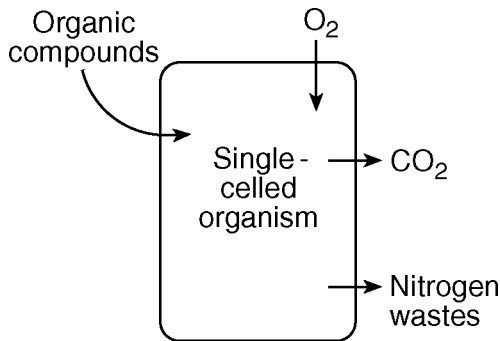


Name: _____

UNIT: HOMEOSTASIS

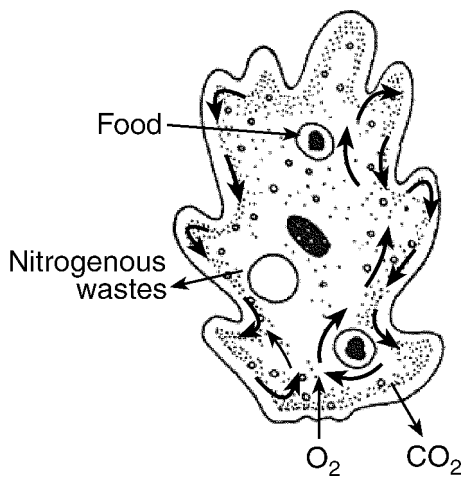
TOPIC: LIFE FUNCTIONS AND MAINTENANCE OF HOMEOSTASIS

- 1) The arrows in the diagram below indicate the movement of materials into and out of a single-celled organism.



The movements indicated by all the arrows are directly involved in

- 1) respiration, only
 - 2) excretion, only
 - 3) the digestion of proteins
 - 4) the maintenance of homeostasis
- 2) In the given diagram of a single-celled organism, the arrows indicate various activities taking place.



Which systems perform these same activities in humans?

- 1) respiratory, excretory, and digestive
- 2) digestive, circulatory, and immune
- 3) respiratory, nervous, and endocrine
- 4) excretory, respiratory, and reproductive

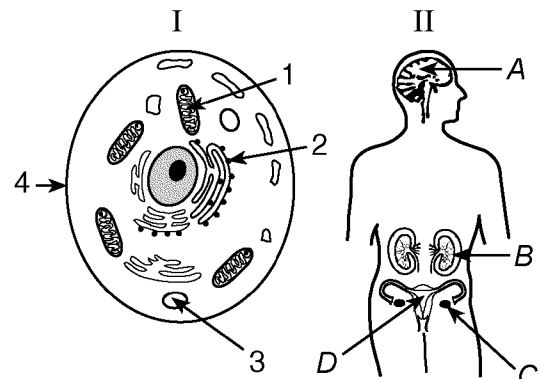
- 3) Humans require organ systems to carry out life processes. Single-celled organisms do not have organ systems, and yet they are able to carry out life processes. This is because

- 1) it is not necessary for single-celled organisms to maintain homeostasis
- 2) organelles present in single-celled organisms act in a manner similar to organ systems
- 3) human organ systems lack the organelles found in single-celled organisms
- 4) a human cell is more efficient than the cell of a single-celled organism

- 4) Which statement *best* compares a multicellular organism to a single-celled organism?

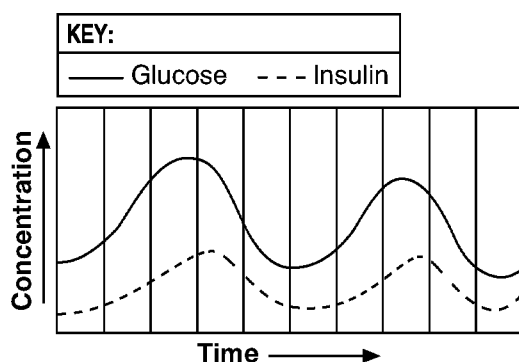
- 1) The cell of a single-celled organism is always much larger than an individual cell of a multicellular organism.
- 2) A single-celled organism carries out fewer life functions than each cell of a multicellular organism.
- 3) A multicellular organism always obtains energy through a process that is different from that used by a single-celled organism.
- 4) A multicellular organism has organ systems that interact to carry out life functions, while a single-celled organism carries out life functions without using organ systems.

- 5) Which structures in diagram I and diagram II carry out a similar life function?



- 1) 2 and D
- 2) 3 and A
- 3) 4 and B
- 4) 1 and C

- 6) Which order of metabolic processes converts nutrients consumed by an organism into cell parts?
- 1) digestion → absorption → circulation → diffusion → synthesis
 - 2) absorption → circulation → digestion → diffusion → synthesis
 - 3) synthesis → absorption → digestion → diffusion → circulation
 - 4) digestion → synthesis → diffusion → circulation → absorption
- 7) Which of the following situations indicates that a disruption of homeostasis has taken place?
- 1) the maintenance of a constant body temperature
 - 2) the presence of hormones that keep the blood sugar level steady
 - 3) a rapid rise in the number of red blood cells
 - 4) cell division that is involved in normal growth
- 8) The graph below shows the levels of glucose and insulin in the blood of a human over a period of time.



