antibody	Gallbladder	Organ system
Antigen	Gastrin	Organelles
Amylase	Gastroesophageal reflux disease (GERD)	Peristalsis
Artery	Gastrointestinal (GI) Tract	Peroxisome
Bile	Golgi complex	Phagocytosis
Bolus	Heartburn	Pharynx
Capillary	Hemorrhoids	Phospholipid
Cardiovascular system	Hiatal Hernia	Plasma
Cell nucleus	Ileocecal sphincter	Portal circulation
Cholecystokinin (CCK)	Immune system	Pyloric sphincter
Chromosome	Irritable Bowel Syndrome (IBS)	Receptor
Chyme	Lower esophageal sphincter	Ribosomes
Constipation	Lymphatic system	Secretin
Diarrhea	Lysosome	Secretory vesicles
Digestion	Mitochondria	Synapse
Endocrine gland	Motility	Thyroid hormone
Endoplasmic reticulum (ER)	Mucus	Tissues
Enzyme	Muscle tissue	Ulcer
Epiglottis	Myelin sheath	Umami
	Nervous system	Urinary system
	Neuron	Vein
		Villi

2. Identify the organs of digestion and absorption.
3. Describe the mechanical and chemical processes that occur in each stage of digestion.
4. Describe the absorption and transport process for each of the nutrient groups.
5. Discuss how carbohydrates and proteins can be converted into fats.
6. Describe the major functions of the: cardiovascular system, endocrine system, nervous system, respiratory system and digestive system.
7. Describe the roles of the liver, gallbladder and pancreas in digestion.
8. Discuss the following digestive disorders:
 - a. Ulcers
 - b. Gastroesophageal reflux disease (GERD)
 - c. Irritable bowel syndrome (IBS)
 - d. Hiatal hernia

Unit 3 - Macronutrients

On completion of this unit the student should be able to:

1. Utilize a vocabulary containing the following terms:

Aerobic	Glycemic Load (GL)	Metabolic syndrome
Alpha-linolenic acid	Glycerol	Monounsaturated fatty acid
Amylase	Glycogen	Myocardial infarction (MI)
Anaerobic	Glucose	Omega-3 fatty acid
Atherosclerosis	High-density lipoprotein (HDL)	Omega-6 fatty acid
Bile acids	High-quality (complete) proteins	Pepsin
Buffers	Homocysteine	Peptide bond
Cellulose	Hydrogenation	Phospholipid
Cerebrovascular accident (CVA)	Hyperglycemia	Plaque
Cholesterol	Hypertension	Polypeptide
Chylomicron	Hypoglycemia	Polysaccharides
Complementary proteins	Insoluble fiber	Polyunsaturated fatty acid
Denature	Insulin	Protein-energy malnutrition (PEM)
Diastolic Blood Pressure	Insulin resistance	Saturated fatty acid
Dietary fiber	Ketone bodies	Soluble fiber
Diverticula	Ketosis	Starch
Diverticulitis	Kwashiorkor	Sterol
Diverticulosis	Lactase	Sucralose
Docosahexaenoic acid (DHA)	Lactoovovegetarian	Sucrose
Edema	Lactose	Sugar
Eicosapentaenoic acid (EPA)	Lactose maldigestion/intolerance	Systolic Blood Pressure
Emulsifier	Lactovegetarian	Trans fatty acid
Essential amino acids	Lecithin	Triglyceride
Essential fatty acid	Limiting amino acid	Type 1 diabetes
Extracellular space	Linoleic acid	Type 2 diabetes
Fiber	Lipase	Urea
Fermentation	Lipoprotein	Vegan
Fructose	Low-density lipoprotein (LDL)	Vegetarian
Fruitarian	Lower-quality (incomplete) proteins	Very low-density lipoprotein (VLDL)
Functional fiber	Maltose	Whole grains
Galactose	Marasmus	
Glucagon		
Glycemic Index (GI)		

2. Differentiate between complex and simple carbohydrates.
3. State two examples of the following carbohydrates:
 - a. monosaccharides
 - b. disaccharides
 - c. polysaccharides
4. State the function of each of these carbohydrates in human nutrition:
 - a. glucose
 - b. starch
 - c. cellulose (fiber)
 - d. glycogen
5. Define the two types of fiber and discuss the health benefits of each.
6. Describe the body's use of glucose for energy and energy storage.
7. Describe the regulation of blood glucose levels.
8. Discuss glycemic index and load, in regards to the effect on the blood glucose levels.
9. State the dietary guidelines for carbohydrates.
10. State the adequate intake of fiber for adults.
11. Discuss the conditions that lead to the following carbohydrate problems:
 - a. lactose intolerance/maldigestion
 - b. diabetes mellitus (hyperglycemia)

