

CHAPTER 17

Sample Answers for Chapter Discussion Questions

Question #1

The energy balance equation consists of the energy that is burned through exercise and other bodily processes (energy output) and energy that is consumed in the form of food (energy input). When energy input equals energy output, energy balance is achieved. To lose weight, energy output must exceed energy input. To gain weight, energy input must exceed energy output.

Question #2

Basal metabolic rate (BMR) is the minimum amount of energy the body requires to carry on all vital functions (including circulation, respiration, and brain activity). Exercise increases BMR by increasing fat-free mass (muscle) and preventing the storage of excess energy as fat mass. Since muscle is more metabolically active at rest than fat, BMR is increased with exercise training.

Question #3

The two-component model refers to the common method of dividing the body into lean body mass (LBM) and fat body mass (FBM), or total body fat (TBF). Lean body mass refers to the nonfat or fat-free component of the human body: skeletal muscle, bone, and water. Fat body mass refers to fat that is either storage fat (SF) or essential fat (EF). Using these two components, body composition refers to the relative amounts of LBM and FBM as a percentage of overall body mass.

Question #4

Storage fat: fat that accumulates as adipose tissue, serves as an energy reserve, and protects internal organs by cushioning them

Essential fat: fat that is required for normal physiological functioning

The average male has approximately 12 percent of body weight as storage fat and 3 percent of body weight as essential fat. The average female has approximately 15 percent of body weight as storage fat and 12 percent of body weight as essential fat. The increased level of fat in women is primarily located in the mammary glands and the pelvic region, and is involved in hormone-related functions and pregnancy.

Question #5

Skinfold calipers

Hydrostatic or underwater weighing

Bod Pod

Bioelectrical impedance (BIA)

Dual energy x-ray absorptiometry (DEXA)

Hydrostatic weighing, the Bod Pod, and DEXA are most accurate. Skinfold calipers and bioelectrical impedance are less accurate.

Question #6

BMI stands for body mass index. BMI is used to assess healthy body weight with the following equation:

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

A healthy BMI value is 20.7 to 27.8 for males and 19.1 to 27.3 for females.

Question #7

Endomorphs: a predominance of the gut and visceral organs; rounded appearance

Mesomorphs: a predominance of muscle

Ectomorphs: a predominance of linearity; tall and thin appearance

Question #8

Creeping obesity is a slight change in the energy balance (toward weight gain) over a period of time, causing a gradual increase in fat mass each year. It is often the result of too little activity and a decreasing resting metabolic rate rather than overeating.

Question #9

Because weight does not differentiate between fat mass and muscle mass, being “overweight” may be associated with an increased muscle mass rather than fat mass. Thus, weight norms can be misleading to individuals who are healthy and active and who maintain a healthy body composition.

Question #10

Anorexia nervosa involves starvation, or failing to eat an adequate amount of food to maintain a reasonable body weight. Anorexia nervosa may also involve excessive exercise and food avoidance in order to control weight. Bulimia nervosa is characterized by episodic binge eating and purging. Bulimia may also involve exercise as a means of purging (by burning energy consumed). Binge eating disorder differs from anorexia and bulimia nervosa because it involves ingesting large quantities of food (unlike anorexia) and does not involve purging behaviors (unlike bulimia). Binge eating often leads to obesity. Eating disorders among (especially male) athletes usually involve weight loss in order to reach a competition weight, with the weight loss only temporary. Among athletes competing in aesthetically judged sports (such as gymnastics and figure skating), weight loss may be desired in order to improve scores. Female athletes are susceptible to a condition known as the female athlete triad (FAT).

Question Bank for Written Student Assessment and Evaluation

Quiz: How Much Do You Know About Weight Management?

1. Of the total energy you require on a daily basis, the highest proportion is used for:

- A) brain activity
- B) digestion and absorption
- C) basal metabolism
- D) exercise and physical activity
- E) blood circulation and respiration

Answer: C

2. The most significant factor affecting BMI is probably _____. **Answer: age**

3. The terms lean body mass and fat-free mass can be used interchangeably. **Answer: false**
(Correct: cannot)

4. A person with a total body mass of 120 pounds and 15 percent body fat has a lean body mass of:

- A) 115 pounds
- B) 102 pounds
- C) 80 pounds
- D) 18 pounds
- E) none of the above

Answer: B

5. In women, excessive leanness may increase the chances of developing _____ (absent menstruation). **Answer: amenorrhea**

6. Essential fat serves as an energy reserve. **Answer: false** (Correct: Storage)

7. The most common indirect method of measuring body composition is:

- A) skinfold calipers
- B) carbohydrate dilution
- C) body mass index
- D) Bod Pod
- E) bioelectrical impedance analysis

