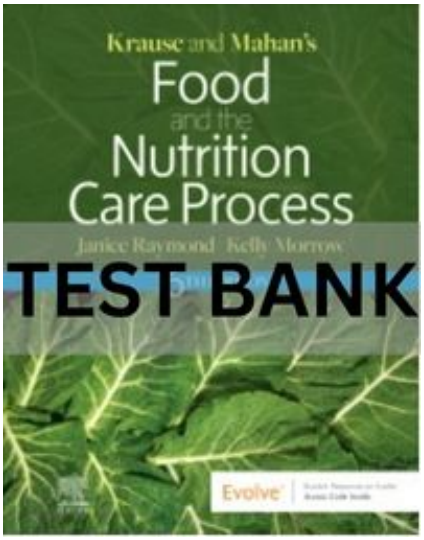
Chapter 01: Intake: Gastrointestinal Digestion, Absorption, and Excretion of Nutrients
Raymond: Krause and Mahan's Food and the Nutrition Care Process, 16th Edition



MULTIPLE CHOICE

1. Pepsinogen is converted to pepsin when it comes in contact with
   a. enterokinase.
   b. trypsinogen.
   c. hydrochloric acid.
   d. peptidases.

   ANS: C
   Pepsinogen is secreted in the stomach and converted to its active form by the acid environment of the stomach. Enterokinase is secreted by the brush border of the small intestine in response to the presence of chyme. Trypsinogen is secreted by the pancreas and activated by enterokinase. Various peptidases are secreted by the either brush border or the pancreas.

2. Which of the following is formed by bacterial synthesis in the colon?
   a. Vitamin K
   b. Vitamin D
   c. Vitamin B_6
   d. Niacin

   ANS: A
   Colonic bacteria produce vitamin K, vitamin B_{12}, thiamin, and riboflavin. Vitamin D may be metabolized by exposure of precursor vitamin D in the skin to ultraviolet light. The human body can synthesize niacin from the amino acid tryptophan. Vitamin B_6 must be obtained from dietary sources such as meats, whole grains, vegetables, and nuts.

3. After surgical removal of a large portion of the small intestine, what functional complication is most likely to develop?
   a. Changes in dietary habits
   b. Impaired digestion
   c. Loss of absorptive tissue
   d. Elimination of dietary residue

   ANS: C

The small intestine is the primary site of nutrient absorption because of its large absorption surface area. Secretions from the liver, gallbladder, and pancreas can still contribute to digestion of intestinal contents. However, decreased absorption of nutrients and food components may result in more intestinal remains and residue. A patient may change dietary habits as a result of gastrointestinal discomfort experienced after intestinal resection, but this is not a functional complication.

4. The sight or smell of food produces vagal stimulation of the parietal cells of the gastric mucosa, resulting in the increased production of what?
   a. Motilin
   b. Gastrin
   c. Cholecystokinin
   d. Secretin

   ANS: B
   Parasympathetic innervation that causes secretion of gastrin and release of hydrochloric acid helps prepare the stomach for the potential of receiving food. After food chyme is passed into the small intestine from the stomach, secretin and cholecystokinin are secreted to stimulate pancreatic secretion of water and bicarbonate. They also signal gallbladder contractions and colonic motility, all resulting in reductions in stomach emptying and duodenal motility. Motilin is secreted from the duodenal mucosa during fasting to stimulate gastric emptying and intestinal motility.

5. If a patient experiences malabsorption of fat resulting from an impaired ability to produce adequate bile salts for micelle formation, how may fat absorption be improved?
   a. By increasing short-chain fatty acids in the diet
   b. By increasing medium-chain fatty acids in the diet
   c. By increasing long-chain fatty acids in the diet
   d. By restricting dietary intake of cholesterol

   ANS: B
   Medium-chain fatty acids of 8 to 12 carbons can be absorbed directly by mucosal cells without the presence of bile. The long-chain fatty acids require micelle formation for absorption. Short-chain fatty acids result from bacterial fermentation of malabsorbed carbohydrates and fibers. As bile is produced from cholesterol, dietary restriction of cholesterol is negligible in regard to improvements in fat absorption.

