

Biology

Questions and Analysis of Scientific Research in the Core Topic Areas Questions on Topics of In-Depth Study

ביולוגיה

שאלות וניתוח מחקר מדעי בנושאי הליבה שאלות בנושאי ההעמקה

Instructions

הוראות

א. Duration of the exam: Three and a half hours

א. משך הבחינה: שלוש שעות וחצי.

ב. Exam structure and breakdown of points:

ב. מבנה השאלון ומפתח ההערכה:

This exam has four parts.
Part One – 32 points
Part Two – 35 points
Part Three – 18 points
Part Four – 15 points
Total – 100 points

בשאלון זה ארבעה פרקים.
פרק ראשון – 32 נקודות
פרק שני – 35 נקודות
פרק שלישי – 18 נקודות
פרק רביעי – 15 נקודות
סך הכול – 100 נקודות

ג. Material that may be used during the exam:

A Hebrew–foreign language / foreign language–
Hebrew dictionary

ג. חומר עזר מותר בשימוש:
מילון עברי–לועזי / לועזי–עברי.

ד. Special instructions:

Mark your answers to Part One on the answer sheet at
the end of your answer booklet (page 23).
Answer the questions in Part Two, Part Three, and
Part Four in your answer booklet.

ד. הוראות מיוחדות:

את התשובות על השאלות בפרק הראשון יש לסמן
בתשובון שבסוף מחברת הבחינה (עמוד 23).
את התשובות על השאלות בפרק השני, בפרק השלישי
ובפרק הרביעי יש לכתוב במחברת הבחינה.

Write in the answer booklet only.

Write the word "טיוטה" at the top of each of draft page.

If you write any draft material on paper outside the answer
booklet, your exam may be disqualified.

יש לכתוב במחברת הבחינה בלבד. יש לרשום "טיוטה" בראש
כל עמוד המשמש טיוטה. כתיבת טיוטה בדפים שאינם במחברת
הבחינה עלולה לגרום לפסילת הבחינה.

Good Luck!

בהצלחה!

Questions

Part One (32 points)

Part One has 20 questions, 1–20.

You must answer all of the questions. If you answer at least 15 questions correctly, you will receive all 32 points.

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

- * Mark the answer you have chosen on the answer sheet at the end of your answer booklet (page 23).
- * For each question, draw an ✕ in pen in the box under the letter (א–ד) 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
☐	☒	☐	☐	

- * 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.

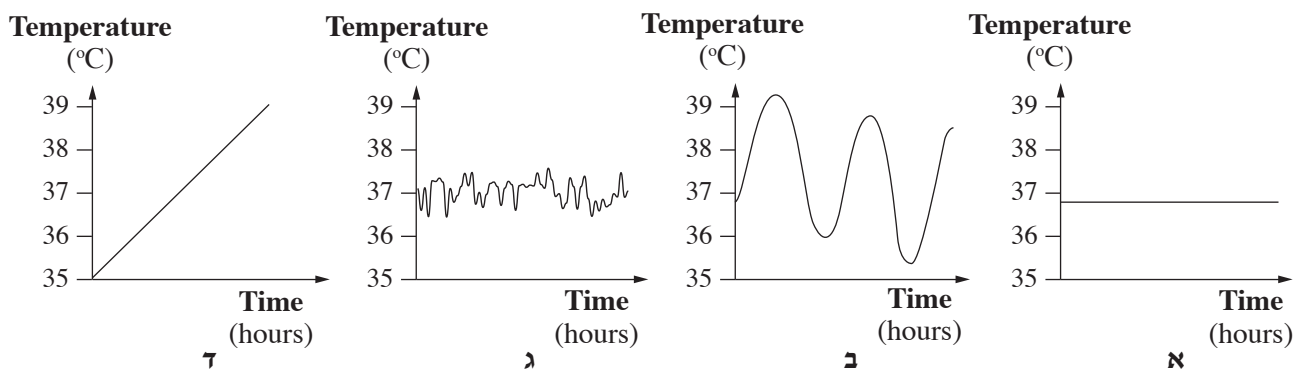
Note: In order to limit the need to erase answers on the answer sheet, we recommend that you first mark the correct answers inside this booklet and only later enter them into the answer sheet at the end of the answer booklet.