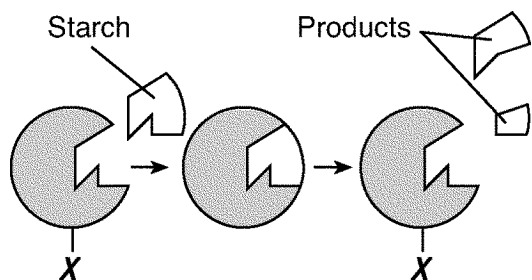
This graph represents

- 1) autotrophic nutrition
- 2) an allergic reaction
- 3) maintenance of homeostasis
- 4) an antigen-antibody reaction

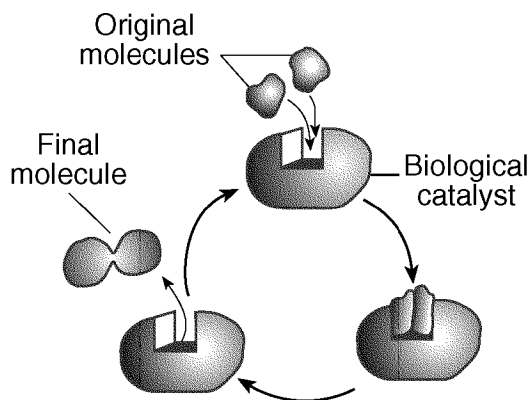
- 9) Contractile vacuoles maintain water balance by pumping excess water out of some single-celled pond organisms. In humans, the kidney is chiefly involved in maintaining water balance. These facts *best* illustrate that
- 1) tissues, organs, and organ systems work together to maintain homeostasis in all living things
 - 2) a disruption in a body system may disrupt the homeostasis of a single-celled organism
 - 3) interference with nerve signals disrupts cellular communication and homeostasis within organisms
 - 4) structures found in single-celled organisms can act in a manner similar to tissues and organs in multicellular organisms
- 10) The energy demands of a cell or an organism are met as a result of interactions between several life functions.
- (a) Identify *two* life functions involved in meeting the energy demands of a cell or an organism.
 - (b) Explain how the two life functions mentioned in *part (a)* interact to make energy available.

Questions 24 and 25 refer to the following:

The diagram below represents stages in the digestion of a starch.



- 24) The products of the digestion of starch shown would most likely contain
- 1) amino acids
 - 2) simple sugars
 - 3) fats
 - 4) minerals
- 25) The structure labeled X in the diagram most likely represents
- 1) a receptor molecule
 - 2) a hormone
 - 3) an enzyme
 - 4) an antibody
- 26) The diagram below represents a series of reactions that can occur in an organism.



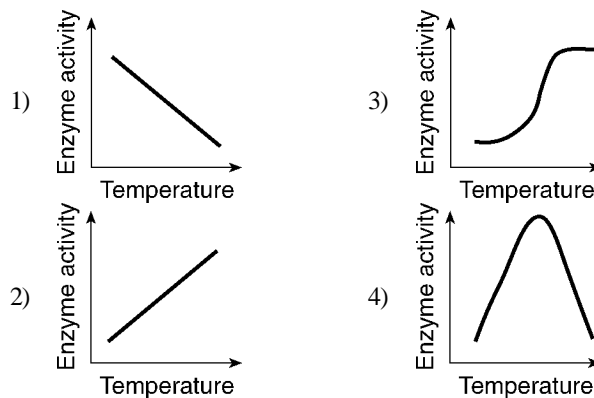
This diagram *best* illustrates the relationship between

- 1) amino acids and glucose
- 2) enzymes and synthesis
- 3) antigens and immunity
- 4) ribosomes and sugars

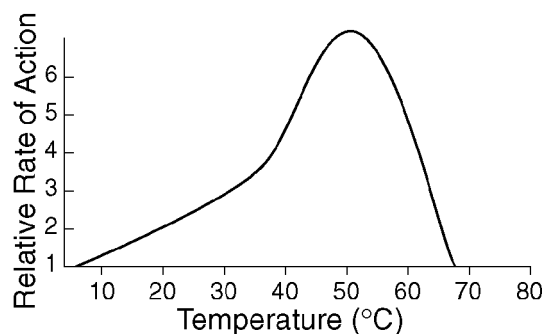
- 27) Which row in the chart below contains correct information concerning synthesis?

Row	Building Blocks	Substance Synthesized Using the Building Blocks
(1)	glucose molecules	DNA
(2)	simple sugars	protein
(3)	amino acids	enzyme
(4)	molecular bases	starch

- 1) 1 2) 2 3) 3 4) 4
- 28) Enzymes have an optimum temperature at which they work best. Temperatures above and below this optimum will decrease enzyme activity. Which graph *best* illustrates the effect of temperature on enzyme activity?



- 29) The graph below shows the effect of temperature on the relative rate of action of enzyme X on a protein.



Which change would *not* affect the relative rate of action of enzyme X?

- 1) an increase in temperature from 70°C to 80°C
- 2) the addition of cold water when the reaction is at 50°C
- 3) a decrease in temperature from 40°C to 10°C
- 4) the removal of the protein when the reaction is at 30°C

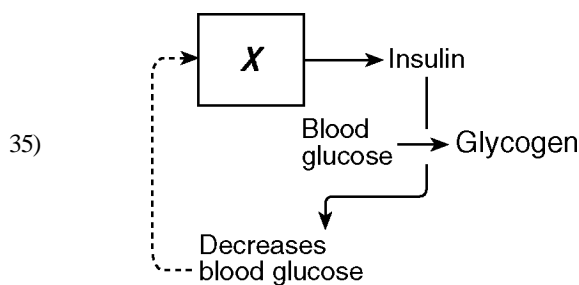
- 30) The sweet taste of freshly picked corn is due to the high sugar content in the kernels. Enzyme action converts about 50% of the sugar to starch within one day after picking. To preserve its sweetness, the freshly picked corn is immersed in boiling water for a few minutes, and then cooled.

Which statement most likely explains why the boiled corn kernels remain sweet?

- 1) Boiling deactivates the enzyme responsible for converting sugar to starch.
 - 2) Boiling activates the enzyme that converts amino acids to sugar.
 - 3) Boiling kills a fungus on the corn that is needed to convert sugar to starch.
 - 4) Boiling destroys sugar molecules so they cannot be converted to starch.
- 31) Meat tenderizer contains an enzyme that interacts with meat. If meat is coated with tenderizer and then placed in a refrigerator for a short time, how would the enzyme be affected?
- 1) It would no longer act as an enzyme.
 - 2) It would be broken down.
 - 3) Its shape would change.
 - 4) Its activity would slow down.
- 32) Which of the following conditions is necessary for enzymes and hormones to function properly in the human body?
- 1) Body pH must be above 10.
 - 2) These chemicals must have a specific shape.
 - 3) These chemicals must be able to replicate.
 - 4) Body temperature must be above 40°C.