6. What is the function of secretin?
   a. Stimulation of gastric secretions and increased motility
   b. Stimulation of gallbladder contraction and the release of bile
   c. Stimulation of the pancreas to secrete water and bicarbonate
   d. Stimulation of the parietal cells to secrete gastrin

   ANS: C
   Secretin is the hormone that works in opposition to gastrin. Whereas gastrin stimulates stomach digestion activities, secretin decreases gastric output and promotes pancreatic secretions to neutralize the acidity of chyme. Cholecystokinin is also secreted when chyme enters the duodenum, and it is responsible for stimulating the gallbladder.

7. Which of the following is a list of enzymes released from the pancreas?
   a. Insulin, trypsin, and secretin
   b. Lactase, isomaltase, and dextrinase

c. Protease, pepsin, and gastrin
d. Trypsin, chymotrypsin, and carboxypeptidase

ANS: D
Trypsin, chymotrypsin, and carboxypeptidase are three protein digestive enzymes secreted by the pancreas. Insulin is an endogenous hormone secreted by the pancreas. Secretin is a hormone secreted by the small intestine. Lactase and isomaltase (also known as dextrinase) are brush-border enzymes. Pepsin, which is a protease, and gastrin are hormones secreted by the stomach.

8. In what form is dietary fat absorbed from the lumen of the intestine?
a. Chylomicron
b. Micelle
c. Triglyceride
d. Lipoprotein

ANS: B
Fats must be emulsified into micelles so that they may cross the unstirred water layer that borders the brush-border membranes. These micelles leave monoglycerides and fatty acids at the brush border, where they are reabsorbed and reassembled as triglycerides. The triglycerides are packaged with cholesterol, fat-soluble vitamins, and phospholipids into chylomicrons, which pass into the lymphatic circulation. When these reach the liver, the chylomicron components are repackaged into low-density lipoproteins.

9. Which of the following is true of probiotics?
a. Probiotics are live microorganisms found in food.
b. Probiotics are nondigestible carbohydrates.
c. Probiotics act primarily on bacteria in the proximal small intestine.
d. Probiotics cannot be given as supplements because they readily die.

ANS: A
Probiotics are live microorganisms, which when administered in adequate amounts confer a health benefit on the host. They are found in fermented foods like yogurt and sauerkraut or as a nutritional supplement. Bacterial action is most intense in the distal small intestine and large intestine.

10. By which transport mechanism are most vitamins absorbed from the small intestine into the blood?
a. Passive diffusion
b. Active diffusion
c. Facilitative diffusion
d. Passive osmosis

ANS: A
Passive diffusion is limited by the number of channels available for nutrients to randomly pass through. Facilitated diffusion requires the presence of carrier proteins, which may be limited by the health and nutritional status of the person. Active transport requires energy, which also may be limited by the person's health and nutritional status. Osmosis occurs in regard to concentration gradient and only involves the movement of water, not vitamins.

11. What are primarily absorbed by the large intestine?
a. Water and fats
b. Carbohydrates

c. Proteins
d. Water and electrolytes

ANS: D
Water and electrolytes are usually the only absorbable remnants of dietary intake that reach the large intestine. Fats, carbohydrates, and proteins from the diet are absorbed throughout the small intestine.

12. What happens to cellulose and lignin as they go through the GI tract?
a. They are converted into glucose before absorption.
b. They are converted into glucose and absorbed by active transport.
c. They are excreted in the feces unchanged.
d. They are excreted in the feces as glucose.

ANS: C
In humans, the secreted amylases cannot split the β1-2 and β1-4 linkages between the saccharides within the cellulose molecule. As a result, no individual glucose molecules are broken off.

13. Which is the process by which minerals are absorbed when they are bound to an acid, organic acid, or amino acid?
a. Cotransportation
b. Carrier protein
c. Competitive inhibition
d. Chelation

ANS: D
Chelation refers to the binding of a cation mineral to a ligand, not a whole protein. Cotransporters carry two different minerals at a time, such as the case with sodium and phosphorus. An overlap of mineral transport mechanisms may lead to competitive absorption between minerals in the presence of other minerals, such as the case with iron or zinc supplementation, leading to a decrease in copper absorption.

14. How often do the cells lining the intestinal tract recycle?
a. Every 2 to 3 days
b. Every 3 to 5 days
c. Every 5 to 7 days
d. Every 10 to 14 days

ANS: B
Intestinal mucosal cells have a life span of 3 to 5 days before they are sloughed off and recycled. They are fully functional only for the last 2 to 3 days as they migrate to the distal third of the villi.