Answer all of the questions 1–20.

1. Which of the following statements is correct for all heterotrophic organisms?

- א. They do not require oxygen to breathe.
- ב. They are prokaryotic organisms.
- ג. They produce organic substances from inorganic substances.
- ד. They depend on getting organic substances from the environment.

2. Which graph best describes body-temperature homeostasis in a healthy human at rest, over 24 hours?



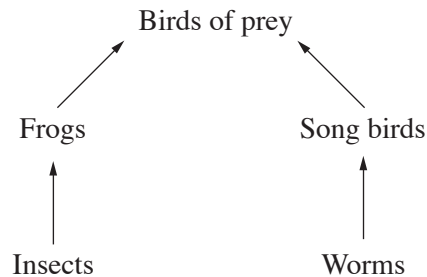
3. Many more **species** of wild plants grow in Israel than in other countries of the same size as Israel. What could be the reason for this?

- א. There is a great variety of habitats in Israel.
- ב. The amount of water available in Israel only allows the existence of geophytes.
- ג. Large areas of Israel are built-up areas.
- ד. The State of Israel is a country with a small area.

4. What will happen if carbon **monoxide** (CO) enters the lungs?

- א. Less oxygen will bind to hemoglobin in the blood.
- ב. There will be more carbon dioxide (CO₂) in the blood.
- ג. The diffusion rate of carbon dioxide from the alveoli [נאדיות] to the blood will decrease.
- ד. The rate of oxygen production through cellular respiration will increase.

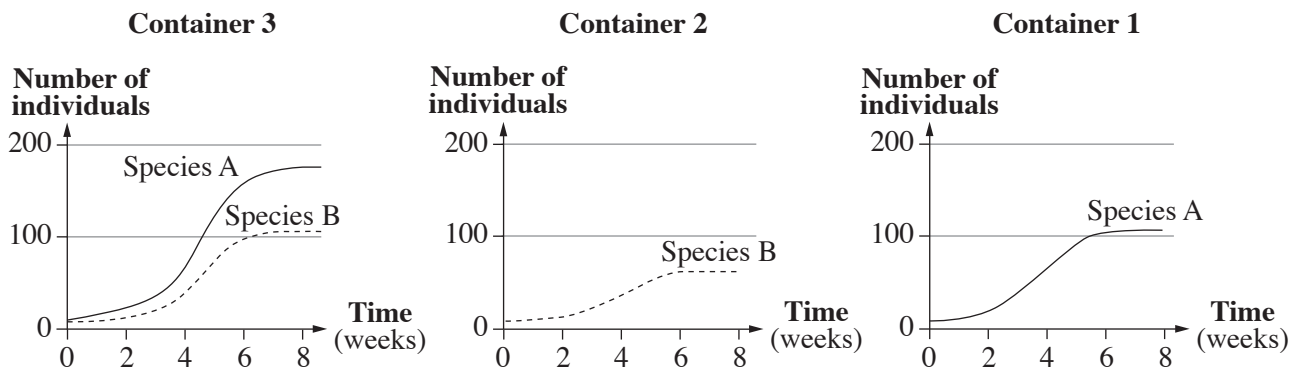
5. Which statement is correct for the two molecules of DNA that are obtained in the replication process?
- They are composed of four strands that formed the original DNA.
 - They are composed of four new strands that were created during replication.
 - Each is composed of one new strand created during replication and one original strand.
 - It is impossible to tell whether the strands of the DNA molecules are original or new.
6. Consider the section of a food web in a certain ecosystem shown in the diagram below.