c. hypoglycemia

12. Differentiate between type 1 and type 2 diabetes mellitus
13. Name the classes of lipids and their roles in nutrition.
14. List the functions of lipids in the human body.
15. Differentiate between saturated and unsaturated fatty acids. Give examples of each type of fat in the diet.
16. Discuss the problems of the digestion and absorption of lipids in the body.
17. Name the two essential fatty acids, explain why they are essential, and list two good sources for each essential fatty acid.
18. State the dietary guidelines for lipids.
19. Summarize the processes of lipid digestion, absorption, transport and utilization in the body.
20. Describe how hypertension develops and identify risk factors associated with the disease.
21. Identify the symptoms of cardiovascular disease (CVD) and highlight risk factors.
22. Define atherosclerosis and identify risk factors.
23. Identify classes of lipoproteins and explain their functions.
24. Explain why manufacturers hydrogenate fats and the possible health implications of consuming trans fatty acids formed during hydrogenation.
25. Explain how the chemical composition of proteins differs from that of lipids and carbohydrates,
26. Describe how amino acids make up proteins.
27. Distinguish between essential and non-essential amino acids.
28. Explain why adequate amounts of essential amino acids are required in the diet.
29. List the functions of protein in the diet.
30. Distinguish between complete and incomplete proteins.
31. Explain nitrogen balance and situations which affect nitrogen balance in the body.
32. List the health risks associated with a diet too high or too low in protein.
33. Explain how it is possible for vegetarians to obtain their necessary protein.
34. Summarize the processes of protein digestion and absorption in the body.

Unit 4 - Water and Micronutrients

On completion of this unit the student should be able to:

1. Utilize a vocabulary containing the following terms:

Acne	Electrolytes	Osteomalacia
Aldosterone	Extracellular fluid	Osteoporosis
Anemia	Fat-soluble vitamins	Oxalic acid
Antidiuretic hormone (ADH)	Free radical	Parathyroid hormone (PTH)
Antioxidant	Goiter	Pellegra
Beriberi	Heme iron	Pernicious anemia
Bioavailability	Hemoglobin	Phytic acid
Bone mass	International unit	Rickets
Bone density	Intracellular fluid	Retinoids
Calcitonin	Intrinsic factor	Scurvy
Carotenoids	Macular degeneration	Solvent
Coenzyme	Major Mineral	Tetany
Cofactor	Megadose	Tocopherols
Cretinism	Neural tube defect	Trace Mineral
Dehydration	Night blindness	Vitamin
Diuretic	Non-heme iron	Water-soluble vitamins
	Osmosis	Xerophthalmia

2. Explain the functions of water in the body.
3. Classify the minerals as major or trace.
4. List the major functions and deficiency symptoms for the minerals.
5. Identify factors that affect absorption, retention and availability of some minerals, e.g., iron, calcium.
6. Identify factors that can affect the vitamin content of food.
7. List the major functions and deficiency symptoms for each vitamin.
8. List important food sources for each vitamin.
9. Identify vitamins that are considered antioxidants.
10. Discuss the major roles of water in the body and the amount of water needed by adults.
11. Describe how the body regulates water intake and excretion to maintain water balance.
12. Explain the role of minerals in maintaining the body's fluid and electrolyte balance and acid-base balance.
13. List the major roles and important deficiency and toxicity symptoms for each major and trace mineral.
14. Describe the characteristics of fat-soluble and water-soluble vitamins and explain how they differ.
15. Evaluate the use of vitamin supplements with respect to their potential benefits and hazards to the body.

Unit 5 - Alcohol and Eating Disorders

On completion of this unit the student should be able to:

1. Utilize a vocabulary containing the following terms:

Alcohol abuse	Bulimia nervosa
Alcohol dehydrogenase (ADH)	Cirrhosis
Alcohol dependence	Eating disorder
Anorexia nervosa	Ethanol
Binge-eating disorder	Fetal alcohol syndrome (FAS)

2. Define moderate alcohol consumption and discuss possible benefits of moderate consumption.
3. Identify the organs damaged by alcohol abuse.
4. Describe the risks of binge drinking.
5. Outline the causes of, effects of, typical persons affected by and the treatment for anorexia nervosa and bulimia nervosa.