15. What effect may be achieved by eating a diet high in prebiotic carbohydrates?
a. Decreased SCFA production in the bowel
b. Increased growth of *Lactobacillus* spp.
c. Decreased absorption of bile salts
d. Increased absorption of cation minerals

ANS: B

The use of prebiotic carbohydrates favors the growth of friendly bacteria such as lactobacilli and bifidobacteria. These bacteria ferment the prebiotic carbohydrates, promoting increased short-chain fatty acid production. These types of carbohydrates have not been demonstrated to have a bile-sequestering effect. Impairments in absorption of cation minerals tend to be in relation to phytates and oxalates that are present in plant foods.

16. How long does it take for small intestine contents to reach the ileocecal valve?
    a. 18 to 72 hours
    b. 3 to 8 hours
    c. 1 to 2 hours
    d. 2 to 3 hours

    ANS: B
    Travel of contents through the small intestine takes 3 to 8 hours. A liquid meal empties from the stomach within 1 to 2 hours of eating. A solid meal takes 2 to 3 hours. Total transport from mouth to anus takes 18 to 72 hours on average.

Chapter 02: Intake: Energy
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MULTIPLE CHOICE

1. A particular food provides 100 kcal. How many kJ does this equal?
    a. 420
    b. 480
    c. 4200
    d. 4800

    ANS: A
    One kilocalorie is equal to 4.184 kJ (100 kcal × 4.2 kJ/kcal = 420 kJ).

2. Which of the following conditions is necessary to obtain an accurate measure of a patient's basal metabolic rate (BMR)?
    a. Test at the end of the day when the patient is ready to go to sleep.
    b. Test 2 to 3 hours after the last meal.
    c. Test in the morning after the patient has awakened.
    d. Test in environmental conditions equal to body temperature.

    ANS: C
    For an accurate measurement of BMR, the test should be performed when the body is using its minimum amount of energy, usually in the morning after waking, and at least 10 to 12 hours after the last meal so as to not include the thermic effect of food. Climates above 86°F increase metabolism because of sweat gland activity.

3. If a patient's body temperature were 104.6°F, what would the BMR be compared with normal?
    a. 58% of normal
    b. 135% of normal
    c. 142% of normal
    d. 178% of normal

    ANS: C

An increase in body temperature increases the BMR by 7% for every degree Fahrenheit above the normal 98.6°F (104.6 – 98.6 = 6°F; 6°F × 7% ÷ 1°F = 42%).

4. How does an elevation in body temperature with fever affect the metabolic rate?
   a. It does not change the metabolic rate.
   b. It increases the metabolic rate by 7% per degree Fahrenheit above normal.
   c. It increases the metabolic rate by 14% per degree Fahrenheit above normal.
   d. It decreases the metabolic rate by 7% per degree Fahrenheit above normal.

   ANS: B
   Fever causes an increase in body temperature. For every degree Fahrenheit above the normal 98.6°F, the BMR increases by 7%.

5. Which of the following does *not* increase the thermic effect of food (TEF)?
   a. Carbohydrates
   b. Fat
   c. Regular eating schedule
   d. Spicy foods

   ANS: B
   Although dietary fat provides the highest concentration of energy, metabolism of fat is highly efficient, with only 4% of calories wasted. This partly explains the obesogenic aspect of dietary fat. The TEF after intake of carbohydrates and proteins tends to be higher than after fat intake. Following a regular eating schedule results in a higher TEF than irregular eating. The use of spice and mustard increases metabolism more than unspiced meals.

6. What is the clinical method for measuring human energy expenditure?
   a. Bomb calorimetry
   b. Indirect calorimetry
   c. Doubly labeled water
   d. Direct calorimetry

   ANS: B
   Indirect calorimetry is commonly used in hospital settings. The piece of equipment is known as a metabolic cart or monitor. Other methods of measuring energy expenditure include doubly labeled water and direct calorimetry; however, these are not practical for clinical practice. Bomb calorimetry measures the energy available from food.

7. When is basal metabolism at its highest rate?
   a. During the digestion of a meal
   b. During periods of sleep
   c. During periods of exercise
   d. During periods of rapid growth

   ANS: D
   Because basal metabolism only accounts for the proportion of energy necessary for support of life functions, it does not include energy increase after eating (TEF) or during exercise (AT). During infancy, childhood, adolescence, and pregnancy, basal metabolism increases as FFM increases.