- What will happen if all the birds of prey are removed from the ecosystem?
- The song bird, frog, and insect populations will grow.
 - The frog population will shrink and the insect population will grow.
 - The song bird population will shrink and the worm population will shrink.
 - The frog population will grow and the insect population will shrink.
7. A healthy person drank a lot of water in a short amount of time.
What is likely to happen to the urine in his body?
- His urine concentration will not change because the kidney is a homeostatic organ.
 - His urine volume will increase because the kidney is a homeostatic organ.
 - The concentration of solutes in his urine will increase to maintain homeostasis.
 - His urine volume will not change because homeostasis is maintained in the kidney.
8. Carrier proteins in the cell membrane and enzymes are two types of proteins that perform different actions in the cell.
Which of the statements א-ד correctly describes a difference between enzymes and carrier proteins?
- Enzymes are affected by ambient temperature, but carrier proteins are not.
 - Enzymes are not specific to the substance to which they bind, but carrier proteins are specific.
 - The amount of enzyme decreases as it works, but the amount of carrier protein remains constant.
 - Enzymes cause change in the substance to which they bind, but carrier proteins do not.

9. Which statement is correct for the levels of an ecological pyramid?
- Each level contains organisms from one species only.
 - A species may be found on more than one level.
 - There are always more individuals on the third level than on the second level.
 - All ecological pyramids have four levels.
10. The kidneys weigh less than 0.5% of body weight, but consume about 7% of the body's total oxygen consumption.
- Which process contributes to the kidneys' relatively high oxygen consumption?
- re-absorption of all glucose from the nephrons into the capillaries
 - re-absorption of protein from the nephrons into the capillaries
 - filtering of substances from the capillaries into the nephrons
 - diffusion of oxygen from the kidney cells to the capillaries
11. When comparing diffusion and active transport, which statement is correct?
- In both processes, substances are transported by investing energy.
 - In diffusion, substances are transported with the concentration gradient, and in active transport substances are transported against the concentration gradient.
 - In diffusion, substances always pass out of the cell, and in active transport substances always enter the cell.
 - Diffusion only occurs through the cell membranes, and active transport only occurs through the organelle membranes.
12. What could increase the amount of air entering the lungs?
- increasing chest volume
 - relaxing the diaphragm
 - increasing the percentage of oxygen in the air
 - reducing the respiration rate
13. What is a gene composed of?
- a sequence of monosaccharides
 - a sequence of amino acids
 - a sequence of nucleotides
 - a sequence of fatty acids
14. Which statement is correct for an ATP molecule?
- All energy in the cell is stored in ATP.
 - It is a molecule that serves as a storage molecule.
 - It is a molecule that is only produced in animals that maintain a constant body temperature.
 - It is a molecule that is produced in processes that release energy and is used in processes that consume energy.

15. A researcher cultured two species of unicellular organisms that consume the same food in three containers: Species A in Container 1, Species B in Container 2, and both species together in Container 3. The following graphs describe the number of individuals of each species that were measured in this experiment.



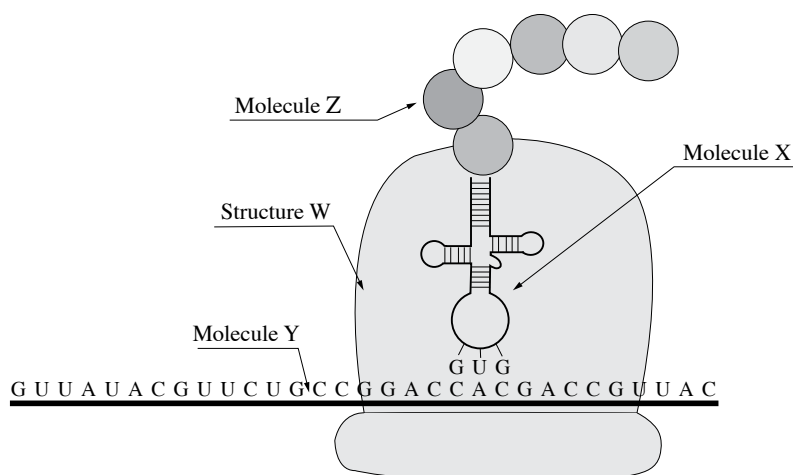
What type of relationship could there be between the two species?