- 33) Some internal environmental factors may interfere with the ability of an enzyme to function efficiently.
- (a) Identify *two* internal environmental factors that directly influence the rate of enzyme action.
 - (b) Explain why changing the shape of an enzyme could affect the ability of the enzyme to function.
- 34) Organ systems of the human body interact to maintain a balanced internal environment. As blood flows through certain organs of the body, the composition of the blood changes because of interactions with those organs.

State *one* change in the composition of the blood as it flows through the digestive system.

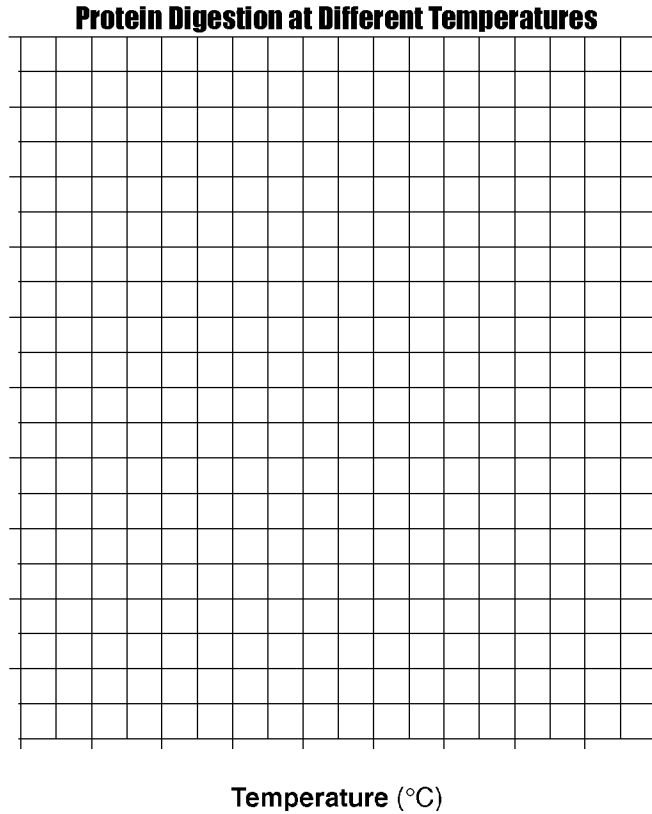


Identify the organ labeled X in the diagram shown.

Questions 36 through 39 refer to the following:

The effect of temperature on the action of pepsin, a protein-digesting enzyme present in stomach fluid, was tested. In this investigation, 20 milliliters of stomach fluid and 10 grams of protein were placed in each of five test tubes. The tubes were then kept at different temperatures. After 24 hours, the contents of each tube were tested to determine the amount of protein that had been digested. The results are shown in the table below.

Tube #	Temperature (°C)	Amount of Protein Digested (grams)
1	5	0.5
2	10	1.0
3	20	4.0
4	37	9.5
5	85	0.0



- 36) The dependent variable in the investigation described is the
- 1) amount of stomach fluid
 - 2) size of the test tube
 - 3) time of digestion
 - 4) amount of protein digested
- 37) If a sixth test tube identical to the other tubes was kept at a temperature of 30° C for 24 hours, the amount of protein digested in the investigation described would most likely be
- 1) less than 1.0 gram
 - 2) between 4.0 and 9.0 grams
 - 3) between 1.0 and 4.0 grams
 - 4) more than 9.0 grams

- 38) Using the information in the data table, construct a line graph on the grid provided:
- (a) Mark an appropriate scale on each axis of the grid.
 - (b) Plot the data on the grid. Surround each point with a small circle and connect the points.



- 39) The investigation described was repeated using 10 grams of starch instead of protein in each test tube. The contents of each tube were tested to determine the amount of starch that had been digested. The test results showed that no starch digestion occurred. Explain why *no* starch was digested.

TOPIC: REGULATION (NERVOUS AND ENDOCRINE SYSTEMS)

40) Most of the starch stored in the cells of a potato is composed of molecules that originally entered these cells as

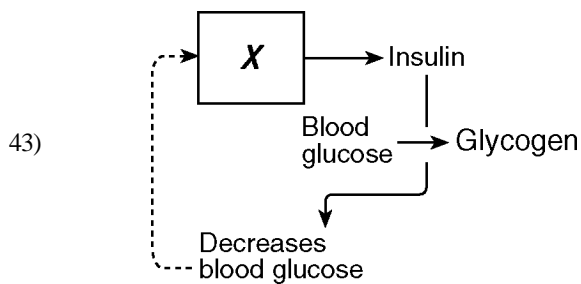
- 1) minerals
- 2) amino acids
- 3) enzymes
- 4) simple sugars

41) Feedback interactions in the human body are important because they

- 1) direct the synthesis of altered genes that are passed on to every cell in the body
- 2) determine the diversity necessary for evolution to occur
- 3) keep the internal body environment within its normal range
- 4) regulate the shape of molecules involved in cellular communication

42) Which statement does *not* describe an example of a feedback mechanism that maintains homeostasis?

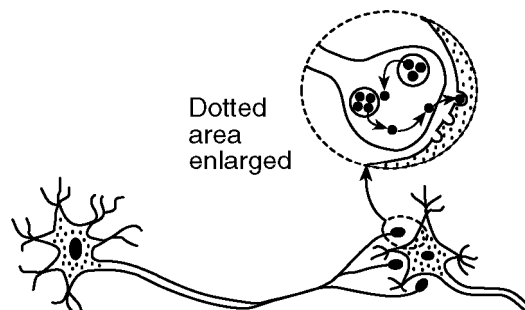
- 1) White blood cells increase the production of antigens during an allergic reaction.
- 2) Increased physical activity increases heart rate in humans.
- 3) The guard cells close the openings in leaves, preventing excess water loss from a plant.
- 4) The pancreas releases insulin, helping humans to keep blood sugar levels stable.



