These review questions for the Digestive system were adapted from our textbook and its website, and also from 1800+ Review Questions for Anatomy and Physiology II (2nd edition) by R. Michael Anson, Ph.D.

You are required to know and understand all the material on the digestive system that is covered in the lecture and in the laboratory. Questions marked with an asterisk are from material presented in the laboratory section of the course.

Multiple choice review questions

1) Which is not a nutrient?
   A) Oxygen
   B) Minerals
   C) Vitamins
   D) Macromolecules
   E) Monomers

2) Chyme
   A) A digestive juice made by the gall bladder
   B) Vomit
   C) Swallowed food
   D) A digestive process that tears food apart by smooth muscle contraction

3) The continuous tube, from mouth to anus, the chyme passes through is the
   A) Rumen
   B) Esophagus
   C) Nutrial-digestive canal
   D) Gastrointestinal tract

4) Which is not a function of the digestive system?
   A) Breaking down food into monomers
   B) Food intake
   C) Eliminating solid wastes as feces
   D) Eliminating liquid wastes as urine
   E) Absorbing nutrients into body

5) Most of the major digestive system organs are located in the
   A) Stomach
   B) Abdominal cavity
   C) Thoracic cavity
   D) Pancreas

6) Which of the following is part of the digestive system, but not the gastrointestinal tract?
A) liver
B) stomach
C) large intestine
D) small intestine

7) Which of the following is an accessory organ of the digestive system?
A) pancreas
B) small intestine
C) stomach
D) large intestine

8) Which is not a tissue layer of the GI tract?
A) Mucosa
B) Peritoneum
C) Submucosa
D) Cartilage lamina
E) Muscularis externa

9) The inner circular and outer longitudinal layers are the two parts of the ____ layer of the digestive tract.
A) lumen
B) muscularis mucosa
C) submucosa
D) muscularis externa

10) The _____ is the inner layer of the gastrointestinal tract which functions in absorption and secretion.
A) muscularis
B) serosa
C) submucosa
D) mucosa

11) Pharynx
A) The nasal cavity
B) A cartilage flap that prevents acids from exiting the stomach
C) The upper part of the throat
D) Indigestible solids in foods

12) Esophagus
A) The tube that carries chyme to the stomach
B) The upper throat
C) Mucus that protects the digestive organs from their own acids
D) The large intestine

13*) In laboratory, you viewed the digestive system organ shown on the right with the microscope. Name the organ. Hint: Note the deep inward folds of the mucosa with many white goblet cells.

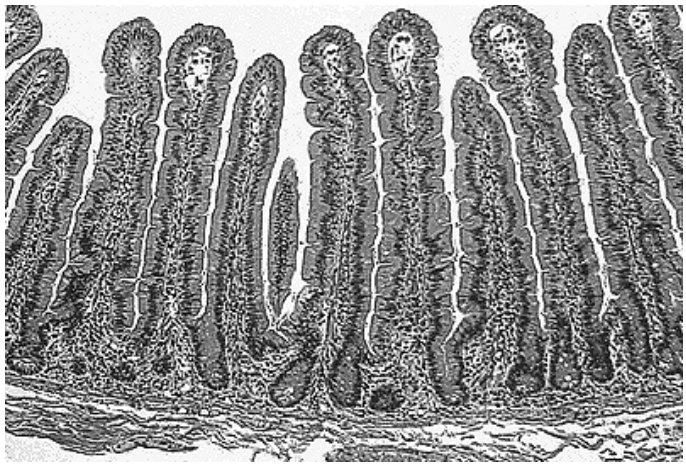
A) Stomach
B) Small Intestine
C) Large intestine
D) Esophagus

14*) In laboratory, you viewed the digestive system organ shown on the right with the microscope. Name the organ. Hint: Note the deep inward folds of the mucosa with no white goblet cells.

A) Stomach
B) Small Intestine
C) Large intestine
D) Pancreas

15*) In laboratory, you viewed the digestive system organ shown on the right with the microscope. Name the organ. Hint: Note the finger-like folds of the mucosa.

A) Stomach
B) Small Intestine
C) Large intestine
D) Gall bladder



16) Which best describes the stomach's function?

A) Churning only (no digestion)
B) Absorbs the most nutrients and water
C) Stores digestive juice but does not contact the chyme directly
D) Digestion of chyme but no absorption of nutrients

17) The acids in the stomach do not splash into the esophagus because of the

A) esophageal sphincter.
B) epiglottis.
C) trachea.
D) glottis.

18) These cells secrete hydrochloric acid in the stomach.

A) parietal cells
B) chief cells
C) goblet cells
D) rugal cells

19) Rugae

A) The folds in the stomach mucosa
B) Sugar-rich foods that are digested first by the GI tract
C) A detergent-like substance used for fat digestion
D) Smooth muscle contractions to mash chyme

20) The digestive system organ where the most digestion and most absorption occurs is the

A) Stomach
B) Large intestine
C) Small intestine
D) Pancreas

21) To enter the small intestine, partially digested food must pass through the
A) esophageal sphincter.
B) pyloric sphincter.
C) ileocecal valve.
D) anal sphincter

22) Which is **not** a section of the small intestine?
A) Ileum
B) Appendix
C) Jejunum
D) Duodenum

23) The small intestine has many folds to increase its surface area. Which of the following is **not** a tissue or cell membrane fold of the small intestine?
A) villi.
B) microvilli.
C) ruga.
D) plicae circulares.