Unit 6 - Energy Balance and Fitness

On completion of this unit the student should be able to:

1. Utilize a vocabulary containing the following terms:

Adenosine Triphosphate (ATP)	Ergogenic	Positive energy balance
Adenosine Diphosphate (ADP)	Gastroplasty	Pyruvic Acid
Basal metabolic rate (BMR)	Heat exhaustion	Set Point Theory
Basal metabolism	Heatstroke	Stress fracture
Bioelectrical impedance	Lactic acid	Stroke volume
Body mass index (BMI)	Lean body mass	Subcutaneous fat
Carbohydrate Loading	Lower body obesity	Thermic effect of food
Cardiac output	Muscle endurance	Thermogenesis
Cardiopulmonary endurance	Muscle strength	Underweight
Central obesity	Negative energy balance	Upper body obesity
Electrolytes	Obesity	Visceral fat
Energy balance	Phosphocreatine (PCr)	

2. Describe the relationship between energy in and energy out.
3. Calculate the basal metabolic rate (BMR) and voluntary activity.
4. List the factors that affect BMR.
5. Describe the methods of determining percentage of body fat composition and explain the importance of the percentage of fat composition.
6. Define obesity and outline the risks to health posed by obesity.
7. Describe how calorie intake, behavior modification and increased physical activity fit into a weight control plan.
8. List the health hazards associated with obesity.
9. List & define the three components of the body's energy budget.
10. Identify & explain the factors that affect the basal metabolic rate.
11. Explain the concept of set point.
12. Discuss the problems of too much or too little body fat.
13. Evaluate popular weight reduction diets.
14. Summarize the recommended strategies to promote weight control.
15. Explain the benefits of and guidelines for regular physical activity.
16. Summarize how the body adjusts its fuel mix to respond to physical activity of varying intensity levels and duration.
17. Explain the importance of water and/or sports drinks during exercise.
18. Describe the role vitamins and minerals play in physical performance and indicate whether supplements are necessary to support the needs of active people.
19. List ergogenic aids and describe their effects, if any, on an athlete's performance.

Unit 7 - Life Cycle Nutrition

On completion of this unit the student should be able to:

1. Utilize a vocabulary containing the following terms:

Allergy	Food aversion	Metastasize
Allergen	Food intolerance	Oxytocin
Anaphylactic shock	Food sensitivity	Placenta
Antigen	Gestation	Preeclampsia
Benign	Gestational diabetes	Preterm
Cancer	Lactation	Prolactin
Carcinogen	Let-down reflex	Reserve capacity
Colostrum	Life expectancy	Small for gestational age (SGA)
Embryo	Life span	Spontaneous abortion
Fetal alcohol effect (FAE)	Low birth weight (LBW)	Trimesters
Fetal alcohol syndrome (FAS)	Malignant	Zygote
Fetus	Meconium	

2. Describe the process by which a cancer develops and explain what is known about the effects of food constituents on cancer development.
3. Describe how maternal nutrition before and during pregnancy affects both the development of the fetus & growth of the infant after birth.
4. Explain why abstinence from smoking and drugs, avoiding dieting, and moderation in the use of caffeine are recommending during pregnancy.
5. Explain the effects of alcohol on the development of the fetus and describe fetal alcohol syndrome.
6. List the benefits of breastfeeding and indicate the changes a lactating woman needs to make in her diet to promote breastfeeding success.
7. Identify diet guidelines to meet basic nutritional needs for normal growth and development of an infant and discuss some of the do's and don'ts associated with infant feeding.
8. Describe the nutrient needs of young children & appropriate feeding practices including issues of choking, portion sizes, and snacking.
9. Discuss nutrition-related concerns of children including the link between diet and behavior, the problem of lead, and the impact of television on nutrition.
10. Distinguish between food allergies, intolerances, and aversions.
11. Discuss the special nutrient needs and concerns of teenagers.
12. Describe special nutritional needs of older adults and the suspected connections between diet and disease.
13. List biological changes that occur during the aging process and discuss how these changes affect nutrient needs of older adults.

Unit 8 - Food Safety and World Nutrition

On completion of this unit the student should be able to:

1. Utilize a vocabulary containing the following terms:

Aseptic processing	Fungi	Pasteurizing
Bacteria	Generally recognized as safe (GRAS)	Preservatives
Biotechnology	Genetically modified organism (GMO)	Salmonella
Botulism	Hepatitis	Spores
E. coli	Incidental food additives	Staphylococcal intoxication
Famine	Intentional food additives	Toxins
Food insecurity	Irradiation	Virus
Foodborne illness	Parasite	

2. Discuss how microbial food poisoning can be prevented and indicate which foods are particularly troublesome.
3. Identify the common viruses and bacteria that can cause foodborne illnesses.
4. Identify the foods and symptoms associated with common foodborne illnesses.
5. List four (4) major food processing techniques and explain the effect they have on the nutrient content of foods.
6. Discuss the regulations concerning food additives and identify the special roles of the major classes of additives.
7. Identify sources of toxic environmental contaminants in foods and the related complications of ingestion.
8. Identify how biotechnology may be used to increase the food supply.
9. Identify government programs designed to relieve poverty and hunger.