The dashed line in the given diagram represents

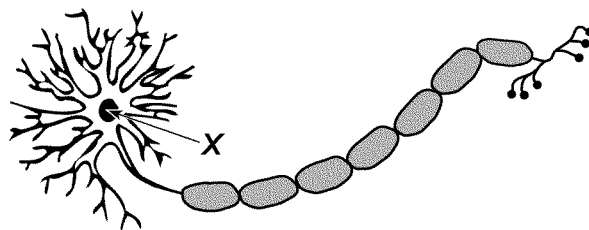
- 1) a digestive process
- 2) cellular differentiation
- 3) recycling of organic chemicals
- 4) a feedback mechanism

44) A process that occurs in the human body is represented in the diagram below.



Which statement is most closely associated with the diagram?

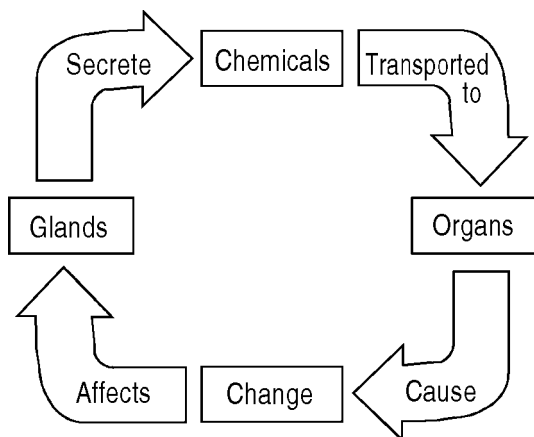
- 1) Certain molecules are replicated by means of a template.
 - 2) Energy from nutrients is utilized for waste disposal.
 - 3) Receptor molecules play an important role in communication between cells.
 - 4) Small molecules are obtained from large molecules during digestion.
- 45) The diagram below shows a cell associated with coordination.



Which statement *best* describes a function of the entire structure shown in the diagram?

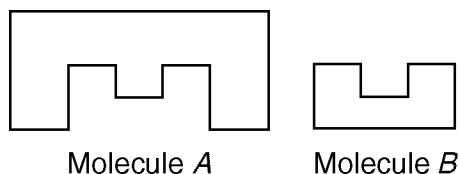
- 1) It releases chemicals involved in cellular communication.
 - 2) It synthesizes a hormone involved in the control of blood sugar level.
 - 3) It controls the replication of genetic material.
 - 4) It unites with an egg cell during fertilization.
- 46) Two primary agents of cellular communication are
- 1) chemicals made by blood cells and simple sugars
 - 2) hormones and chemicals made by nerve cells
 - 3) hormones and carbohydrates
 - 4) enzymes and starches
- 47) The human reproductive system is regulated by
- 1) complex carbohydrates
 - 2) restriction enzymes
 - 3) hormones
 - 4) antigens

- 48) The reproductive cycle of a human is usually regulated by
- 1) gametes
 - 2) hormones
 - 3) natural selection
 - 4) immune responses
- 49) The diagram below represents an interaction between parts of an organism.



The term "chemicals" in this diagram represents

- 1) hormone molecules
 - 2) DNA molecules
 - 3) starch molecules
 - 4) receptor molecules
- 50) The diagram below represents two molecules that can interact with each other to cause a biochemical process to occur in a cell.

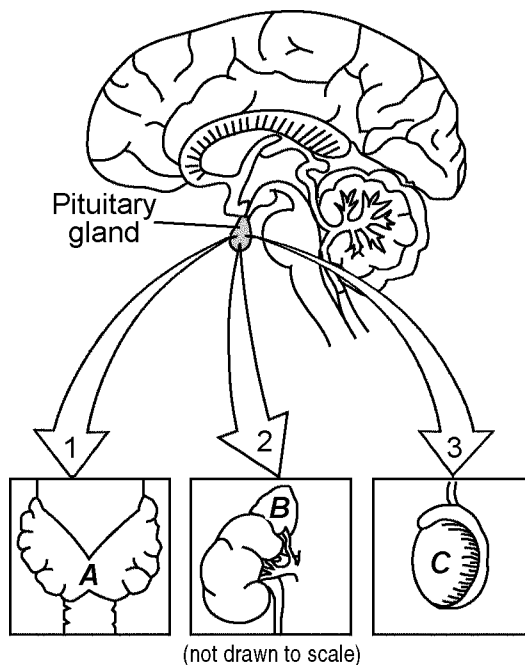


Molecules A and B most likely represent

- 1) an antibody and a hormone
- 2) a carbohydrate and an amino acid
- 3) a receptor and a hormone
- 4) a protein and a chromosome

Questions 51 through 53 refer to the following:

Each arrow in the diagram below represents a different hormone released by the pituitary gland that stimulates the gland indicated in the diagram. All structures are present in the same organism.



- 51) The pituitary gland in the given diagram may release hormone 2 when blood pressure drops. Hormone 2 causes gland B to release a different hormone that raises blood pressure which, in turn, stops the secretion of hormone 2.

The interaction of these hormones is an example of

- 1) a feedback mechanism
 - 2) an antigen-antibody reaction
 - 3) manipulation of genetic instructions
 - 4) DNA base substitution
- 52) What would most likely occur if the interaction is blocked between the pituitary gland shown in the diagram and gland C, the site of meiosis in males?
- 1) The level of progesterone would start to increase.
 - 2) The pituitary would produce another hormone to replace hormone 3.
 - 3) Gland A would begin to interact with hormone 3 to maintain homeostasis.
 - 4) The level of testosterone may start to decrease.
- 53) In the given diagram, why does hormone 1 influence the action of gland A but *not* gland B or C?
- 1) The cells of glands B and C contain different receptors than the cells of gland A.
 - 2) Each gland contains cells that have different base sequences in their DNA.
 - 3) The distance a chemical can travel is influenced by both pH and temperature.
 - 4) Every activity in gland A is different from the activities in glands B and C.