24) Which is the correct order of regions of the small intestine?
A) duodenum. jejunum, ileum
B) jejunum, duodenum, ileum
C) ileum, duodenum, jejunum
D) jejunum, ileum, duodenum

25) The large intestine's function is best described as
A) Final water and ion absorption but no digestion
B) Digestion of macromolecules only
C) Digestion of fats only
D) Storage of nutrients between meals

26) The large intestine is also known as the
A) Colon
B) GI tract
C) Accessory organ
D) Plicae circularis

27) Which is **not** a region of the large intestine?
A) Ascending colon
B) Descending colon
C) Sigmoidal colon
D) Lateral colon
E) Transverse colon

28) The region of the GI tract that houses the largest bacteria population
A) Mouth
B) Bladder
C) Large intestine
D) Stomach

29) Large amounts of salt, undigested lactose, or other solutes that make the feces in the colon hypertonic tend to cause
A) acid reflux
B) pyloricstenosis
C) diarrhea
D) ulcers

30) Organs that make digestive juices but that do not contact the chyme are called
A) Gastrointestinal tract organs
B) Alimentary canal organs
C) Accessory organs
D) Chymogen organs

31) All accessory organs secrete their digestive juices into the _____ (a region of the GI tract).
A) Stomach
B) Duodenum
C) Large Intestine
D) Liver

32) The accessory organ that makes the most digestive enzymes is the…
A) Liver
B) Gall bladder
C) Pancreas
D) Small intestine

33) Which organ makes a buffer to neutralize the acidic chyme entering the small intestine from the stomach?
A) Stomach
B) Small intestine
C) Liver
D) Pancreas

34) The gall bladder stores
A) Bile
B) Acids
C) Bases
D) Fats

35) The function of bile is to…

A) Neutralize stomach acids
B) Break down fat globules
C) Control bacterial growth in the lower GI tract
D) Lubricate the passage of chyme

36) Pebble-like pieces of solid bile which can cause irritation to the digestive system are known as

A) Kidney stones
B) Gall stones
C) plaques
D) Bile masses

37) Bile is manufactured in which organ?

A) The stomach
B) The gall bladder
C) The duodenum
D) The liver

38) High levels of bile in the blood (as might occur when a person has a liver disease) causes

A) diabetes mellitus.
B) gallstones.
C) jaundice.
D) diabetes insipidus.

39) The blood vessel that carries nutrient-rich blood directly from the GI tract to the liver is the

A) Hepatic portal vein
B) Renal artery
C) Aorta
D) Alimentary canal

40) The term for all the chemical reactions that take place in the body

A) Metabolism
B) Hemostasis
C) Physiology
D) Cellular aerobic respiration

41) All metabolic reactions

A) Occur in the blood
B) Occur inside the small intestine
C) Are carried out by enzymes
D) Involve glucose and oxygen as reactants or products

42) Which is **not** a correct sequence of digestion of a macromolecule?
A) Glucose -> Amino acids -> Starch
B) Protein -> Peptides -> Amino acids
C) Polysaccharides -> Disaccharides -> Monosaccharides
D) Fat globules -> Triglycerides -> Glycerol and fatty acids

43*) The enzyme that digests starch into smaller sugar molecules
A) Insulin
B) Glucagon
C) Amylase
D) Pancreas

44) The major monosaccharide in the blood
A) Amino acids
B) Oxygen
C) Glucose
D) Water

45) The major source of glucose for the body is _____ in our diet.
A) Sweets
B) Glycogen
C) Proteins
D) Starch

46) When glucose levels in the blood are high (such as after a carbohydrate-rich meal) the _____ (an organ) stores the glucose.
A) Adipose
B) Liver
C) Pancreas
D) Small intestine

47) The liver stores carbohydrate as a polymer of glucose called
A) Starch
B) Glucagon
C) Insulin
D) Glycogen

48) High blood sugar
A) Hyperglycemia
B) Hypertonic
C) Hemostasis
D) Hypotonic

49) Glucose levels in the blood are controlled by hormones released from the _____ (an organ)

A) Pancreas
B) Liver
C) Small intestine
D) Pituitary gland

50) The structures within the pancreas that release hormones are called

A) Parathyroid glands
B) Islets of Langerhans
C) Pancreatic ducts
D) Diabetes

51) The action of the hormone insulin is to

A) Cause drowsiness after a meal
B) Increase cellular uptake of glucose
C) Increase movement of chyme through the GI tract
D) Decrease blood oxygen

52) The effect of insulin on glucose in the blood

A) Increases blood glucose
B) Decreases blood glucose
C) Transforms glucose into other carbohydrates
D) Transforms glucose into polymers in the blood

53) The action of the hormone glucagon is to

A) Increase blood flow to the digestive organs
B) Increase heart rate and breathing rate
C) Increase appetite, especially for carbohydrate-rich foods
D) Cause the liver to release glucose

54) The effect of glucagon on glucose in the blood

A) Increases blood glucose
B) Decreases blood glucose
C) Transforms glucose into other carbohydrates
D) Transforms glucose into polymers in the blood

55) Diabetes is caused by

A) Poor blood circulation
B) Abnormally low dietary consumption of carbohydrates
C) The insulin system not working
D) Plaques (fatty deposits) in the arteries

56) The major symptom of diabetes that we discussed in lecture (a symptom that almost all diabetics will experience)

A) Weakness, especially in the lower limbs
B) Weakened heart with poor circulation
C) Drowsiness or complete coma
D) Increased blood sugar

57) Another major symptom of diabetes that we discussed in lecture (a symptom that almost all diabetics will experience)

A) Increased urination
B) Loss of vision
C) Weight gain
D) Increased cravings for sweets

58) In diabetes, glucose level in the blood is _____ and glucose use by the cells is _____

A) Increased, Increased
B) Decreased, Increased
C) Increased, Decreased
D) Decreased, Decreased

59) Which statement about diabetes is false?