- א. competition
 - ב. commensalism
 - ג. mutualism
 - ד. parasitism
16. Why can we not give type AB⁻ blood to a person whose blood type is A⁺? The signs -/+ signify the Rh antigen.
- א. because the recipient's body has antibodies to the A antigen
 - ב. because the recipient's body has antibodies to the B antigen
 - ג. because the recipient's body has antibodies to the A and B antigens
 - ד. because the recipient's body has antibodies to the Rh antigen
17. Which statement about the existence of organelles in the cell is correct?
- א. The existence of organelles characterizes prokaryotic cells, not eukaryotic cells.
 - ב. The existence of organelles characterizes plant cells, not animal cells.
 - ג. The existence of organelles allows processes to occur in different conditions at the same time.
 - ד. The existence of organelles allows processes to take place only in the larger cells of the organism.
18. What is the correct sequence of processes in the heart of a healthy person?
- א. atria contract → valves between atria and ventricles open → blood flows from atria to ventricles.
 - ב. ventricles contract → valves between atria and ventricles open → blood flows from ventricles to atria
 - ג. ventricles contract → valves between atria and ventricles open → blood flows from ventricles to arteries
 - ד. all atria and ventricles contract simultaneously → all valves open → blood flows from ventricles to arteries

19. Which statement is correct for the carbon cycle and the nitrogen cycle in nature?

- א. Carbon and nitrogen that plants take up from the air are used to build organic compounds.
- ב. Inorganic compounds of carbon and of nitrogen are used to build organic compounds in plants.
- ג. Inorganic compounds of carbon and of nitrogen are used to produce energy in plants.
- ד. Decomposers do not participate in either the carbon cycle or the nitrogen cycle.

20. Based on the following illustration, determine which of the statements א–ד below is correct.



- א. Structure W is messenger RNA (mRNA).
- ב. Molecule Y is composed of amino acids.
- ג. Molecule Z is composed of codons.
- ד. Molecule X is transfer RNA (tRNA).

Note: Mark your answers on the answer sheet on page 23 at the end of the answer booklet.

Part Two (35 points)

Part Two has seven questions, 21–27.

Choose four questions and answer them in your **answer booklet** (each question — 8.75 points).

21. א. Capillaries A and B are located in two different organs in the human body. In Capillary A, oxygen concentration is lower at the venous end than at the arterial end. In Capillary B, oxygen concentration is higher at the venous end than at the arterial end.

(1) Of the two capillaries, which one (A or B) is in the hand and which one is in the lung?

(2) For each capillary, determine the direction of glucose transfer: from the blood into the cells or from the cells into the blood.

(5 points)