54) Acetylcholine is a chemical secreted at the ends of nerve cells. This chemical helps to send nerve signals across synapses (spaces between nerve cells). After the signal passes across a synapse, an enzyme breaks down the acetylcholine. LSD is a drug that blocks the action of this enzyme. Describe *one* possible effect of LSD on the action of acetylcholine

55) Identify *two* body systems that help maintain glucose levels in the blood and describe how each system is involved.

Questions 56 and 57 refer to the following:

Insulin is a hormone that has an important role in the maintenance of homeostasis in humans.

56) Identify the structure in the human body that is the usual source of insulin.

57) Identify a substance in the blood, other than insulin, that could change in concentration and indicate a person is not secreting insulin in normal amounts.

Questions 58 and 59 refer to the following:

Cell communication involves a cell detecting and responding to signals from other cells. Receptor molecules play an important role in these reactions. Human cells have insulin receptors that are needed for the movement of glucose out of the blood.

58) State *one* way that the shape of the insulin receptor mentioned in the given paragraph is related to its role in cell communication.

59) A typical human liver cell can have over 90,000 insulin receptors. If a genetic error occurred, resulting in each liver cell in a person having only 1,000 insulin receptors, what specific effect would this have on the liver cells?

Questions 60 through 62 refer to the following:

Cells of the immune system and the endocrine system of the human body contribute to the maintenance of homeostasis. The methods and materials these two systems use as they carry out this critical function are different.

60) State *two* ways cells of the immune system fight disease.

61) Identify *one* specific product of one of the endocrine glands and state how it aids in the maintenance of homeostasis.

62) Identify the substance produced by the cells of all the endocrine glands that helps maintain homeostasis.

Questions 63 through 66 refer to the following:

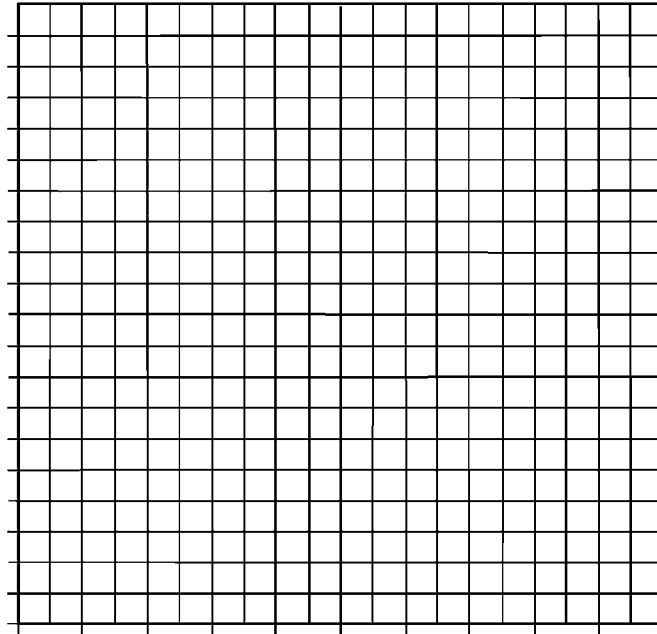
The results of blood tests for two individuals are shown in the data table below. The blood glucose level before breakfast is normally 80-90 mg/100 mL of blood. A blood glucose level above 110 mg/100 mL of blood indicates a failure in a feedback mechanism. Injection of chemical X, a chemical normally produced in the body, may be required to correct this problem.

Data Table

Time (a.m.)	Blood Glucose (mg/100 mL)	
	Individual 1	Individual 2
7:00	90	150
7:30	120	180
8:00	140	220
8:30	110	250
9:00	90	240
9:30	85	230
10:00	90	210
10:30	85	190
11:00	90	170

Blood Glucose (mg/100 mL)

Blood Glucose Levels



Time

- 63) (a) Mark an appropriate scale on each labeled axis of the grid provided.
- (b) On the same grid, plot the blood glucose levels for the individual who will most likely need injections of chemical X. Surround each point with a small circle and connect the points.
- EXAMPLE:**
- 64) Based on the given information, identify chemical X.
- 65) State *one* reason for the change in blood glucose level between 7:00 a.m. and 8:00 a.m., as shown in the table.
- 66) What term refers to the relatively constant level of blood glucose of individual 1 in the table between 9:00 a.m. and 11:00 a.m.?

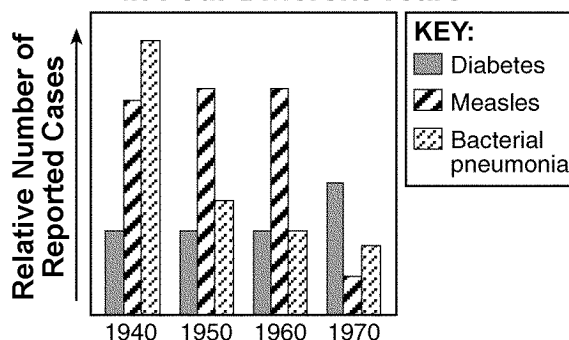
TOPIC: IMMUNITY (IMMUNE SYSTEM)