8. Which of the following best describes the contribution of physical activity to total energy expenditure?
   a. It accounts for 10% of total energy expenditure.

b. Its contribution to total energy expenditure increases with age.
c. Its contribution to total energy expenditure is most consistent during childhood.
d. It is the most variable component of total energy expenditure.

ANS: D
Activity thermogenesis is highly variable and dependent on body size and the efficiency of individual habits of motion. Whereas the thermic effect of food tends to be about 10% of TEE, AT can range from 100 kcal/day in sedentary people to 3000 kcal/day in highly active people. AT tends to decrease with age, and it tends to be variable during childhood.

9. What does indirect calorimetry measure?
a. The amount of heat produced by the body at rest
b. The energy potential of foods consumed
c. Oxygen consumption and carbon dioxide excretion
d. The resting metabolic rate

ANS: C
Indirect calorimetry measures gas exchange that results from metabolism. The oxygen consumption and carbon dioxide excretion can be used to estimate a resting metabolic rate. Direct calorimetry measures heat production, either from humans in a controlled environment, or from food, by incinerating the food and measuring the amount of heat released.

10. The respiratory quotient (RQ) is highest after consumption of a diet that is primarily composed of what?
a. Carbohydrate
b. Protein
c. Fat
d. Mixed macronutrients

ANS: A
The RQ compares the carbon dioxide produced with the oxygen consumed when energy substrates are metabolized. The RQ for carbohydrate is 1. The RQs for protein, fat, and a mixed diet are, respectively, 0.82, 0.7, and 0.85.

11. Studies have shown that which factor(s) is(are) the primary determinant of an individual's resting energy expenditure (RMR)?
a. The amount of lean body mass
b. The amount of adipose tissue
c. A person's age, gender, and health status
d. The individual's body weight

ANS: A
The lean body mass, or fat-free mass, accounts for about 80% of the variance in RMR. Although the body weight and composition are affected by a person's age, gender, and health status, the amount of metabolically active tissue that exists within the overall lean body mass contributes to the overall metabolic rate.

12. Which of these best describes the change in the metabolic rate during pregnancy?
a. It decreases as a result of a decrease in maternal physical activity.
b. It increases as a result of fetal growth.
c. It increases as a result of fetal growth and maternal cardiac output.
d. It decreases as a result of an increase in maternal adipose tissue.

ANS: C
Hormonal changes that occur during pregnancy support the changes in the maternal body to support the growth of the fetus. These changes include the growth of metabolically active tissue in the uterus, placenta, and fetus. Additionally, blood volume is increased, and cardiac workload increases. Because the metabolic rate is dependent on metabolically active tissues, as these increase and the heart's work increases, the overall metabolic rate increases.

13. A dish has 60 g of carbohydrate, 35 g of protein, and 25 g of fat. How many total kilocalories are in the dish?
    a. 480 kcal
    b. 555 kcal
    c. 605 kcal
    d. 655 kcal

    ANS: C
    One gram of carbohydrate provides 4 kcal. One gram of protein provides 4 kcal. One gram of fat provides 9 kcal. Therefore, $(60 \times 4) + (35 \times 4) + (25 \times 9) = 240$ kcal + 140 kcal + 225 kcal = 605 kcal.

14. How many kilocalories are in 4 oz of 40-proof schnapps?
    a. 28 kcal
    b. 64 kcal
    c. 128 kcal
    d. 240 kcal

    ANS: C
    The kilocalorie equivalent of an alcoholic drink is equal to the volume of drink times the proof × 0.8 kcal/proof/fl oz. $4 \times 40 \times 0.8 = 128$ kcal.

15. How is the determination of the physical activity level (PAL) categories beyond sedentary different from the sedentary category?
    a. They are based on metabolic equivalents.
    b. They are based on the pace of walking.
    c. They are based on the total time spent doing physical activity.
    d. They are based on types of physical activity.

    ANS: B
    Beyond the sedentary category, the PAL category is determined according to the energy expended by a person walking a set pace of 3 to 4 mph. Low-active, active, and highly active PALs are equivalent to walking 2, 7, and 17 miles per day, respectively, at 3 to 4 mph. Metabolic equivalents (METs) are another means by which to determine energy expenditure during physical activity, but they are not used in the EER estimation. Determination of physical activity energy expenditure using METs does consider the type, or intensity, of physical activity and total time spent doing physical activity.

