

Biology
Reform for Meaningful Learning Program
Questions and Analysis of Scientific Research in the Core Topic Areas
Questions in Areas of In-Depth Study

ביולוגיה
על פי תכנית הרפורמה
ללמידה משמעותית
שאלות וניתוח מחקר מדעי בנושאי הליבה
שאלות בנושאי ההעמקה

Instructions for examinees

א. Duration of the exam: Three hours

ב. Exam structure and breakdown of points:

This exam has four parts.

Part One — 32 points

Part Two — 35 points

Part Three — 18 points

Part Four — 15 points

Total — 100 points

ג. Material that may be used during the exam:

A Hebrew-foreign language/foreign language-Hebrew dictionary.

ד. Special instructions:

For the questions in Part One, mark your answers in the answer sheet found at the end of the answer booklet (page 19).

For the questions in Part Two, Part Three and Part Four, write your answers in the answer booklet.

Write all of your rough work (notes, calculations, etc.) on separate pages of the answer booklet only.

Write the word "טייטה" on the top of each of these pages.

If you write any sort of work outside the answer booklet, your test may be disqualified!

הוראות לנבחן

א. משך הבחינה: שלוש שעות.

ב. מבנה השאלון ומפתח ההערכה:

בשאלון זה ארבעה פרקים.

פרק ראשון — 32 נקודות

פרק שני — 35 נקודות

פרק שלישי — 18 נקודות

פרק רביעי — 15 נקודות

סה"כ — 100 נקודות

ג. חומר עזר מותר בשימוש:

מילון עברי-לועזי / לועזי-עברי.

ד. הוראות מיוחדות:

את תשובותיך לשאלות בפרק הראשון סמן בתשובון שבסוף מחברת הבחינה (עמוד 19). את תשובותיך לשאלות בפרק השני, השלישי והרביעי כתוב במחברת הבחינה.

כתוב במחברת הבחינה בלבד, בעמודים נפרדים, כל מה שברצונך לכתוב כטייטה (ראשי פרקים, חישובים וכדומה).

רשום "טייטה" בראש כל עמוד טייטה. רישום טייטות כלשהן על דפים שמחוץ למחברת הבחינה עלול לגרום לפסילת הבחינה!

בהצלחה!

Good Luck!

Questions

Part One (32 points)

Part One is made up of 20 questions, 1-20.

You must answer all of the questions. If you answer at least 17 of the questions correctly, you will receive all 32 points.

Four possible answers are presented for each question. Choose the most appropriate answer for each question.

- * Mark the answer you have chosen on the answer sheet at the end of the answer booklet (page 19).
- * For each question, draw an ✕ in pen in the box under the letter (ד-א) that represents the answer you chose.

Example:

47. Which disease is carried by mosquitoes?

- א. jaundice
- ב. rubella
- ג. malaria
- ד. whooping cough

In this case, you would mark your answer on the answer sheet as follows:

ד	ג	ב	א	.47
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

- * Draw only one ✕ for each question.
- * To erase an answer, fill in the entire box like this: ■ .
- * You **may not** use White-Out to erase answers.

Note: In order to limit the need to erase answers on the answer sheet, we recommend that you first mark the correct answers inside this booklet and only later enter them into the answer sheet.

Answer all of the questions 1-20.

1. Plant cells and animal cells both have:
 - א. a mitochondrion and chloroplasts.
 - ב. a vacuole and a cell membrane.
 - ג. a cell membrane and a cell wall.
 - ד. a mitochondrion and ribosomes.
2. In the circulatory system of the human body, a red blood cell exited the right kidney and reached the left kidney.
Through which organs/body parts must the cell have passed?
 - א. the heart and lungs
 - ב. the head and the lungs
 - ג. the heart and the left hand
 - ד. the liver and the intestine
3. The sentences below (ד-א) compare enzymes with antibodies.
Which sentence is correct?
 - א. Enzymes catalyze metabolic processes in the cell; whereas antibodies inhibit those processes.
 - ב. Both enzymes and antibodies are active only outside of cells.
 - ג. Enzymes and antibodies are both proteins that bind to substances in unique ways.
 - ד. DNA contains information for the production of enzymes, but does not contain information for the production of antibodies.
4. Which one of the sentences below describes adaptation to biotic factors?
 - א. Birds that swim in water have a membrane that joins their toes together.
 - ב. Plants that are wind-pollinated have small flowers that are both colorless and odorless.
 - ג. The leaves of plants grown under cold conditions fall off in autumn.
 - ד. Birds that feed on nectar from flowers have long, thin beaks.