- 67) Antibody molecules and receptor molecules are similar in that they *both*
- 1) speed up chemical reactions in cells
 - 2) have a specific shape related to their specific function
 - 3) remove wastes from the body
 - 4) control transport through the cell membrane
- 68) Some human white blood cells help destroy pathogenic bacteria by
- 1) producing toxins that compete with bacterial toxins
 - 2) causing mutations in the bacteria
 - 3) engulfing and digesting the bacteria
 - 4) inserting part of their DNA into the bacterial cells
- 69) Which activity is *not* a function of white blood cells in response to an invasion of the body by bacteria?
- 1) speeding transmissions of nerve impulses to detect these bacteria
 - 2) producing antibodies to act against this type of bacteria
 - 3) engulfing these bacteria
 - 4) preparing for future invasions of this type of bacteria
- 70) The immune system of humans may respond to chemicals on the surface of an invading organism by
- 1) releasing hormones that break down these chemicals
 - 2) synthesizing antibodies that mark these organisms to be destroyed
 - 3) altering a DNA sequence in these organisms
 - 4) secreting antibiotics that attach to these organisms
- 71) Vaccinations help prepare the body to fight invasions of a specific pathogen by
- 1) inhibiting white blood cell production
 - 2) stimulating red blood cell production
 - 3) stimulating antibody production
 - 4) inhibiting antigen production
- 72) Which of the following statements *best* describes how a vaccination can help protect the body against disease?
- 1) Vaccines act as a medicine that cures the disease.
 - 2) Vaccines contain white blood cells that engulf harmful germs and prevent them from spreading throughout the body.
 - 3) Vaccines directly kill the pathogen that causes the disease.
 - 4) Vaccines cause the production of specific molecules that will react with and destroy certain microbes.

- 73) The purpose of introducing weakened microbes into the body of an organism is to stimulate the
- 1) replication of genes that direct the synthesis of hormones that regulate the number of microbes
 - 2) immune system to react and prepare the organism to fight future invasions by these microbes
 - 3) production of living microbes that will protect the organism from future attacks
 - 4) production of antigens that will prevent infections from occurring
- 74) The use of a vaccine to stimulate the immune system to act against a specific pathogen is valuable in maintaining homeostasis because
- 1) once the body produces chemicals to combat one type of virus, it can more easily make antibiotics
 - 2) the body can digest the weakened microbes and use them as food
 - 3) the more the immune system is challenged, the better it performs
 - 4) the body will be able to fight invasions by the same type of microbe in the future

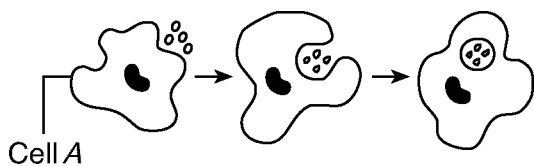
Questions 75 through 77 refer to the following:

Incidence of Three Human Diseases in Four Different Years



- 75) According to the graph, the *greatest* difference between the incidence of measles and the incidence of bacterial pneumonia occurred in
- 1) 1960
 - 2) 1940
 - 3) 1950
 - 4) 1970
- 76) Based on the data shown, which statement *best* explains a change in the incidence of disease in 1970?
- 1) Children were vaccinated against measles.
 - 2) New technology helped to reduce the incidence of all three diseases.
 - 3) New drugs cured diabetes.
 - 4) The bacteria that cause pneumonia developed a resistance to drugs.

- 77) Based on the data shown, which statement provides the *best* possible reason for the decrease in number of cases of bacterial pneumonia from 1940 to 1970?
- 1) The bacteria did not respond to medical treatments.
 - 2) As a result of genetic engineering, humans became immune to the bacteria.
 - 3) Antibiotics were made available for the treatment of bacterial infections.
 - 4) As a result of sexual reproduction, the bacteria evolved into a harmless form.
- 78) To increase chances for a successful organ transplant, the person receiving the organ should be given special medications. The purpose of these medications is to
- 1) increase the immune response in the person receiving the transplant
 - 2) decrease the immune response in the person receiving the transplant
 - 3) increase mutations in the person receiving the transplant
 - 4) decrease mutations in the person receiving the transplant
- 79) Which transplant method would prevent the rejection of tissue after an organ transplant?
- 1) using organs only from pigs or monkeys
 - 2) using organs produced by genetic engineering to get rid of all proteins in the donated organs
 - 3) using an organ donated by a close relative because the proteins will always be identical to those of the recipient
 - 4) using organs cloned from the cells of the patient
- 80) The diagram below represents an event that occurs in the blood.



Which statement *best* describes this event?

- 1) Cell A is a white blood cell releasing antigens to destroy bacteria.
 - 2) Cell A is a white blood cell engulfing disease-causing organisms.
 - 3) Cell A is protecting bacteria so they can reproduce without being destroyed by predators.
 - 4) Cell A is a cancer cell produced by the immune system, and it is helping to prevent disease.
- 81) State *one* specific way white blood cells help to protect the human body from pathogens.

Questions 82 through 84 refer to the following:

Vaccines play an important role in the ability of the body to resist certain diseases.

- 82) Describe the contents of a vaccine.
- 83) Identify the system in the body that is most directly affected by a vaccination.
- 84) Explain how a vaccination results in the long-term ability of the body to resist disease.
- 85) Smallpox is a disease caused by a specific virus, while the common cold can be caused by over 100 different viruses. Explain why it is possible to develop a vaccine to prevent smallpox, but it is difficult to develop a vaccine to prevent the common cold. In your answer be sure to:
- (1) Identify the substance in a vaccine that makes the vaccine effective.
 - (2) Explain the relationship between a vaccine and white blood cell activity.
 - (3) Explain why the response of the immune system to a vaccine is specific.
 - (4) State *one* reason why it would be difficult to develop a vaccine to be used against the common cold.

86) Until the middle of the 20th century, transplanting complex organs, such as kidneys, was rarely successful. The first transplant recipients did not survive. It was not until 1954 that the first successful kidney transplant was performed. Success with transplants increased as research scientists developed techniques such as tissue typing and the use of immunosuppressant drugs. These are drugs that suppress the immune system to prevent the rejection of a transplanted organ. In 2002, there were nearly 15,000 kidney transplants performed in the United States with a greater than 95% success rate.