Answer: A

8. Bioelectrical impedance analysis (BIA) is based on the differences in electrical _____ between fat-free mass and fat mass. **Answer: conductivity**

9. Body mass index can be calculated using the equation weight (kg) / height (m). **Answer: false**
(Correct: $weight (kg) / height (m)^2$)

10. BMI is intended for:

- A) males and females between the ages of 6 and 60
- B) males and females between the ages of 10 and 65
- C) males and females between the ages of 12 and 65
- D) males and females between the ages of 18 and 60
- E) males and females between the ages of 20 and 65

Answer: E

11. In somatotyping, _____ exhibit a predominance of muscle. **Answer: mesomorphs**

12. Creeping obesity refers to a gradual change in energy balance that causes a slight increase in fat mass over a period of time. **Answer: false; false (Correct: slight; gradual)**

13. Both individuals with anorexia nervosa and bulimia nervosa practice disordered eating behaviors as a means of gaining:

- A) self-esteem
- B) attention
- C) control
- D) athletic excellence
- E) none of the above

Answer: C

14. Ingesting large amounts of food without purging is characteristic of _____. **Answer: binge eating disorder**

15. A stress fracture may be an indicator of the female athlete triad. **Answer: true**

16. Explain why weight norms must be interpreted with caution. **Answer: Being overweight according to norms does not necessarily mean that one is obese. Consider two individuals of the same weight and height. One person might be very fit and have only 7 percent body fat, while the other person might have 30 percent body fat. Both individuals have the same mass, but their body composition differs drastically. Thus, although an excess of muscle and other lean body mass can render an individual overweight by normative standards, it does not render him or her obese, since he or she may not have an excess of body fat.**

Multiple Choice Questions

1. Which of the following statements about basal metabolic rate is **false**:

- A) Body composition has an effect on BMR.
- B) A man's BMR is approximately 5 percent higher than that of a woman the same age.
- C) A rise in body temperature increases BMR.
- D) Unfit people have higher BMRs.
- E) None of the above.

Answer: D

2. The equation for basal metabolic rate is:

- A) $\text{BMR per day} = 1 \text{ cal} \times \text{body weight (kg)} \times 24$
- B) $\text{BMR per day} = 1 \text{ kcal} \times \text{body weight (kg)} \times 24$
- C) $\text{BMR per day} = 1 \text{ cal} \times \text{body weight (kg)} \times 2.2$
- D) $\text{BMR per day} = 1 \text{ kcal} \times \text{body weight (kg)} \times 2.2$
- E) none of the above

Answer: B

3. TEE stands for:

- A) thermic energy effect
- B) total energy effect
- C) thermic effect of exercise
- D) thermic effect of energy
- E) total energy expenditure

Answer: E

4. Lean body mass generally consists of:

- A) skeletal muscle and bone
- B) skeletal muscle, bone, and blood
- C) skeletal muscle, bone, organs, and water
- D) skeletal muscle, bone, and water
- E) skeletal muscle, bone, organs, and blood

Answer: D

5. What is the main storage site for storage fat:

- A) around internal organs
- B) beneath the skin
- C) in the trunk
- D) in the bone marrow
- E) none of the above

Answer: B

6. The average male has approximately _____ percent storage fat and _____ percent essential fat.

- A) 18, 6
- B) 15, 12
- C) 15, 6
- D) 12, 3
- E) none of the above

Answer: D

7. Which of the following is **not** a method to assess body composition:

- A) chemical analysis
- B) hydrostatic weighing
- C) bioelectrical impedance analysis

- D) dual energy x-ray absorptiometry
- E) carbohydrate dilution

Answer: E

8. Which of the following statements about hydrostatic weighing is **true**:

- A) It is the standard for other direct measurement techniques.
- B) An individual with a high percentage of fat-free mass will weigh less in the water than an individual with a high percentage of body fat.
- C) The water density must be measured at the temperature used for the test.
- D) Residual lung volume is the amount of air held in the lungs after a forceful inspiration.
- E) Two of the above.