5. What causes air to exit the lungs when a person exhales?
- א. Contraction of the diaphragm [סרעפת], which increases the volume of the chest cavity
 - ב. Relaxation of the diaphragm, which decreases the volume of the chest cavity
 - ג. The difference between the concentration of CO_2 in the blood and the concentration of CO_2 in the alveoli [נאדיות] of the lungs
 - ד. The body's need to take in oxygen necessary for cell activities
6. The bumblebee bat is the smallest mammal in the world, with a weight of about 2 grams.
What is the most reasonable explanation for the fact that there are no smaller mammals?
- א. A smaller mammal would not be able to have an efficient gas-exchange system.
 - ב. A smaller mammal would have trouble maintaining a constant body temperature.
 - ג. In a smaller mammal, the systems would be too small to function properly.
 - ד. A smaller mammal would be in constant danger of being eaten by predators.
7. After a meal rich in carbohydrates, the concentration of glucose in the blood entering the liver is higher than the concentration of glucose in the blood leaving the liver. What is the reason for this?
- א. Most of the glucose is converted into starch that is stored in the liver.
 - ב. The glucose is converted into a disaccharide [דו-סוכר] that is stored in the liver and released as needed by the body.
 - ג. The glucose remains a monosaccharide, is stored in that form in the liver and is released as needed by the body.
 - ד. Most of the glucose is converted into glycogen, which is stored in the liver.
8. Which one of the statements below, א-ד, is correct?
- א. The pancreas secretes ADH.
 - ב. The kidney secretes insulin.
 - ג. Reproductive cells secrete LH.
 - ד. The pituitary gland [היפופיזה] secretes FSH.

9. Researchers put starch and enzymes that break down starch into test tubes. They then placed the test tubes into containers that were kept at different temperatures, as described in the table below. After a certain period of time, they examined the contents of the test tubes and found that glucose had been produced in only one of the containers.

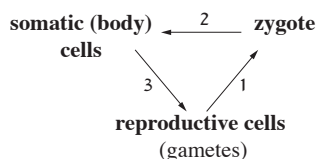
Temperature (°C)	Enzymes that break down starch	Starch	Test tube
20	+	+	1
20	–	+	2
37	+	–	3
100	+	+	4

In which test tube was glucose obtained?

- א. Test Tube 1, because it contained substrate and active enzymes
 - ב. Test Tube 2, because the addition of starch inhibited the degradation of glucose
 - ג. Test Tube 3, because the temperature at which this tube was kept is the optimal temperature for enzyme activity
 - ד. Test Tube 4, because a higher temperature speeds up the processes of enzymatic degradation
10. Sexual reproduction is important for evolution, mainly because:
- א. it produces offspring that are identical to their parents.
 - ב. it produces hereditary differences between offspring.
 - ג. it allows the continued existence of the individual.
 - ד. it allows changes in the way that the DNA multiplies.
11. Measurements taken by researchers over a period of time in a particular ecological system revealed that the amount of CO₂ emitted during each 24-hour period is greater than the amount of CO₂ that is taken up. The researchers concluded that the biomass of all of the organisms in the system:
- א. was decreasing
 - ב. was increasing
 - ג. was not changing
 - ד. decreased and then increased

- 12.** An animal cell was put into a solution. The cell then contracted.
What can we conclude from this with regard to the concentration of solutes in the solution, as compared to the concentration of solutes inside the cell?
- א. The concentration of the solution is lower than the concentration inside the cell.
 - ב. The concentration of the solution and the concentration inside the cell are identical.
 - ג. The concentration of the solution is higher than the concentration in the cell.
 - ד. We cannot reach any conclusion.
- 13.** How is a neural stimulus transmitted through the nervous system?
- א. A neurotransmitter moves from one synapse to the next through a neuron [תא עצב].
 - ב. An electrical signal moves through a synapse following the secretion of a neurotransmitter from a neuron.
 - ג. An electrical signal moves through a neuron and causes a neurotransmitter to be secreted into a synapse.
 - ד. An electrical signal moves along the length of a neuron and is transferred directly to the next neuron.
- 14.** Which property of a substance allows it to be used as a storage substance [חומר תשמורת] in cells?
- א. Its accumulation increases the concentration of solutes in the cell.
 - ב. It is a small molecule that easily penetrates cells.
 - ג. Its storage does not affect the concentration of solutes in the cell.
 - ד. It is very soluble in water.
- 15.** Sentences (א-ד) below explain why the insects known as stick-bugs [מקלונים] look like thin twigs.
Which explanation is correct?
- א. The fact that stick-bugs have lived on thin twigs for many generations has caused their bodies to change to resemble thin twigs.
 - ב. Insects found on thin twigs prefer to look like thin twigs, to avoid being eaten by predators.
 - ג. The stick-bugs feed on thin twigs that cause them to look like thin twigs.
 - ד. Among insects found on thin twigs, those that resemble thin twigs are eaten less often by predators.