A) The disease causes hypoglycemia.
B) It can result from inadequate insulin release from the pancreas
C) Cellular uptake of glucose is decreased
D) Glucose usually appears in the urine.

60) Since cells can't use glucose without the insulin hormone system working correctly, the cells of people with diabetes use _____ for energy (more than one answer possible).

A) insulin
B) sucrose
C) fatty acids
D) amino acids

61) Metabolic rate

A) The total activities per day
B) All the chemical reactions that take place in the body
C) Heart beats per minute
D) Calories used per hour

62) Basal metabolic rate (BMR) is the calories used per hour when _____.

A) Resting
B) Performing physical activity
C) Digesting a meal
D) Between meals

63) Which hormone directly controls BMR?
A) Insulin
B) Pituitary
C) Thyroxine
D) Glucose

64) Basal metabolic rate
A) is higher in females compared to males
B) is lower in younger people compared to older people
C) is lower in smaller people compared to larger people
D) is higher during periods of rest compared to active periods

65) Total metabolic rate (TMR) is the calories used per hour when _____.
A) Resting
B) Performing physical activity
C) Digesting a complete meal (from food intake to defecation)
D) Between meals

66) When calories gained from food exactly equal calories expended by the body, the person is said to be in
A) Homeostasis
B) Energy balance
C) Cardiac arrest
D) Metabolic equilibrium

67) If _____ calories are taken in than are used by the body, the weight will _____.
A) Fewer, Increase
B) More, Increase
C) Fewer, Increase
D) More, Decrease

Answers to multiple choice review questions:

1 = A
2 = C
3 = D
4 = D
5 = B
6 = A
7 = A
8 = D
9 = D
10 = D
11 = C
12 = A
13* = C
14* = A
15* = B
16 = D
17 = A
18 = A
19 = A
20 = C
21 = B
22 = B
23 = C
24 = A
25 = A
26 = A
27 = D
28 = C
29 = C
30 = C
31 = B
32 = C
33 = D
34 = A
35 = B
36 = B
37 = D
38 = C
39 = A
40 = A
41 = C
42 = A
43* = C
44 = C
45 = D
46 = B
47 = D
48 = A
49 = A
50 = B
51 = B
52 = B
53 = D
54 = A
55 = C
56 = D
57 = A
58 = C
59 = A
60 = C and D
61 = D
62 = A
63 = C
64 = A
65 = B
66 = B
67 = B

Fill-in-the-blank review questions

1) Carbohydrates, proteins, lipids, vitamins, and minerals are called _____, meaning that they are molecules in foods required for health and proper growth.

2) Carbohydrates, proteins, and lipids are _____, meaning that they are large molecules composed of many smaller molecules linked together. The smaller molecules that are the building blocks of carbohydrates, proteins, and lipids are called _____.

3) _____ means breaking things down into smaller pieces, such as when macromolecules in foods are broken down into monomers.

4) There are two types of digestion: _____ digestion and _____ digestion.

5) Chemical digestion is when _____ break apart chyme, such as when digestive juices (acids, enzymes, and bile) are mixed with the swallowed food. Mechanical digestion is when _____ break apart the chyme (such as when food is chewed).

6) Although acid and bile play important roles in chemical digestion, the most active molecules made by the digestive system for chemical digestion are proteins called digestive _____.

7) The major digestive system organs are located in the _____ body cavity.

8) After being swallowed, food becomes known as _____. The swallowed food passes through the _____, which is a tube that runs from mouth to anus. This tube is also known as the _____.

9) Smooth muscles in the gastrointestinal tract are responsible for propelling chyme from mouth to anus. This processes is called _____.

10) In addition to propelling chyme through the GI tract, the smooth muscles in the gastrointestinal tract are also responsible for _____ (describe their other function).

11) The digestive system organs fall into two major groups: the _____ and the _____.

12) The _____, _____, and _____ are the three major GI tract organs. The _____, _____, and _____ are the three major accessory organs.

13) The chyme does/doesn't (circle one) pass through the accessory organs.

14) What is the function of the accessory organs? _____.

15) The central hollow area inside the gastrointestinal tract, where the chyme passes through, is called the _____. This same term that is used to describe the hollow region in many other tubular organs, such as blood vessels.

16) The wall of the GI tract has four major tissue layers. From the lumen outward, the first three are the _____, _____, and the _____.

17) The _____ layer of the gastrointestinal tract is lined with simple columnar epithelial cells. Its two major functions are _____ and _____.

18) Most blood vessels and nerve fibers of the GI tract are found in the _____ tissue layer of the GI tract. This layer is made of _____ tissue.