Describe the relationship of the immune system to organ transplants and the use of immunosuppressant drugs to prevent the rejection of a transplanted organ. In your answer be sure to:

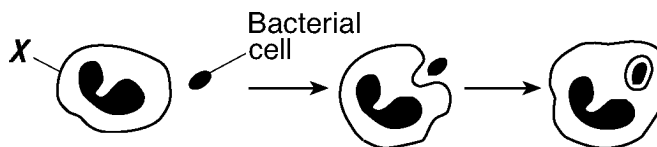
- (1) State *one* way the immune system is involved in the rejection of transplanted organs.
- (2) Explain why the *best* source for a donated kidney would be the identical twin of the recipient.
- (3) Explain why immunosuppressant drugs might be needed to prevent rejection of a kidney received from a donor other than an identical twin.
- (4) State *one* reason a person may get sick more easily when taking an immunosuppressant drug.

87) Many people become infected with the chicken pox virus during childhood. After recovering from chicken pox, these people are usually immune to the disease for the rest of their lives. However, they may still be infected by viruses that cause other diseases, such as measles.

Discuss the immune response to the chicken pox virus. In your answer, be sure to include:

- (1) the role of antigens in the immune response
- (2) the role of white blood cells in the body's response to the virus
- (3) an explanation of why recovery from an infection with the chicken pox virus will not protect a person from getting a different disease, such as measles
- (4) an explanation of why a chicken pox vaccination usually does not cause a person to become ill with chicken pox

88) The diagram below shows a cell in the human body engulfing a bacterial cell.



The cell labeled X is most likely a

- 1) nerve cell 2) liver cell 3) red blood cell 4) white blood cell

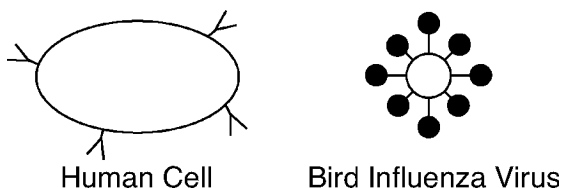
89) Which row in the chart below contains an event that is paired with an appropriate response in the human body?

Row	Event	Response
(1)	a virus enters the bloodstream	increased production of antibodies
(2)	fertilization of an egg	increased levels of testosterone
(3)	dehydration due to increased sweating	increased urine output
(4)	a drop in the rate of digestion	increased respiration rate

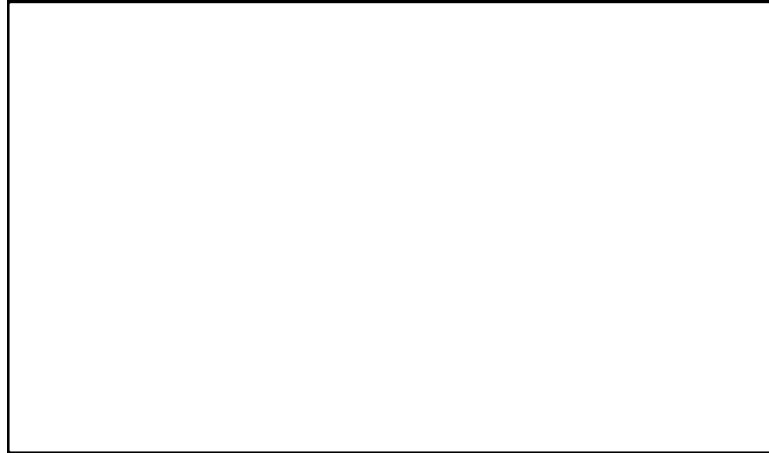
- 1) 1 2) 2 3) 3 4) 4

Questions 90 and 91 refer to the following:

Proteins on the surface of a human cell and on a bird influenza virus are represented in the diagram below.



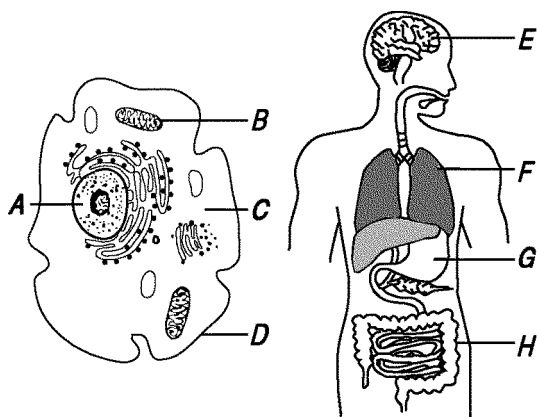
90) In the space below, draw a change in the bird influenza virus shown that would allow it to infect the human cell.



91) Explain how a change in the bird influenza virus that allows it to infect a human cell could come about.

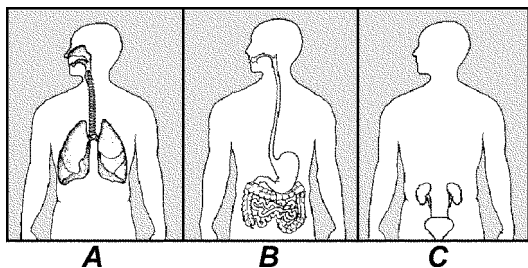
TOPIC: OTHER BODY SYSTEMS (RESPIRATORY, CIRCULATORY, EXCRETORY)

- 92) Which two organ systems provide materials required for the human body to produce ATP?
- 1) digestive and respiratory
 - 2) respiratory and immune
 - 3) digestive and reproductive
 - 4) reproductive and excretory
- 93) A single-cell and a multicellular organism are represented below.



Which structures are correctly paired with their primary function?

- 1) B and E — photosynthesis
 - 2) A and G — transmission of nerve impulses
 - 3) D and F — gas exchange
 - 4) C and H — digestion of food
- 94) The diagram below represents three human body systems.



Which row in the chart below correctly shows what systems A, B, and C provide for the human body?