16. All of the molecules that are final products of the digestion of food and pass into the blood are:
- small molecules that are used only for the production of energy.
 - small molecules that are used to produce energy and to build materials.
 - glucose molecules that are used to build glycogen.
 - amino acid molecules that are used to build proteins.
17. In the pancreas, one type of cells makes the hormone insulin and another type of cells produces digestive enzymes. What causes this difference between the two types of cells?
- the difference in the structure of the DNA molecules in the two types of cells
 - the different structure of the ribosomes found in the two types of cells
 - the different structure of the transfer RNA (tRNA) molecules in the two types of cells
 - the activation of different genes in the two different types of cells
18. The main difference between viruses and bacteria is that:
- the DNA in bacteria is found in a nucleus; whereas in viruses, the DNA is found outside of a nucleus.
 - bacteria can reproduce on their own; whereas viruses need a living cell in order to reproduce.
 - in terms of the consumption of nutrients, bacteria are heterotrophs; whereas viruses are autotrophs.
 - bacteria are much smaller than viruses.
19. The figure below describes three processes that occur in creatures that reproduce sexually.



What processes do the arrows 1, 2 and 3 represent?

- | | | |
|---------------------|------------|------------------|
| א. 1. fertilization | 2. mitosis | 3. meiosis |
| ב. 1. fertilization | 2. meiosis | 3. mitosis |
| ג. 1. mitosis | 2. meiosis | 3. fertilization |
| ד. 1. meiosis | 2. mitosis | 3. fertilization |
20. A student studied for the Biology *Bagrut* exam. In which part of his nervous system did the learning process occur?
- the brain stem
 - the cerebral cortex [קליפת המוח]
 - the spinal cord
 - sensory organs

Part Two (35 points)

Part Two is made up of seven questions, 21-27.

Choose five of these questions that you want to answer, and write your answers in the **answer booklet** (each question — 7 points).

- 21.** Below are four biological phenomena that occur in the body of a healthy human being.
- (1) Bleeding from a small cut stops quickly.
 - (2) The production of red blood cells increases at higher altitudes.
 - (3) The amount of urine excreted on hot days is generally smaller than the amount excreted on cold days.
 - (4) Body temperature rises during physical activity and then falls quickly.
- Choose two of the phenomena (1)-(4) and for each of the phenomena that you chose:

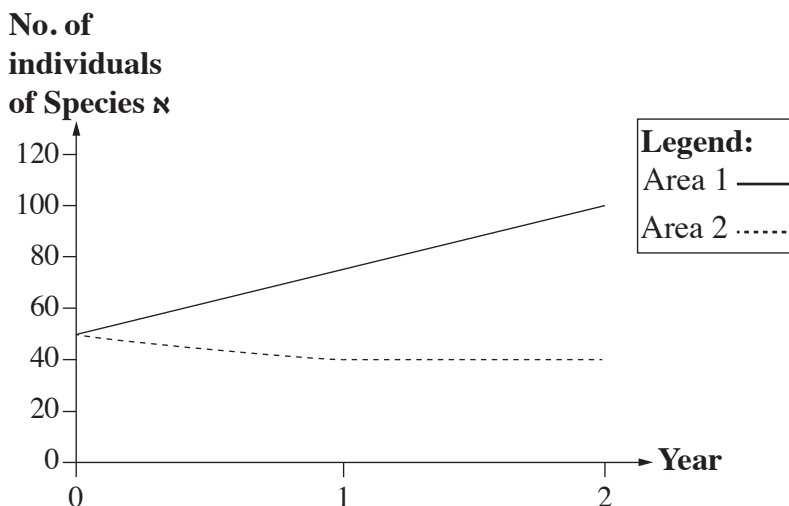
- briefly describe the mechanism that causes the phenomenon.
- explain its importance for the proper functioning of the body.

- 22.** A researcher wanted to examine the reciprocal relationship [יחסי הגומלין] between two species: Species α and Species β .

To do so, he raised them for a period of two years in different areas under identical conditions.

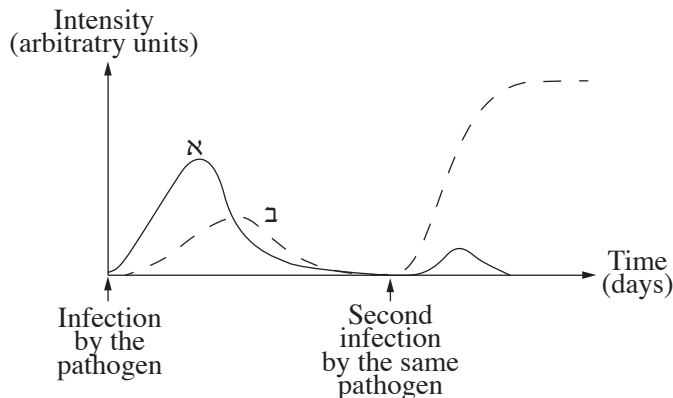
He raised only Species α in Area 1 and both species together in Area 2.