19) The GI tract has a tissue layer of smooth muscle.

a) What is this layer called? _____

b) What are the two functions of this layer?

20) The inner layer of the muscularis externa consists of smooth muscle cells which are oriented in a circle around the lumen and are therefore called the _____ layer of the muscularis externa. This layer is primarily responsible for _____. The outer layer of the muscularis externa has muscle cells are oriented up and down the GI tract and are therefore called the _____ layer of the muscularis externa. It is responsible for _____.

21) The organs of the digestive system which are found in the abdominal cavity are surrounded and cushioned by a _____ membrane, a term that means **any** fluid-filled membrane in the body. The name of the **specific** fluid-filled membrane that surrounds the GI tract is the _____.

22) The sheet-like extensions of the peritoneum that cover other abdominal organs are called the _____.

23) The first section of the GI tract is the oral cavity. After the food in the oral cavity is swallowed, the next section of the GI tract that it moves through is the _____.

24) The _____ is the next section of the GI tract after the pharynx. It is posterior to the trachea (the windpipe). Chyme and beverages do not enter the trachea because the _____, a cartilage flap, blocks the trachea when we swallow.

25) Which alimentary canal organ carries chyme downward through the thoracic cavity, into the abdominal cavity? _____.

26) In certain regions of the GI tract, the muscles of the muscularis externa form doughnut shaped rings called _____. These act as valves. They can close to prevent movement of chyme through the tract.

27) As chyme reaches the bottom of the esophagus, the _____ sphincter opens. It controls the entrance of chyme into the _____ (an organ).

28) The interior of the empty stomach is extremely wrinkled: these wrinkles, or folds, are called _____. These folds increase surface area and allow the stomach to expand and stretch when storing food or drink.

29) The stomach's digestive juice (acid and digestive enzymes) is secreted into the lumen of the stomach from microscopic **inward** folds of its mucosa called _____; their entrances, the _____, appear as microscopic crevices on the stomach's interior surface.

30) The _____ cells and _____ cells are the cells that line the gastic glands.

31) The _____ cells of the gastric glands are responsible for secreting hydrochloric acid.

32) Digestive enzymes of the gastric glands are made and secreted by ____ cells.

33) Unlike the muscularis external in other regions of the GI tract, the muscularis externa of the stomach has _____ (a number) of layers

34) When the esophageal sphincter does not fully close, a disorder called _____ occurs.

.

35) After several hours of digestion in the stomach, the _____ sphincter will open to allow passage of chyme out of the stomach and into the _____ (an organ).

36) The most digestion and absorption in the GI tract takes place in the _____ (an organ).

37) The small intestine is divided into three sections. Write the names of the three sections in the blanks below. List them in their correct order.

_____
_____
_____

Circle the one where the most digestion and absorption takes place.

Put a star next to the one where the digestive juices from the accessory glands enter the small intestine.

Put a box around the one that contacts the ileocecal valve.

Draw a triangle next to the one that begins with the pyloric sphincter.

38) The mucosa of the small intestine is very folded to increase its surface area. There are three types and sizes of folds: The largest folds are visible to the naked eye. They are called _____.

39) In addition to the plicea circularis folds in the small intestine, there are smaller finger-like projections called _____. These are easily seen using a microscope set at low magnification.

40) The smallest folds in the small intestine are folds of the plasma membranes of the_____ cells of the small intestine mucosa. These folds are called _____ and are so small that they can only be seen using a microscope set at high magnification.

41) The passage of chyme from the small intestine into the large intestine is controlled by the _____ sphincter.

42) Another name for the large intestine is the _____.

43) The major function of the large intestine is absorption of _____ and _____.

44) Once chyme has entered the large intestine it is now referred to as _____.

45*) The large intestine has many white colored cells called _____ cells, which make mucus. The mucus lubricates the passage of feces.

46) The large intestine is divided into four regions, the _____ on the right side of the abdomen, the _____ which crosses the abdomen from right to left, the _____on the left side of the abdomen, and the _____ which is the final region before the anus.

47) The _____ is a tiny pouch-like organ, roughly the size of one's index finger, that is part of the ascending colon.

48) The physiological term for elimination of feces from the gastrointestinal tract is _____.

49) Bacteria are mostly found in the _____ organ of the digestive system.

50) Overly rapid transit of feces through the large intestine does not allow time for water resaborption; the result is _____.

51) The organs of the gastrointestinal tract, taken in order, after the mouth, include the _____, _____, _____, _____ and _____, which ends with the anus.

52) Match the descriptions on the right with the alimentary canal organs on the left. Some descriptions may match more than one organ. Write the letters of all matching descriptions.

Stomach: _____

a) The pyloric sphincter separates it from another

organ

b) Most digestion and absorption take place here

c) Has gastric pits

Small intestine: _____

d) The longest organ of the alimentary canal

e) Contains folds called villi

f) The appendix is located at its beginning

Large intestine: _____

g) Contains many bacteria

53) The pancreas is a long, roughly triangular organ located just inferior to the _____ (a GI tract organ).

54) One major function of the pancreas is to make several different _____ (a type of protein), which become mixed with the chyme.

55) Another major function of the pancreas is to make a(n) _____ which is needed because of the high acidity of the chyme that leaves the stomach. This substance takes away the acidity of acids, so we say it "_____"the acids in the chyme.