16. In research regarding the measurement of activity-related energy expenditure, what method correlated with and validated triaxial monitors of human movement?
    a. Doubly labeled water
    b. Indirect calorimetry
    c. Heart rate monitor
    d. Physical activity questionnaire

    ANS: A

As doubly labeled water has become the research method of choice in regard to measurements of total energy expenditure as well as the individual components of energy expenditure, comparisons of other techniques are made to it. Indirect calorimetry can be used for activity energy expenditure but not in free-living situations. The heart rate monitor has not been found to be reliable in measurement of physical activity in individuals. Physical activity questionnaires would be used as a less expensive alternative to movement monitors and are not used for validation of other techniques.

17. A respiratory quotient of 0.64 would most likely occur in which of these patients?
    a. A pregnant woman
    b. A patient with diabetic ketoacidosis
    c. A trauma patient in the ICU
    d. Someone who had just eaten a high-fat meal

    ANS: B
    The respiratory quotient provides information on the type of fuel the body is burning for energy. A mixed fuel meal yields a respiratory quotient of 0.82. Burning fat exclusively is 0.7. Burning ketones results in a respiratory quotient less than or equal to 0.65.

18. A cocktail containing 10 g of alcohol and 20 g of carbohydrate would provide how many calories?
    a. 150
    b. 170
    c. 120
    d. 220

    ANS: A
    Alcohol contains 7 kcal/g. 10 g × 7 kcal/g = 70 kcal. Carbohydrates provide 4 kcal/g. 20 g × 4 kcal/g = 80 kcal. 70 + 80 = 150 kcal.

Chapter 03: Clinical: Water, Electrolytes, and Acid–Base Balance
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MULTIPLE CHOICE

1. Eating which of the following would most likely increase dietary potassium intake?
    a. Fruits and vegetables
    b. Saltwater fish
    c. Grains
    d. Cereals

    ANS: A
    Fruits and vegetables tend to be the richest sources of dietary potassium with a number of them providing more than 300 mg per serving. Seafood, grains, and cereals do not contribute nearly the same amount of potassium available in fruits and vegetables.

2. When vasopressin is excessively secreted in the blood, which of the following effects occurs?
    a. Low serum potassium because water is retained.
    b. Low serum sodium because water is retained.
    c. High serum potassium because water is excreted.
    d. High serum sodium because water is excreted.

ANS: B
Vasopressin, also known as antidiuretic hormone, stimulates renal reabsorption of water. In syndrome of inappropriate diuretic hormone, excessive secretion of vasopressin retains water and results in hyponatremia and low urine output. Aldosterone is the hormone that stimulates renal sodium retention, and when present, the kidneys excrete potassium in exchange for the sodium, which then attracts the retention of water.

3. Which effect is of greatest concern in water intoxication?
   a. Increased fluid volume of the brain cells
   b. Hypertension
   c. Decreased circulating blood volume
   d. Increased urinary output

   ANS: A
   When water intake exceeds the body's ability to excrete it, such as with impairment in kidney function, intracellular fluid volume increases. The increase in the fluid volume of brain cells results in swelling which contributes to headaches, nausea, blindness, vomiting, and convulsions. Hypertension, decreased circulating blood volume, and changes in urinary output tend to be associated with or the cause of hypovolemia.

4. For the average woman, _____ ml/day would meet fluid needs.
   a. 1500
   b. 1700
   c. 2700
   d. 3500

   ANS: C
   A daily allowance of water from all sources, including beverages and foods, is about 2700 ml/day for women and 3700 ml/day for men. The general recommendation for water intake is approximately 35 ml/kg of usual body weight in adults.

5. How does body water, as a percentage of body weight, change based on stage of the life cycle and lifestyle?
   a. Decreases significantly with age and is higher in athletes than nonathletes.
   b. Decreases significantly with age and is lower in athletes than nonathletes.
   c. Increases significantly with age and is higher in athletes than nonathletes.
   d. Increases significantly with age and is lower in athletes than nonathletes.

   ANS: A
   At birth, an infant's body weight is about 75% to 85% water compared with a lean adult, who is 60% to 70% by body weight. As muscle mass decreases with age, total body water also decreases. Also, compared with the lean adult, an obese adult may be 45% to 55% water by body weight. This is because the weight is displaced by adipose tissue, which contains very little water.

6. Where in the body is interstitial fluid located?
   a. Within body cells and the lymphatic system
   b. Within body cells
   c. Between and around body cells
   d. In the blood and the lymphatic system

   ANS: C