The graph below shows the number of individuals of Species α in the two areas over two years.



- א. The results presented in the graph correspond to two types of reciprocal relationships between the two species.
Name one of these types of relationships and explain your answer using data from the graph. (4 points)
- ב. At the end of the experiment, the researcher removed Species א from Area 2, leaving Species ב alone in that area.
Based on the type of reciprocal relationship you noted for Item א, hypothesize as to how the removal of Species א might affect the number of individuals of Species ב. Explain your answer. (3 points)
23. The disease sickle-cell anemia is caused by defective hemoglobin. In one spot in the defective hemoglobin protein, the amino acid valine is present instead of the amino acid glutamate, which is found in that spot in normal hemoglobin.
- א. (1) What type of mutation could cause a change in one amino acid in the hemoglobin molecule?
(2) Describe the stages of the process from the DNA mutation to the production of the defective hemoglobin protein.
(5 points)
- ב. People with sickle-cell anemia suffer from general weakness.
Explain why. (2 points)
24. Two children were born to a couple. One child has Type O blood and the other child has Type AB blood.
- א. Only one of the children can donate blood to his sibling. Which child can donate blood to his sibling? Explain your answer. (2.5 points)
- ב. (1) What are the possible blood types of the father, based on the blood types of his children? Explain your answer.
(2) After several years, the father married for a second time. The second wife had Type A blood. A child with Type B blood was born to the new couple. Based on the additional information regarding the father's second family, we can determine the father's blood type without any doubt. What is his blood type? Explain your answer. (4.5 points)

25. The graph below shows two curves that describe processes that occur in the body when the body is invaded twice by the same pathogen. One curve describes the intensity of the immune response and the other curve describes the intensity of disease symptoms (such as fever and pain).



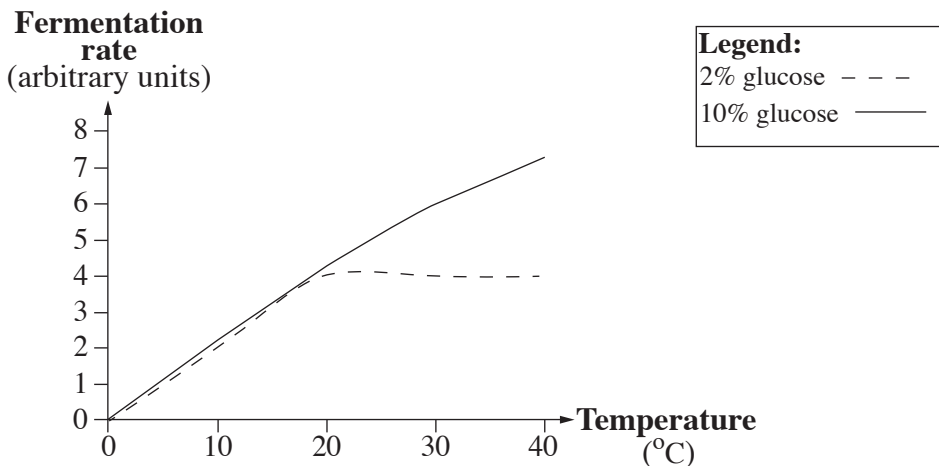
- א. Which curve, א or ב, describes the intensity of the disease symptoms and which describes the intensity of the immune response? Base your answers on the data presented in the graph. (4 points)
 - ב. Does one of the curves indicate immunological memory? Explain your answer based on the data presented in the graph. (3 points)
26. Goats in a certain herd are susceptible to Disease X. Sometimes, some individuals exhibit a mutation that provides them with resistance to this disease.
- א. Does the likelihood of the occurrence of this mutation differ between a population of goats that is exposed to the pathogen and a population of goats that is not exposed? Explain. (4 points)
 - ב. There was an outbreak of this disease in the herd and only a small proportion of the goats survived. Several years later, there was another outbreak of this disease in the herd and, this time, most of the goats survived. Explain the reason for the difference between the proportion of the goats that survived the first outbreak and the proportion of the goats that survived the second outbreak. (3 points)

27. Researchers examined the effect of temperature on the rate of fermentation carried out by yeast at two different concentrations of glucose.

The yeast was put into two closed containers in which all conditions were identical, except for the concentration of glucose in the nutrient medium.

The concentration of glucose in the nutrient medium was 2% in one container and 10% in the other container.

The results of the experiment are presented in the graph below.



- א. Under which conditions, that is, at which concentration of glucose and at which temperatures, is the concentration of glucose the limiting factor for the rate of fermentation? Explain your answer based on the results presented in the graph.
(3.5 points)
- ב. When the same experiment was conducted in open containers, the rate at which the yeast multiplied was greater than that observed in the experiment described above. Explain why. (3.5 points)

Part Three (18 points)

Part Three is made up of three questions, 28-30.