56) The digestive juices of the pancreas are secreted into the _____ region of the _____ (an organ).

57) In the blank space after each digestive system structure on the left, write the letters of all descriptions on the right that match it. Some descriptions may match more than one structure. Write the letters of all matching descriptions.

Small intestine: _____ a) Located in the thoracic cavity

Stomach: _____ b) An alimentary canal organ

Esophagus: _____ c) A serosa

Peritonium _____ d) An accessory organ

Pancreas _____ e) Has a sphincter at its entrance

58) The gallbladder stores _____ .

59) The liver is mostly on the patient's left/right (circle one) side of the abdominal cavity.

60) _____ is the digestive juice that is produced by the liver. This digestive juice's function is to _____.

61) In addition to making bile, another function of the liver is to store _____ (a nutrient monomer) in the form of a macromolecule called _____.

62) Certain types of liver disease can cause bile pigments to enter the blood, causing a yellow skin color. This skin discoloration is called _____.

63) Below is a partial list of digestive system structures. Write an A in the blank next to all parts that are accessory organs. Write a G in the blank for all that are parts of the GI tract. Also write a number in the blank next to all GI tract parts to indicate the correct order that chyme passes through them.

Large intestine: _____
Oral cavity_____
Stomach_____
Esophageal sphincter_____
Pancreas_____
Duodenum_____
Liver_____
Gall bladder_____

64) The term _____ means all the chemical reactions that take place in the body.

65) The molecules that carry out metabolic reactions are called proteins called _____.

66) Enzymes that break down larger molecules into smaller molecules are called _____ enzymes.

67) The two organs that produce the most digestive enzymes are the _____ and the _____.

68) Proteins in foods are first digested by enzymes into smaller chains of amino acids called _____. Triglycerides (fats and oils) in foods are digested by enzymes into _____ and _____ molecules.

69) Large carbohydrates (such as starch) are called polysaccharides. They are polymers of the monosaccharide _____.

70) When a large carbohydrate molecule, such as starch, is eaten, the first digestive enzyme breaks it down into _____, which is a carbohydrate made of two glucose sugars linked together. Any carbohydrate made of two monosaccharides linked together is called a _____.

71) The polysaccharide from plants that provides most of our glucose is called _____. Major sources of this polysaccharide are potatoes, bread, pasta, and rice. In our bodies, glucose monomers are linked together to form a polysaccharide called _____.

72) One of the major reasons we eat is to provide "fuel" molecules (such as glucose) for our cells. Our cells usually use a process called cellular aerobic respiration to convert the energy in fuel molecules into cellular energy. Write the complete chemical reaction of cellular aerobic respiration of one molecule of glucose. Include all reactant and product molecules in the chemical reaction.

73) Cellular aerobic respiration is used to recharge the cell's supply of an energy-rich molecule inside the cell. Name that energy-rich molecule: _____ (hints: It is not glucose. The molecule is the direct energy source that powers the cell's proteins).

74) We lack enzymes to digest cellulose, a plant carbohydrate abundant in stems and leaves. When eaten, cellulose ends up in the feces, undigested. On food labels, cellulose molecules are referred to as _____ or _____.

75) Although we cannot digest fiber, it benefits use in two ways. It lowers the level of _____ (a lipid found in the blood) and it also lowers the risk of _____ (an organ) cancer.

76) "Fiber" or "bran" are terms for cellulose, a plant carbohydrate that the body is not able to digest. You are a fiber molecule (yes, you are). Make a numbered list of the parts of the alimentary canal (in the correct order) you pass through starting with the oral cavity and ending with the anus. Include all sphincters, tubes, and the sub-sections of major organs (if the organ is divided into sub-sections) that you pass through. Do not include organs that you do not pass through.

77) In the GI tract, starch in foods must be fully digested into _____ monomers before it can be absorbed into the body.

78) Once absorbed from the GI tract into the blood, most glucose molecules are transported to the _____ (an organ) for storage.

79) The liver stores glucose in the form of a glucose polymer called _____.

80) The pancreas contains endocrine (hormone secreting) clusters of cells. These cell clusters are called _____ or _____.

81) The pancreatic islets contain two kinds of cells: Some cells release the hormone _____ and other cells release the hormone _____.

82) The pancreas releases the hormone _____ when there is _____, a term that means high blood sugar levels. The pancreas releases the hormone _____ when there is _____, a term that means low blood sugar levels.

83) The hormone insulin causes cells to do what? _____.

84)Most cells respond to insulin by taking in blood glucose for energy, but one major organ responds to insulin by storing the blood glucose as glycogen. This organ is the _____.

85) The hormone from the pancreas that raises the plasma glucose concentrations, such as during periods of fasting between meals, or starving is called _____.

86) Glucagon is released in response to low/high (circle one) glucose in the blood, and its major target is the _____ (an organ).

87) In response to glucagon, the liver _____, which increases the glucose concentration in the blood.

88) Fill in the blanks in the following paragraphs. Be as specific as possible in your answers.

> If you ate a meal consisting of pasta and potatoes, the major macromolecule nutrient you are consuming is _____. This nutrient will first be broken down by an enzyme into the disaccharide _____, then another enzyme will digest the disaccharides into the monosaccharide _____.
>
> The monosaccharide will travel in the hepatic portal vein to the _____ (an organ), which will store it in the form of a polysaccharide known as _____. When blood sugar levels are low (such as between meals) the liver breaks down the polysaccharide into the monomer _____ to keep your blood sugar levels from declining.