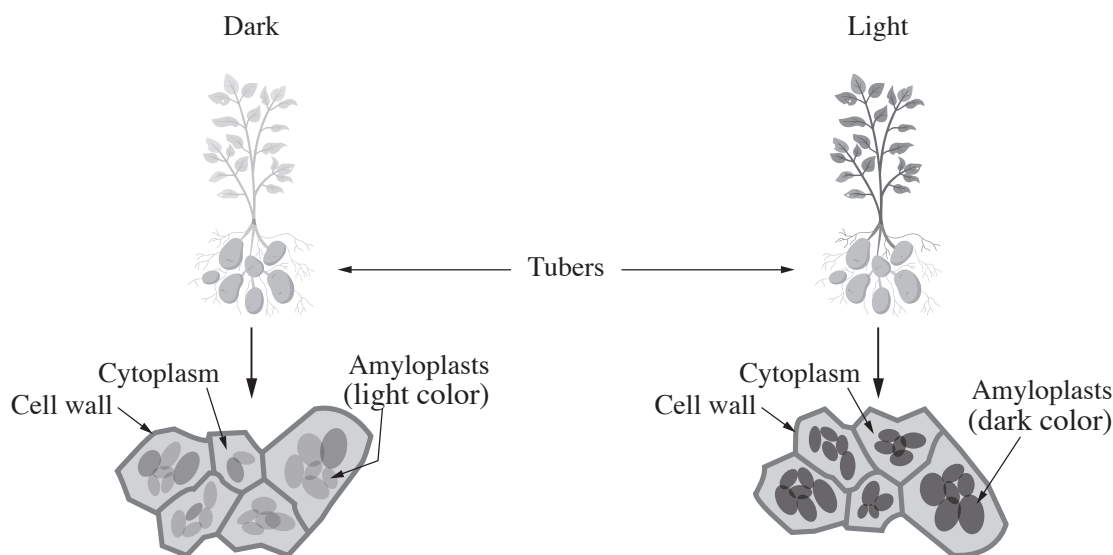
- א. Red blood cells lack certain organelles that other cells do have.

A researcher discovered that red blood cells produce the **same** amount of ATP with and without oxygen, and that this amount is **lower** compared to the amount that most body cells produce.

The absence of which organelle could account for these findings? Explain your answer.

(3.75 points)

22. א. Researchers grew two potato plants in the light. After some time, they moved one plant to the dark and left the other in the light. All other conditions were identical. Five days later, they cut open one tuber from each plant, applied iodine solution, and observed the cells. The results are shown in the illustration below. Remember that the reaction of iodine and starch produces a dark color.



Explain how the different lighting conditions caused the different results obtained in the cells of each of the tubers. In your explanations, discuss the processes that take place in the plant cells. (4.75 points)

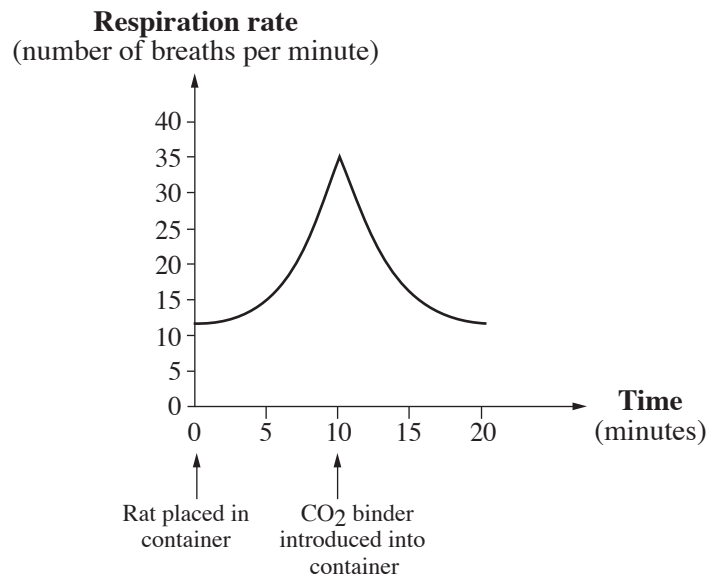
- א. The enzyme RuBisCO catalyzes CO_2 fixation in the process of photosynthesis. Some individuals in the population of a certain plant species had a more efficient RuBisCO enzyme. **Determine** whether we can expect the biomass of these plants to be higher than, lower than, or equal to the biomass of the other plants in this population. **Explain** your answer. (4 points)

23. א. The relationship between structure and function is a central concept in biology.

Name two structural properties of the human respiratory system, and **explain** how each of these properties is adapted to the function of the respiratory system. (4 points)

ב. Humans and rats have a similar mechanism for regulating breathing.

A rat was placed in a large sealed container with air. After 10 minutes, a substance that binds CO_2 and removes it from the air inside was introduced into the container. The rat's respiration rate was measured throughout the experiment. The results are shown in the graph below.