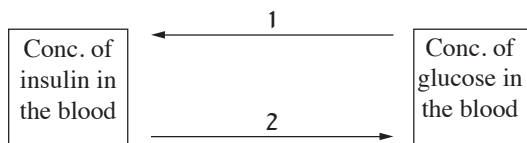
Read the description of a research study presented below and answer all of the questions 28-30. (The point value of each question is given.)

Should we consume artificial sweeteners?

Maintaining a glucose concentration in the blood that is within a certain range is essential for the proper functioning of the human body. Changes in the concentration of glucose in the blood are regulated by several hormones. Disruption of the regulation of the glucose concentration in the blood can cause different diseases, for example, diabetes.

The hormone insulin is one of the main factors that regulate the concentration of glucose in the blood.

28. א. The figure below describes the relationship between the concentration of glucose in the blood and the concentration of insulin in the blood.



Copy the numbers 1 and 2 into your notebook. Next to each number, write one of the following options:

[does not affect] לא משפיע על ; [increases] מעלה ; [decreases] מוריד .

(2 points)

- ב. Some people who are diabetic have the right concentration of insulin in their blood, but, despite that fact, the concentration of glucose in their blood is high. Suggest a possible explanation for this. (4 points)

A **glucose-loading** test is used to examine changes in the concentration of glucose in blood. In this test, the concentration of glucose is checked in a person who is fasting. That person is then given a measured amount of glucose solution to drink and the changes in the concentration of glucose in his blood are monitored over several hours.

If this test reveals that the concentration of glucose in the person's blood is slightly higher than the normal concentration, that person might be in a **pre-diabetic** state, which is an intermediate state between being healthy and having diabetes.

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Many people consume artificial sweeteners instead of sugar. The researchers Elinav and Segal from the Weizmann Institute of Science wanted to investigate whether certain artificial sweeteners affect the concentration of glucose in the blood.

To that end, the researchers carried out Experiment 1 in mice.

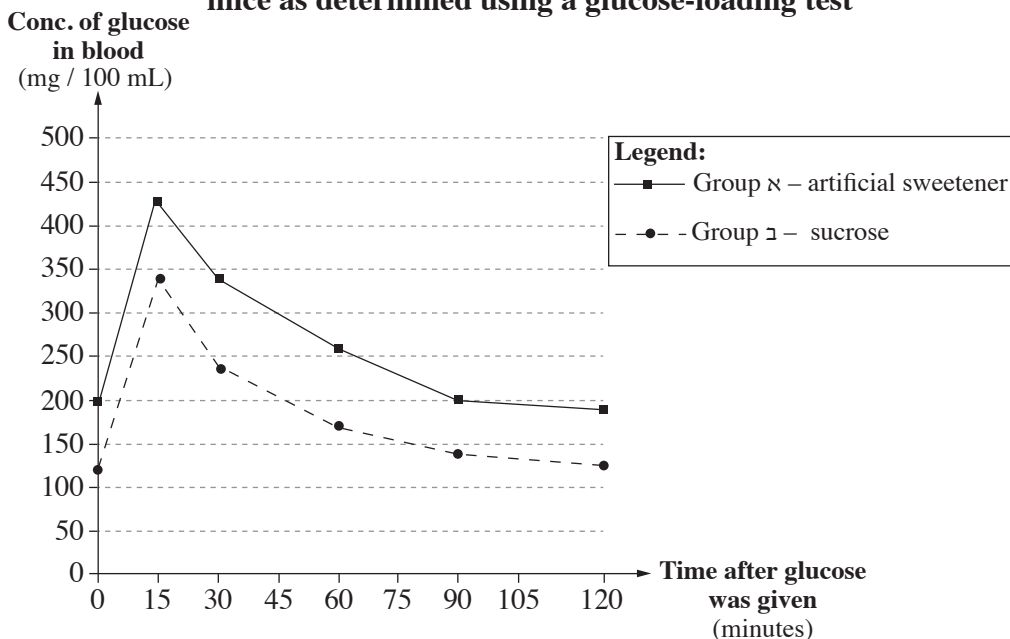
Experiment 1

Step א: Mice were randomly assigned to two groups, א and ב, and raised for several weeks under the same conditions, the only difference being the composition of the sweetened drink that they received. The mice in Group א were given a solution containing an artificial sweetener and the mice in Group ב were given a sucrose solution. (Sucrose is the sugar we use at home.)

Step ב: After several weeks, the researchers used a glucose-loading test to check the effect of the composition of the sweetened drink given to the mice on the concentration of glucose in their blood. They measured the concentration of glucose in the blood of mice that had fasted before they were given a glucose solution to drink (Time 0), and continued to monitor the concentration of glucose in the blood of these mice over the next two hours.

The results of this experiment are presented in Graph 1 below.