89) Blood glucose levels stay more or less constant (at around 70-100 mg/100 ml). This steady level of glucose is maintained mainly by two hormones with opposing effects. For the hormone that is secreted **just after** a carbohydrate-rich meal is eaten, answer the following questions:

a) Hormone name: _____
b) Which organ secretes this hormone? _____
c) Name the region within this organ that secretes the hormone: _____
d) The hormone raises/lowers (circle one) blood sugar.
e) What is the target organ/tissue of the hormone? _____
f) What is the response of the target organ/tissue to the hormone?
_____

90) Blood glucose levels stay more or less constant (at around 70-100 mg/100 ml). This steady level of glucose is maintained mainly by two hormones with opposing effects. For the hormone that is secreted between meals (**many hours after** the last meal is eaten) answer the following questions:

a) Hormone name: _____
b) Which organ secretes this hormone? _____
c) Name the region within this organ that secretes the hormone: _____
e) This hormone raises/lowers (circle one) blood sugar.
f) What is the target organ/tissue of the hormone? _____
g) What is the response of the target organ/tissue to the hormone?

91) The major three symptoms of uncontrolled diabetes are _____, _____, and _____.

92) Diabetes mellitus results from the inadequate secretion or action of the hormone _____.

93) The amount of the calories use by the body per hour is the _____. But there are two subcategories of this measurement: The calories used per hour *when the person is at rest* is called the _____, whereas the calories used per hour *when the person is doing an activity* is called the _____.

94) Most of the calories of the BMR are used for what process of the body? _____

95) The major thing that controls basal metabolic rate is _____.

96) TMR is always above/below/equal to (circle one of the three) the BMR.

97) Below is a list of factors that can change the metabolic rate (the calories expended per hour by the body). In the blank space after each factor, write I if it is associated with increased metabolic rate, and write D if it is associated with decreased metabolic rate.

a) Thyroxin_____

b) Being male_____

c) Being elderly_____

d) Being a large person_____

e) Exercising_____

98) When a person's caloric intake is exactly equal to the calories they expend, the person is said to be in _____. This person's weight will
increase/stay the same/decrease (circle one of the three).

99) To lose weight, caloric intake must be greater/equal to/less than (circle one of the three) calories expended.

100) To gain weight, caloric intake must be greater/equal to/less than (circle one of the three) calories expended.

101) Although there are hundreds of different weight-loss diet plans, weight loss can only be achieved by _____, which decreases the amount of energy brought into the body, or by _____, which raises the amount of energy the body expends, or both together.

Answers to fill-in-the-blank review questions:

1) Nutrients
2) Macromolecules
   Monomers
3) Digestion
4) Mechanical
   Chemical
5) Chemical reactions
   Physical forces
6) Enzymes
7) Abdominal
8) Chyme
   Alimentary canal
   Gastroinestinal (GI) tract
9) Peristalsis
10) Segmentation (breaking apart chyme by contracting and relaxing of the GI tract smooth muscles)
11) GI tract organs
   Accessory organs
12) Stomach
   Small intestine
   Large intestine

   Pancreas
   Gall bladder
   Liver
13) Doesn't
14) Make digestive juices for the GI tract
15) Lumen
16) Mucosa
   Submucosa
   Muscularis externa
17) Mucosa
   Absorption
   Secretion
18) Submucosa
   Connective tissue
19) Muscularis externa
   Peristalsis
   Segmentation
20) Circular
   Segmentation
   Longitudinal
   Peristalsis
21) Serosa
   Peritoneum
22) Mesenteries
23) Pharynx
24) Esophagus
   Epiglottis
25) Esophagus
26) Sphincters
27) Esophageal
   Stomach
28) Rugae
29) Gastic glands
   Gastric pits
30) Parietal
   Chief
31) Parietal
32) Chief
33) Three
34) Acid reflux (heart burn)

35) Pyloric sphincter
   Small intestine
36) Small intestine
37) Duodenum (star) (triangle)
   Jejunum (circled)
   Ileum [boxed]
38) Plicea circularis
39) Villi
40) Epithelial
   Microvilli
41) Ileocecal sphincter
42) Colon
43) Water
   Ions
44) Feces
45*) Goblet cells

46) Ascending colon
   Transverse colon
   Descending colon
   Sigmoidal colon
47) Appendix

48) Defecation
49) Large intestine
50) Diarrhea
51) Pharynx
    Esophagus
    Stomach
    Small intestine
    Large intestine
52) A, C
    A, B, D, E
    F, G
53) Stomach
54) Digestive enzymes
55) Buffer
    Neutralizes
56) Duodenum
    Small intestine
57) B, E
    B, E
    A, B
    C
    D
58) Bile
59) Right
60) Bile
    Emulsify fat globules
61) Glucose
    Glycogen
62) Jaundice
63) G5
    G1
    G3
    G2
    A
    G4
    A
    A

64) Metabolism
65) Enzymes
66) Digestive
67) Pancreas
    Small intestine
68) Peptides
    Glycerol
    Fatty acids
69) Glucose
70) Maltose
    Disaccharide
71) Starch
    Glycogen
72) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
73) ATP
74) Fiber
    Bran
75) Cholesterol
    Colon