Answer: C

9. Which of the following indirect methods of measuring body composition can also determine bone mineral density:

- A) Bod Pod
- B) chemical analysis
- C) dual energy x-ray absorptiometry
- D) bioelectrical impedance analysis
- E) carbohydrate dilution

Answer: C

10. A gymnast and a high jumper are most likely examples of:

- A) a mesomorph and an endomorph
- B) an ectomorph and an endomorph
- C) a mesomorph and an ectomorph
- D) an ectomorph and an ectomorph
- E) a mesomorph and a mesomorph

Answer: C

12. To be classified as obese, men and women between the ages of 17 and 50 require a body fat percentage greater than _____:

- A) 30 percent
- B) 12 and 15 percent, respectively
- C) 15 and 20 percent, respectively
- D) 20 and 30 percent, respectively
- E) 30 and 40 percent, respectively

Answer: D

13. Which of the following statements about obesity is **true**:

- A) People who are obese generally consume more kilocalories than other individuals.
- B) Many obese people are genetically predisposed to the condition.
- C) Obesity may involve environmental factors.
- D) All of the above.
- E) Two of the above.

Answer: C

14. Which of the following is **not** a symptom of anorexia nervosa:

- A) dry skin
- B) dental problems
- C) reduced bone mass
- D) brittle nails
- E) none of the above

Answer: B

15. Which of the following is **not** present during most episodes of binge eating:

- A) eating much more rapidly than usual
- B) feeling disgusted with oneself
- C) eating until feeling uncomfortably full
- D) avoiding eating alone
- E) none of the above

Answer: D

16. Which of the following statements about the female athlete triad is **false**:

- A) It involves three distinct interrelated problems.
- B) It is a serious medical condition that can lead to death.
- C) Athletes who participate in sports such as gymnastics, dance, and figure skating are more susceptible.
- D) The single best prevention strategy is to consume more kilocalories, especially during intense or increased exercise training.
- E) None of the above.

Answer: E

Fill in the Blank Questions

1. For weight gain to occur, caloric input must _____ caloric output. **Answer: exceed**

2. For weight maintenance, caloric input must _____ caloric output. **Answer: equal**

3. When caloric input and output are the same, the body is said to be in a state of _____.

Answer: energy balance

4. Basal metabolic rate represents the _____ amount of energy the body requires to carry on all _____ functions. **Answer: minimum; vital**

5. When your _____ is high, you can eat more without necessarily gaining weight, and your body will burn more energy even when you are not exercising. **Answer: metabolism**

6. The human physique includes three interrelated aspects of the body: size, _____, and composition. **Answer: structure**

7. Total body fat is calculated by multiplying total body mass by _____ divided by 100. **Answer:** *percent body fat*

8. Storage fat is also known as _____ fat. **Answer:** *subcutaneous*

9. The _____ method of measuring body composition is also known as air-displacement plethysmography. **Answer:** *Bod Pod*

10. Mesomorphs exhibit a predominance of _____, while _____ exhibit a predominance of linearity. **Answer:** *muscle; ectomorphs*

11. _____ nervosa is characterized by binge eating and _____. **Answer:** *Bulimia; purging*

12. Three distinct interrelated problems form the female athlete triad: disordered eating, amenorrhea, and _____. **Answer:** *osteoporosis*

True or False Questions

1. For weight loss to occur, caloric input must be less than caloric output. **Answer:** *true*

2. Your basal metabolic rate remains relatively stable throughout your life. **Answer:** *false*
(*Correct: varies*)

3. Basal metabolic rate is 5 percent lower during sleep. **Answer:** *false* (*Correct: 10 percent*)

4. We can calculate lean body mass by subtracting total body fat from total body mass. **Answer:** *true*

5. To maintain normal health and metabolism, women require a minimum essential body fat of 12 percent. **Answer:** *true*

6. During hydrostatic weighing, if residual lung volume is not accounted for, body fat will be overestimated. **Answer:** *true*

7. One disadvantage of BIA is the extent to which measurements are influenced by the bone density of the subject. **Answer:** *false* (*Correct: hydration*)

8. A man or a woman with a BMI of 18 would be considered underweight. **Answer:** *true*

9. A person who is obese by normative standards is always considered obese by medical professionals. **Answer:** *false* (*Correct: not always*)

10. Ectomorphs exhibit a predominance of roundness. **Answer:** *false* (*Correct: linearity*)

11. Basketball players and horse racing jockeys exhibit the typical ectomorphic body type.

Answer: *true*

12. Chronic dieting, especially among teenagers, is a serious concern because it can lead to retardation of physical growth, menstrual irregularities in women, and a lowering of the metabolic rate. **Answer:** *true*

13. Individuals with both anorexia nervosa and bulimia nervosa exhibit an extreme concern about appearance and a desire for perfection. **Answer:** *true*

14. Individuals with bulimia nervosa can be identified by abnormal body weights. **Answer:** *false*
(Correct: cannot)

15. Consciously restricting food intake is not an example of disordered eating. **Answer:** *false*
(Correct: is)

Other Types of Questions

1. What is probably the most significant factor affecting basal metabolic rate? Why?

Answer:

Age is probably the most significant factor affecting basal metabolic rate because many people fail to recognize their changing metabolic needs, and do not adjust their food intake to reflect these changes. Many people put on extra pounds as they grow older for this very reason.