Explain the change in the rat's respiration rate **up to** Minute 10, and the change in its respiration rate **after** Minute 10. (4.75 points)

24. The 2023 Nobel Prize for medicine was granted for research that became the foundation for development of **mRNA vaccines** for the COVID virus.

The vaccine injected into the body is composed of artificial particles containing mRNA (messenger RNA) that encodes one viral protein. This mRNA penetrates cells in the body and is translated into the viral protein. The translated viral protein is presented on the surface of the membrane of the penetrated cell.

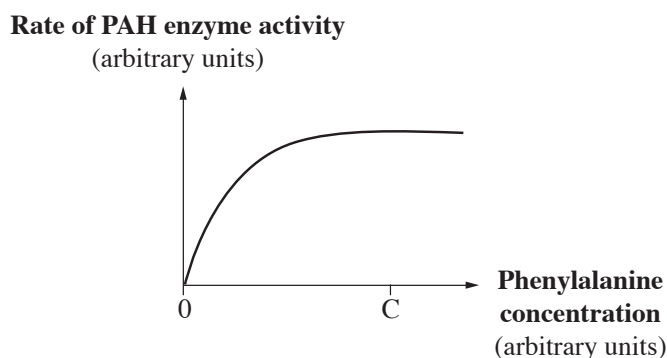
א. Explain how the mRNA vaccine injected into the body causes active immunity to the virus. (4 points)

ב. Can mRNA vaccines change the DNA in body cells? Explain your answer. (4.75 points)

25. The amino acid tyrosine is produced in cells from the amino acid phenylalanine. The enzyme PAH catalyzes this process.



- א. The graph below describes the relationship between the concentration of the amino acid phenylalanine and the rate of enzyme activity.



A test tube contains phenylalanine at a concentration of C. Substance X is added to the test tube, which causes an increase in the activity rate of the enzyme PAH.

Of the three substances phenylalanine, tyrosine, and the enzyme PAH, **determine** one that could be Substance X and one that could not be Substance X. **Explain** your answers.

(5 points)

- ב. The gene encoding the enzyme PAH has several point mutations. In some cases, despite the mutation, the enzyme produced is normal.

With which type of point mutation—deletion, change, addition—is there the highest chance of producing a **normal** enzyme despite the mutation? Explain your answer. (3.75 points)

26. Twisted acacia [שיטה סלילנית] is a common tree in the Negev. The dorcas gazelle [צבי המדבר] eats the fruit of the twisted acacia. The gazelle excretes seeds of these fruit in its feces, which may germinate at a distance from the tree. The *Plicosephalus acaciae* (הרנוג השיטים), a type of mistletoe, is a climber that grows on the twisted acacia tree, absorbing water and minerals from the tree. The *Plicosephalus acaciae* has green leaves and red flowers with nectar. The Palestine sunbird [צופית] feeds on this nectar and pollinates the mistletoe's flowers.

- א. Choose from the species discussed above two pairs of organisms, from different species, that have the same type of relationship.

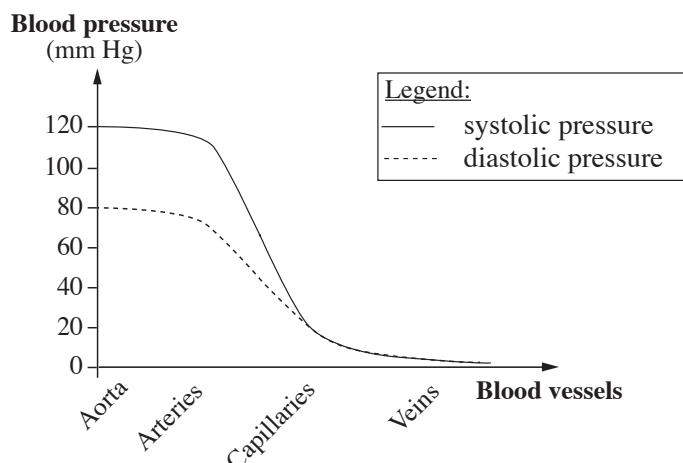
List both pairs, **determine** the type of relationship in each pair, and **describe** the way this relationship works in each pair.