76) Oral cavity
    Pharynx
    Esophagus
    Esophageal sphincter
    Stomach
    Pyloric sphincter
    Duodenum (of small intestine)
    Jejunum (of small intestine)
    Ileum (of small intestine)
    Ileocecal sphincter
    Ascending colon (of large intestine)
    Transverse colon (of large intestine)
    Descending colon (of large intestine)
    Sigmoidal colon (of large intestine)
    Rectum (of large intestine)
    Anus
77) Glucose
78) Liver
79) Glycogen
80) Pancreatic islets
    Islets of Langerhans
81) Insulin

Glucagon

82) Insulin
Hyperglycemia
Glucagon
Hypoglycemia

83) Take in glucose from the blood

84) Liver

85) Glucagon

86) Low
Liver

87) Breaks down glycogen

88) Starch
Maltose
Glucose
Liver
Glycogen
Glucose

89) a = Insulin
b = Pancreas
c = Islets of Langerhans
d = Lowers
e = All tissues and organs
f = Take in glucose

90) a) Glucagon
b = Pancreas
c = Islets of Langerhans
d = Raises
e = The liver
f = Release stored glucose

91) High blood sugar
Sugar in urine
Frequent urination

92) Insulin

93) Metabolic rate
Basil metabolic rate
Total metabolic rate

94) Generating heat

95) Thyroid hormone

96) Above

97) a = I
b = I
c = D
d = D
e = I

98) Energy balance
Stay the same

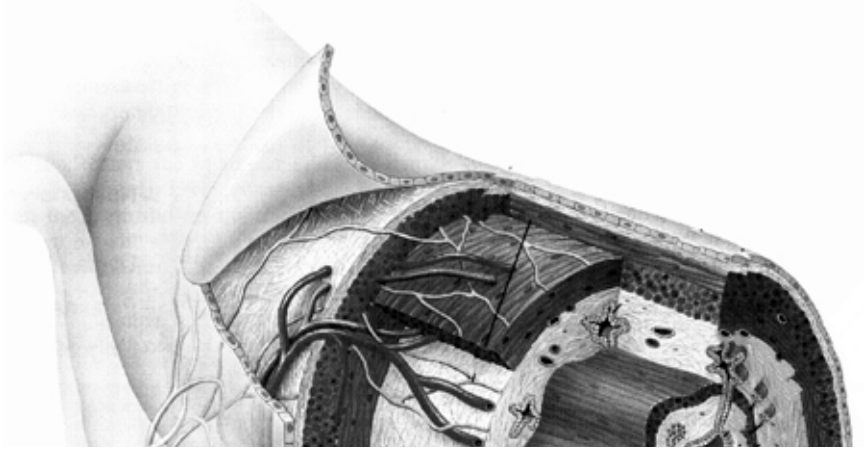
99) Less than

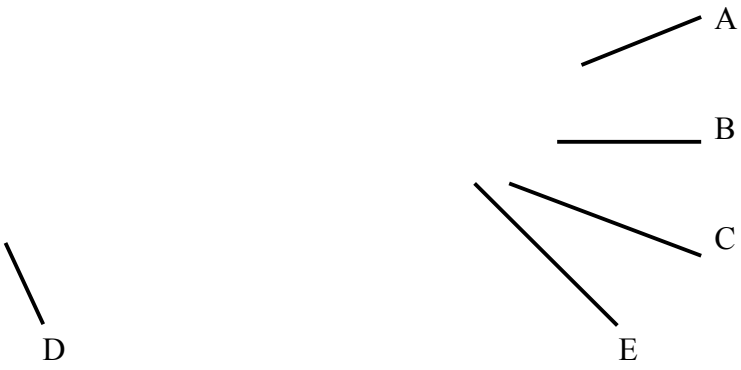
100) Greater

101) Eating fewer calories
Exercise

Short answer review questions:

1) A cross section of the GI tract is shown below. After each letter below the drawing, give each part's name, its tissue type, and its function. (For part E, just give its name and function).





A: *Hint: Churns chyme, does peristalsis*
B: *Hint: Contains blood vessels and nerves*
C: *Hint: Innermost tissue layer*
D: *Hint: Cushions the GI tract*
E: *Hint: The hollow space inside*

2) Describe the tissue type, location, and function of the pyloric sphincter:

3) List the cells of the stomach mucosa and what they secrete:

4) Name and describe all the folds that increase the surface area of the small intestine:

5) What substances are absorbed by the large intestine mucosa?

6) What is the function of the buffer in pancreatic juice, and where does it carry out that function?

7) The drawing below represents the digestion of a large nutrient macromolecule in the digestive system. Each circle represents one monomer molecule. The arrow represents a digestive enzyme.

a) The product molecules of this reaction will/will not (circle one) be absorbed into the body.

b) Justify your answer to question (a).

c) If the circles represent amino acids, the proper term for the molecule on the left is a _____ and the proper term for the molecules on the right is _____.

8) Person X eats a starchy meal (like pasta). Person Z eats a meal with lots of maltose sugar. Starch and maltose are both make of glucose sugars linked together. Which person's blood sugar will increase faster? _____ Justify your answer using concepts about how digestion of food molecules is carried out by enzymes.