Graph 1: Concentration of glucose in the blood of the two groups of mice as determined using a glucose-loading test



/continued on page 14/

Further Information:

- * The results obtained for the mice in Group ב were similar to the **normal** levels of glucose in mouse blood.
- * When **diabetic** mice were subjected to a glucose-loading test, the results revealed a higher than normal initial concentration of glucose, which remained high for a period of time.

29. א. From the results presented in Graph 1, what can we conclude about the effect of the artificial sweetener on the concentration of glucose in the blood of the mice? (3 points)
- ב. The mice that received the artificial sweetener solution (Group א):
- (1) are in a **pre-diabetic** state
 - (2) do not have **diabetes**.
- Explain the two sub-items, (1) and (2), based on the graph and the information in the "Further Information" box.
- (4 points)

In recent years, many researchers have suggested that food can affect the composition of the population of bacteria in the intestine and that intestinal bacteria affect human health.

The researchers Elinav and Segal thought that artificial sweeteners might also affect the composition of the bacterial population of the intestine.

They hypothesized that these changes in the composition of the bacterial population might lead to pre-diabetes in mice. In order to test this hypothesis, they conducted Experiment 2.

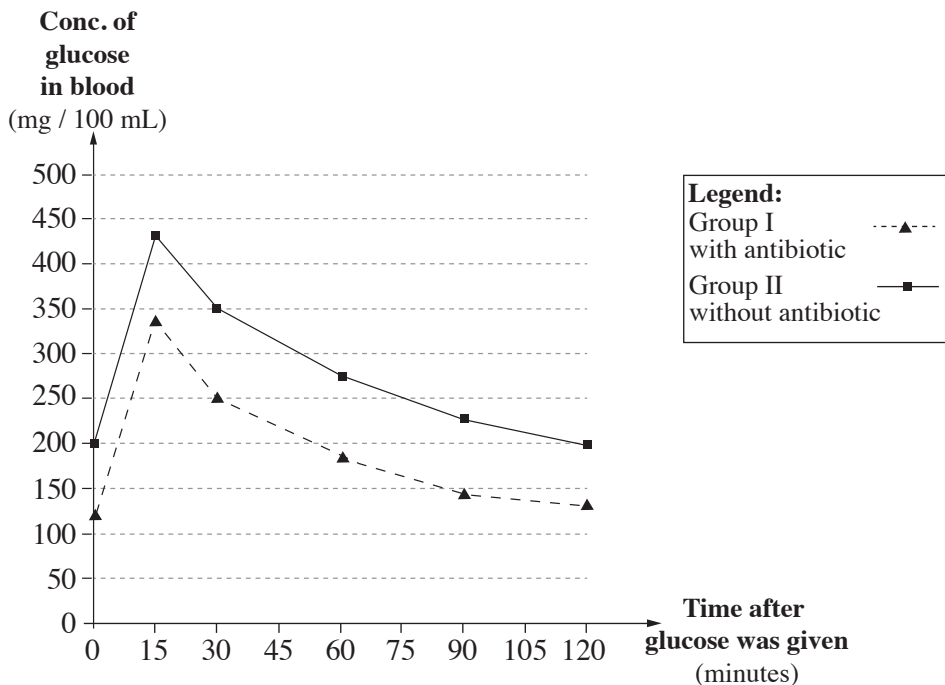
Experiment 2

Step א: Mice were randomly assigned to two groups, I and II, and raised for several weeks under the same conditions. The mice in both groups were given a sweet solution containing artificial sweetener to drink. The mice in Group I were also given an antibiotic that destroys some species of intestinal bacteria. The mice in Group II were not given any antibiotic.

Step ב: After several weeks, the mice from the two groups were subjected to a glucose-loading test.

The results of this experiment are presented in Graph 2 below.

Graph 2: Concentration of glucose in the blood of the two groups of mice as determined using a glucose-loading test



30. Do the results of Experiment 2 support the researchers' hypothesis? Explain. (5 points)

It is interesting to note that the relationship between the consumption of artificial sweeteners and the appearance of pre-diabetic symptoms has also been examined among humans. Preliminary results of research carried out in humans provide evidence of such a relationship among some of the people who have been tested.

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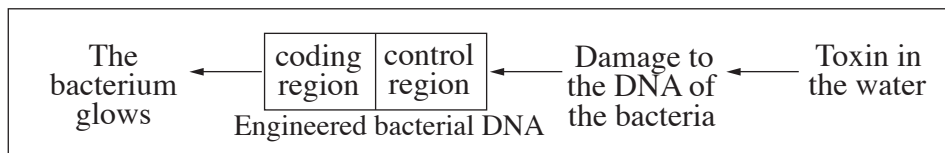
Part Four (15 points)

Part Four is made up of questions on three topics: Regulation of Gene Expression and Genetic Engineering; Physiology and Comparative Development; and Bacteria and Viruses in the Human Body. Choose one topic and answer **two** questions on that topic, according to the directions given for that topic.