2. Match the following terms with their corresponding characteristic. Terms can be matched with more than one answer.

Term	Answer	Characteristic
1. Basal metabolic rate	<i>C</i>	A) Equals TBM – TBF
2. Lean body mass	<i>A & D</i>	B) Is about 3 percent in the average man
3. Storage fat	<i>E, G, & I</i>	C) Affected by gender, sleep, and physical fitness
4. Essential fat	<i>B</i>	D) Can be measured with DEXA
5. Body mass index	<i>F & H</i>	E) Is about 15 percent in the average woman
		F) Can be misleading
		G) Serves as an energy reserve
		H) Correlates well with body composition
		I) Accumulates as adipose tissue

3. What must be determined when using hydrostatic weighing?

Answer:

To use hydrostatic weighing, one must first determine body density by measuring (a) body weight on land, (b) underwater body weight, (c) water density at the temperature used for the test, and (d) residual lung volume (the amount of air left in the lungs after a forceful expiration).

4. Place a letter corresponding to the correct somatotype beside each athlete:

- A) endomorph
- B) ectomorph
- C) mesomorph

		Answer:
Basketball player	_____	<i>B</i>
Sumo wrestler	_____	<i>A</i>
Jockey	_____	<i>B</i>
Gymnast	_____	<i>C</i>
Bodybuilder	_____	<i>C</i>
High jumper	_____	<i>B</i>
Hammer thrower	_____	<i>A</i>
Marathon runner	_____	<i>B</i>

5. Define obesity. Who is classified as obese?

Answer:

Obesity is defined as having an excess of body fat beyond some particular standard that is usually based on age and sex (i.e., norms derived from a large number of people). To be classified as obese, men and women between the ages of 17 and 50 require a body fat percentage of greater than 20 and 30 percent, respectively.

6. Why is bulimia more difficult to detect than anorexia? What are the warning signs of bulimia?

Answer:

Bulimics are more difficult to identify because their body weight is often normal, and they usually conceal their eating habits well. However, look for warning signs such as secretive eating patterns, repeated isolation soon after a meal, disappearance of large amounts of food, nervous or agitated behavior immediately after eating, or the loss or gain of extreme amounts of weight. Bulimics may experience weight fluctuations exceeding 10 pounds during periods of binge eating.

7. Discuss the three components of the female athlete triad.

Answer:

Disordered eating: refers to a spectrum of poor and unhealthy nutritional behaviors that can be as extreme as anorexia nervosa and bulimia nervosa or as subtle as consciously restricting food intake.

Amenorrhea: the occurrence of irregular or absent menstrual periods for at least three months. This is a classic sign of the triad, and medical intervention should be initiated.

Osteoporosis: a weakening of the bones that results if amenorrhea persists over long periods. Osteoporosis refers to low bone mass; bones become weak and brittle, which increases the risk of fracture.

8. "Exercise is an effective method of weight management." Explain this statement in terms of energy balance, body composition, creeping obesity, and dieting. Address the issue of some negative behaviors involving exercise as a method of weight management.

Answer:

Exercise is an effective method of weight management because of its capacity to equalize energy balance. That is, energy output in the form of exercise is often an effective method of losing excess weight and maintaining a healthy weight in the long term, without significantly reducing energy intake that is crucial for adequate nutrition.

Exercise positively affects body composition by increasing lean body mass and reducing fat mass. Fat mass is reduced by preventing consumed energy from being stored as fat, and by utilizing existing fat stores as a source of energy for exercise. With increased lean body mass as a result of exercise, basal metabolic rate is increased because muscle is more metabolically active at rest than fat.

Exercise is effective in preventing creeping obesity. Creeping obesity is often the result of too little physical activity, rather than increased energy intake, over the long term. Thus, exercising increases energy output and helps prevent weight gain and creeping obesity.

Exercise is a positive alternative to dieting because it does not drastically restrict food intake, prevents great fluctuations in weight that can result from "yo-yo dieting," increases self-esteem, can be maintained over the long term, and is usually not associated with the negative outcomes of chronic dieting (such as retardation of physical growth, menstrual irregularities in women, a lowering of metabolic rate, and development of eating disorders).

Exercise may be used as a negative behavior when it is employed to compensate for energy consumed or to reduce body weight (as with bulimia nervosa and anorexia nervosa, respectively). Some athletic endeavors may also encourage negative behaviors, particularly in weight-dependant sports (e.g., wrestling) and aesthetically judged sports (e.g., gymnastics).