9) The nutrient monomers that are absorbed into the body by the digestive system (such as monosaccharides, amino acids, and fatty acids) serve two major purposes. What are those two purposes? In other words, why do we need to eat?

10) Explain how the liver helps maintain a constant blood glucose concentration:

11) Name the endocrine structures of the pancreas and list the names and actions of the hormones they secrete.

12) Explain, at a cellular and molecular level, why diabetes leads to increased urine volume.

13) Explain why total metabolic rate is always larger than basil metabolic rate. Your explanation must include the types of body processes that the calories are used for.

14) The table below lists the three major macromolecule nutrients on the top row and some traits on the left hand column. Fill in the table.

	Protein	Carbohydrates	Fats
It is first digested into a smaller molecules called	_____	_____	_____
It is then digested into monomers			

called _____ _____ _____

Are its monomers
a major cell energy
source? (Yes/No) _____ _____ _____

Answers to short answer review questions:

1) A = Muscularis externa; smooth muscle tissue; propels chyme through GI tract (peristalsis) and churns chyme within the GI tract (segmentation)

B = Submucosa; dense connective tissue; supports mucosa, contains blood vessels to carry away absorbed nutrients, and contains nerves to sense chyme and control smooth muscles.

C = Mucosa; simple columnar epithelial tissue; secretes digestive juices and absorbs nutrients and water.

D = Peritonium; a serosa (a fluid-filled membrane of epithelial and connective tissue); surrounds, cushions, and protects the GI tract organs.

E = Lumen; Hollow space for chyme

2) The pyloric sphincter is a donut-shaped ring of smooth muscle tissue. It acts as a valve that controls the flow of chyme from the exit of the stomach to the entrance of the small intestine. It opens only briefly so that the small intestine is not damaged by large volumes of acidic chyme.

3) Chief cells = Make a digestive enzyme.
Parietal cells = Make hydrochloric acid
Goblet cells = Make a protective mucus

4) Plicae circularis = Folds of the mucosa that are large enough to be visible to the naked eye.

Villi = Finger-shaped folds of the mucosa can be seen at low microscopic magnification.

Microvilli = Finger-shaped folds of the cell membranes of epithelial cells of the mucosa. Microvilli can be seen only at high microscope magnification.

5) Water, ions, and some vitamins.

6) The buffer in pancreatic juice neutralizes the acid chyme which enters the small intestine from the stomach.

7) a) Will not.

b) In general, only monomer molecules can be absorbed into the body from the GI tract. The product molecules shown in the diagram are not monomers (they are still polymers: Monomers linked together). The product molecules will require further digestion into monomers before they can be absorbed into the body.

c) Protein, Peptides

8) Person Z's blood sugar will rise faster.

The reason that person Z's blood sugar will rise faster is that only monomers in the GI tract are absorbed into the body. The maltose that person Z ate is a disaccharide, meaning it is two glucose monosaccharides linked together. A single digestive enzyme (maltase) is sufficient to digest it into glucose monosaccharides. Starch, on the other hand, is a polymer of hundreds of glucose monosaccharides linked together. It takes two enzyme steps to fully digest it: The first enzyme (amylase) digests starch into maltose, and then maltase enzyme digests the maltose into glucose. Since person Z's meal requires fewer digestion steps, he will digest his meal into monomers and absorb them into his blood faster.

9) The monomers are used for two purposes: (1) As fuel molecules to provide energy for our cells (for example, glucose and fatty acids), or (2) As monomers for the construction of our own macromolecules (such as proteins, polysaccharides, triglyceride lipids, and nucleic acids).

10) The liver lowers blood glucose when glucose is high. The liver lowers blood glucose by absorbing it from the blood and storing it in the form of a glucose polymer called glycogen.

The liver raises blood glucose when glucose is low. The liver raises blood glucose by breaking apart its stored glycogen into individual glucose molecules then releasing them into the blood.

11) The pancreatic islet (also known as islets of Langerhans) are the endocrine structures of the pancreas. These structures contain cells that release the hormone insulin when blood glucose is high. Insulin signals all cells of the body to take in glucose from the blood. The islets also contain cells that release the hormone glucagon when blood sugar is low. Glucagon signals the cells of the liver to release glucose into the blood.

12) Diabetes first leads to high glucose levels in the blood (hyperglycemia). When a substance (such as glucose) is above its normal concentration in the blood, the kidneys lower by moving it from the blood into the urine. As a result, the urine of diabetics contains a high concentration of glucose solute. Any fluid in the body (including urine) that contains a large solute concentration will attract water by osmosis. Therefore the urine attracts water from the body by osmosis, resulting in frequent and large volume urination by the diabetic.

13) Basil metabolic rate is the number of calories the body uses per hour when resting. Most of these calories are used to generate body heat, although some calories are also expended for heart beating, diaphragm breathing, brain signaling, and other vital functions. Total metabolic rate is the number of calories expended per hour when performing a physical activity (such as jogging, for example). TMR is higher because it includes all of the calories used when resting (body heat, heartbeat, breathing, thinking) as well as additional calories for the skeletal muscles used in the physical activity.

14)	Protein	Carbohydrates	Fats
It is first digested into a smaller molecules called	Peptides	Disaccharides	Triglycerides
It is then digested into monomers called	Amino acids	Monosaccharides	Glycerol and fatty acids
Are its monomers a major cell energy source? (Yes/No)	No	Yes	Yes