Topic I — Regulation of Gene Expression and Genetic Engineering

Answer two questions: Question 31 (required) and one of the questions 32-33. Answer Question 31 (**required**).

- 31.** One method for detecting the presence of toxins that damage DNA in drinking water involves genetically engineered E. coli bacteria. A special operon is inserted into these E. coli bacteria. This operon contains a control region that is activated when there is damage to the DNA and coding genes whose products glow. The coding genes are taken from an organism of a certain species and the control region is taken from an organism of a different species. The engineered bacteria glow in the presence of toxins that harm DNA, as described in the figure below.



- א. (1) Describe the different stages in the production of E. coli bacteria that contain genes whose products can glow.
(2) From what organism is the control region taken? Explain.
(7 points)
- ב. At which point in the pathway from DNA to protein do we find the regulation of the production of the material that can glow? (2 points)

Answer one of the questions 32-33.

- 32.** The gender of a cat is determined by X and Y chromosomes, similar to that of a human.

The gene that determines whether a cat's fur will be black or orange is linked to the X chromosome. There are cats that have random patches of both colors in their coats.

- א. Explain how the inactivation of the X chromosome in female cats can cause the random distribution of colors in their coats. (3.5 points)
- ב. Could a female cat whose coat has orange and black patches have male offspring whose coats have patches of both colors? Explain.
(2.5 points)

33. The disease β -thalassemia is a hereditary blood disorder in which abnormal hemoglobin is produced. A person suffering from this disease can be treated with gene therapy, in which a gene coding for normal hemoglobin is introduced into stem cells from his bone marrow.

- a. In individuals with this disease, the dysfunctional allele is found in all of the cells of the body. Why are only the red blood cells of these individuals affected? Briefly describe the process that causes this. (3 points)
- b. Will the normal hemoglobin gene that is introduced into the patient's cells by gene therapy be passed on to the patient's descendants? Explain. (3 points)

Topic II — Physiology and Comparative Development

Answer two questions: Question 34 (required) and one of the questions 35-36.

Answer Question 34 (**required**).

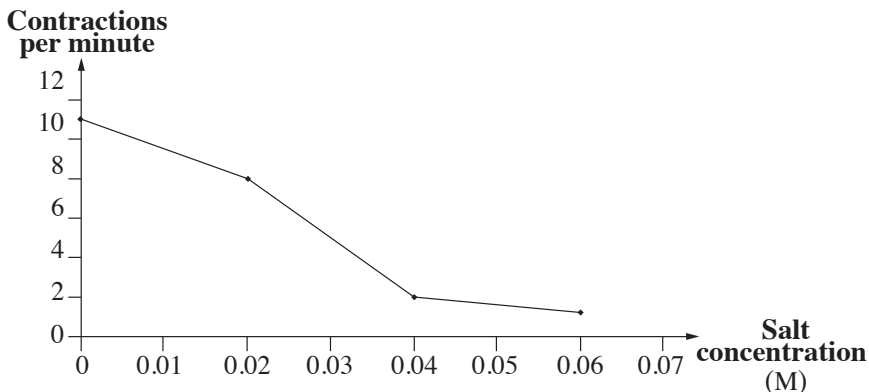
34. a. Some species of fish live in seawater and some species of fish live in freshwater.

Explain the difficulty that fish living in seawater face in regulating their water balance.

Describe two methods that these fish use to regulate their water balance. (5 points)

- b. A paramecium [סנדלית] is a single-celled organism that lives in freshwater. Researchers examined the rate of the activity of the paramecium's contractile vacuole [בועית המתכווצת] in solutions containing different concentrations of salt.

The results of their experiment are presented in the graph below.



- (1) Explain the relationship between the concentration of the salt solution and the rate at which the contractile vacuole contracted.
- (2) A substance that damages mitochondria was added to paramecia that were growing in a salt solution that had a concentration of 0.02 M. After a short period of time, the paramecia swelled up and burst. Explain why.

(4 points)

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Answer one of the questions 35-36.

35. In the life cycle of the frog, the tadpole [ראשן] is the young stage that lives only in water.

- א. What are two characteristics shared by the respiratory system of the tadpole and that of a human? (3 points)
- ב. Explain the importance of each of the characteristics you mentioned above for the proper functioning of the respiratory system. (3 points)

36. א. What are two differences between the structure of a fish egg and the structure of a bird's egg? (3 points)

- ב. Explain how each of the differences that you mentioned above is related to the compatibility of fish eggs or birds' eggs with the environment in which they develop. (3 points)

Topic III — Bacteria and Viruses in the Human Body

Answer two questions: Question 37 (required) and one of the questions 38-39.

Answer Question 37 (**required**).