Row	System A	System B	System C
1	blood cells	glucose	hormones
2	oxygen	absorption	gametes
3	gas exchange	nutrients	waste removal
4	immunity	coordination	carbon dioxide

- 1) 1 2) 2 3) 3 4) 4

- 95) Which of the following statements *best* describes a change that usually takes place in the human body when the heart rate increases as a result of exercise?
- 1) No hormones are produced.
 - 2) Blood cells are excreted at a faster rate.
 - 3) More oxygen is delivered to muscle cells.
 - 4) The rate of digestion increases.
- 96) What will most likely happen to wastes containing nitrogen produced as a result of the breakdown of amino acids within liver cells of a mammal?
- 1) They will be removed by the excretory system.
 - 2) They will be destroyed by specialized blood cells.
 - 3) They will be absorbed by mitochondria in nearby cells.
 - 4) They will be digested by enzymes in the stomach.

Questions 97 through 99 refer to the following:

When humans perspire, water, urea, and salts containing sodium are removed from the blood. Drinking water during extended periods of physical exercise replenishes the water but not the sodium. This increase in water dilutes the blood and may result in the concentration of sodium dropping low enough to cause a condition known as hyponatremia.

Symptoms of hyponatremia include headache, nausea, and lack of coordination. Left untreated, it can lead to coma and even death. The body has a variety of feedback mechanisms that assist in regulating water and sodium concentrations in the blood. The kidneys play a major role in these mechanisms, as they filter the blood and produce urine.

- 97) The *best* way to reduce the symptoms of hyponatremia discussed in reading passage would be to
- 1) drink more water
 - 2) eat chocolate
 - 3) drink cranberry juice
 - 4) eat salty foods
- 98) Based on the reading passage and your knowledge of biology, how would running in a marathon on a warm day most likely affect urine production? [*Support your answer.*]
- 99) Many people today drink sport drinks containing large amounts of sodium. Based on the reading passage and your knowledge of biology, describe *one* possible effect this might have on a person who is *not* very active.

TOPIC: GENERAL HUMAN BODY QUESTIONS

100) Select *one* of the paired items below and describe how the first item in the pair regulates the second item for the maintenance of homeostasis.

- insulin — blood sugar level
- CO₂ in blood — breathing rate
- activity of guard cells — water loss from a leaf

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Many runners pour water on their bodies during a race. Based on the reading passage and your knowledge of biology, explain how this action helps to maintain homeostasis.

Questions 102 through 104 refer to the following:

ARSENIC AND OLD GLUCOCORTICIDS:

Constant exposure to small amounts of arsenic in drinking water has been found to increase the risk of cancer and other diseases. In January of 2001, the EPA (Environmental Protection Agency) lowered the acceptable levels of arsenic in drinking water from 50 ppb (parts per billion) to 10 ppb.

Researchers are now trying to determine how arsenic affects the body. Recent experiments suggest that arsenic may block the activity of hormones. One group of hormones affected by arsenic is glucocorticoids, which are responsible for activating many genes that appear to suppress cancer.

Rat tumor cells were used to determine the effect of arsenic on glucocorticoids. One group of cells was treated with a solution of synthetic glucocorticoid and arsenic, another with a solution of synthetic glucocorticoid and water, and a third group with a solution containing only water. Researchers then measured the activity of one of the genes that is usually activated by glucocorticoids. The genes in the cells treated with the hormone and arsenic mixture and those treated with just water did not become activated. The genes in the cells treated with the hormone and water mixture were activated. Researchers concluded that arsenic blocked the normal activity of the hormone. They are now extending their studies to determine if arsenic acts in a similar manner in other types of cells and in entire organisms.

102) Identify *one* specific hormone in the body, other than glucocorticoid. Explain how disruption of the activity of the hormone you identified might upset a feedback mechanism in the body.

103) According to the reading passage, research suggests that a buildup of arsenic in the cells of humans may be harmful because

- 1) arsenic prevents the reaction in which water and hormones bond and attach to cancer cells
- 2) glucocorticoids can build up in tissues and cause an increase in the absorption of arsenic
- 3) arsenic prevents the action of genes that are important in reactions that suppress cancer
- 4) synthetic arsenic can be formed by the breakdown of glucocorticoids in the body

104) State *one* reason the study referred to in the reading passage should be extended to other cells or to other complex organisms.

105) Describe *one* example of diffusion in the human body. In your description be sure to:

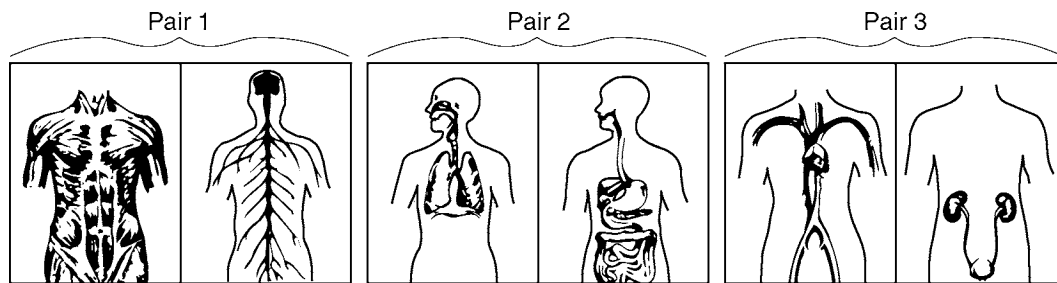
- (1) Identify the place where diffusion takes place.
- (2) Identify a substance that diffuses there.
- (3) Identify where that substance diffuses from and where it diffuses to, at that place.

106) Not all diseases are caused by pathogenic organisms. Other factors, such as inheritance, poor nutrition, and toxic substances, may also cause disease.

Describe a disease or disorder that can occur as a result of one of these other factors. Your answer must include *at least*:

- (1) the name of the disease
- (2) *one* specific factor that causes this disease
- (3) *one* major effect of this disease on the body, other than death
- (4) *one* way this disease can be prevented, treated, or cured

107) The diagrams below represent some of the systems that make up the human body.



- (a) Select *one* of the pairs of systems and write down its number.
- (b) For the pair selected, identify each system and state *one* function of that system.
- (c) Explain how the two systems work together to help maintain homeostasis in an individual.