37. As part of an industrial production process, a culture of bacteria is grown in a chemostat. A chemostat is a system made up of a container in which the culture of bacteria is grown in a liquid medium. Fresh growth medium flows into the container and some of the culture is removed at a fixed rate, so that the volume of medium in the container remains constant. In this manner, the bacteria in the system are maintained at the same phase of the growth curve.

- א. (1) At which phase of the growth curve are the bacteria in the chemostat?
(2) Name two different factors in the system that allow the bacteria to remain at this phase.
(4 points)
- ב. (1) The bacteria in human intestines live in a system similar to a chemostat. Explain this statement.
(2) There is a reciprocal relationship [יחסי הגומלין] between intestinal bacteria and humans. Name two ways that this relationship benefits the bacteria and two ways in which this relationship benefits the human.

(4 points)

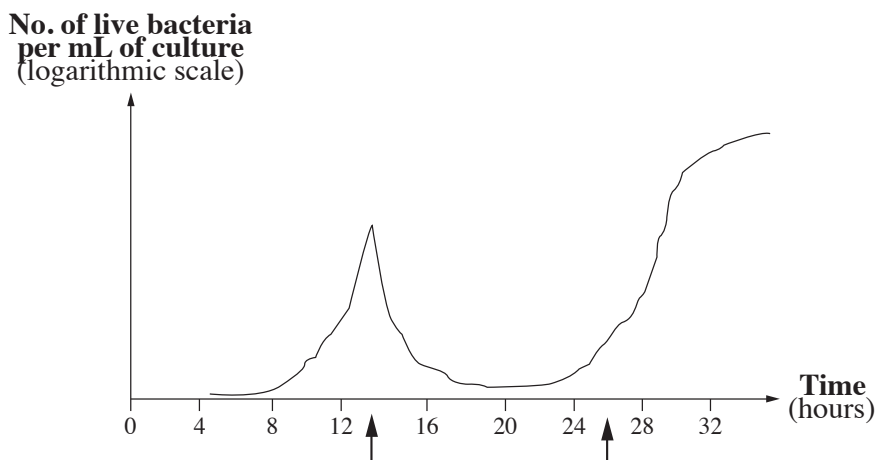
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Answer one of the questions 38-39.

38. The effect of Antibiotic A on *E. coli* bacteria was examined in an experiment. The bacteria grew in a liquid nutrient medium. When they started to multiply rapidly, equal doses of the antibiotic were added to the growth medium at two points in time, indicated by the arrows in the graph below.

Over the course of the experiment, the researchers checked the number of live bacteria in 1 mL of culture each hour.

The results of the experiment are presented in the graph below.

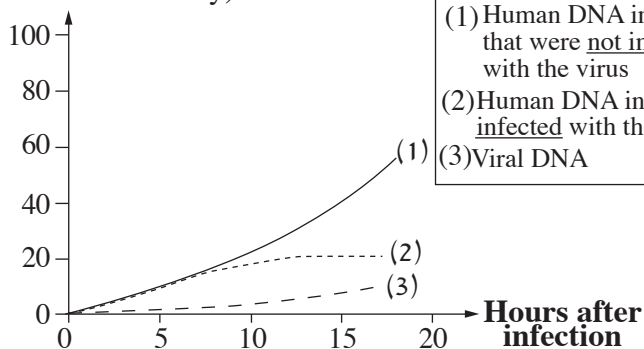


- א. (1) Describe the effect of each of the two applications of the antibiotic on the bacterial population.
- (2) Explain the reason for the difference in the results observed following the two applications of the antibiotic.
- (4 points)
- ב. Compare the mode of action of penicillin in bacterial cells with that of erythromycin.
- (3 points)

39. Researchers examined how the infection of human cells by viruses affects the DNA production of the human and that of the virus. The researchers infected human cells with a virus and then sampled the DNA from those cells at fixed points in time after infection. After the DNA was extracted, they separated the viral DNA from the human DNA and measured the amount of each type of DNA. At the same points in time, the researchers measured the amounts of DNA produced in cells that had not been infected with the virus.

The results of the experiment are presented in the graph below.

**Amount of DNA produced
in the human cells**
(units of radioactivity)



Legend:

- (1) Human DNA in cells that were not infected with the virus
- (2) Human DNA in cells infected with the virus
- (3) Viral DNA

- א. (1) What is the difference between the amount of human DNA in the cells that were infected with the virus and the amount of human DNA in the cells that were not infected with the virus?
- (2) Explain the reason for this difference. Base your answer on the three curves in the graph.
- (4 points)
- ב. Researchers are trying to develop a drug for a disease caused by a virus. Name one mode of action of a drug that is effective against a virus and does not damage the host cells.
- (3 points)

Good Luck!

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בהצלחה!

זכות היוצרים שמורה למדינת ישראל
אין להעתיק או לפרסם אלא ברשות משרד החינוך