(5 points)

- ב. **Determine** whether *Plicosephalus acaciae* is a producer. **Explain** your answer.

(3.75 points)

27. א. The following graph shows data for average blood pressure in various blood vessels in the systemic circulation [מחזור הדם הגדול].



- (1) What factor causes the difference between systolic blood pressure and diastolic blood pressure in the aorta?
 - (2) **List** one structural difference between an artery and a vein, and **explain** how this difference is related to the data shown in the graph.
(5 points)
- ב. During vigorous running, more blood flows to the muscles and skin.
Explain why increased blood flow to each of these body parts is important during exertion.
(3.75 points)

Part Three (18 points)

Part Three has three questions, 28–30.

Read the description of the research below, and answer all of the questions 28–30 in your answer booklet.

Honey trap

It's a good idea to avoid leaving sweet foods out on your kitchen table, because so many insects, cockroaches included, are attracted to sweet food. This attraction is useful in pest control: glucose, a sweet-tasting monosaccharide, is added to poisonous bait used to exterminate cockroaches.

Sometimes this bait is ineffective. Researchers are trying to find the reason for this.

In an experiment conducted in an American university, researchers collected cockroaches of a certain species in the wild and tested their attraction to glucose. The researchers found that most of the individuals were attracted to it—these individuals were called WT. They also found a few individuals that avoided glucose—these individuals were called GA.

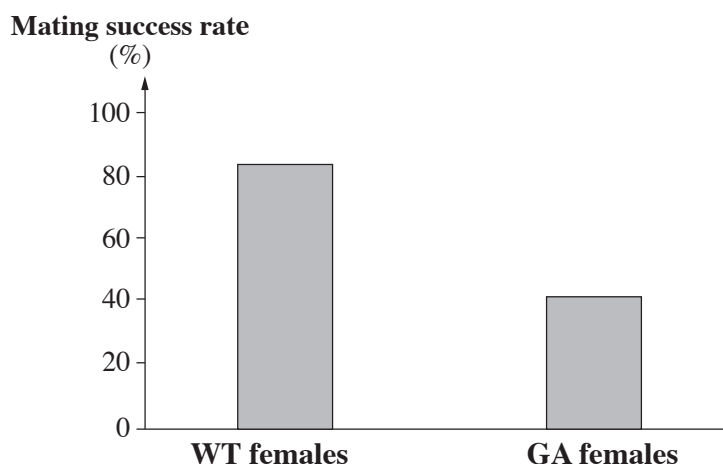
The researchers cultivated a population of this species of cockroaches for 150 generations in the presence of poisonous bait that contained glucose.

They found that in time, over the generations, the frequency of glucose-avoiding individuals increased in this population.

- 28.** Describe the steps in the evolutionary process that eventually led to an increase in the frequency of individuals with the glucose avoidance trait in the study population. (5 points)

In the species of cockroaches tested in this study, males attract females in a process called **nuptial feeding**. In this process, the male cockroach offers the female a liquid secretion from a gland that is located on its abdomen under its wings. This courtship liquid is a mixture of nutrients, including sugars like glucose. After the female consumes the courtship liquid, the mating process takes place. The researchers measured mating success of WT males with GA (glucose avoiding) females and of WT males with WT (attracted to glucose) females. The results of this experiment are shown in Graph 1.

Graph 1: Mating success rates for WT males mating with GA females and WT females



/continued on page 13/

29. א. (1) Explain the **difference** in results between the two groups of females shown in Graph 1.
- (2) The glucose avoidance trait can have both benefits and drawbacks for the cockroach population.
- Explain one benefit and one drawback. Base your explanation on information in the passage.
- (4.5 points)

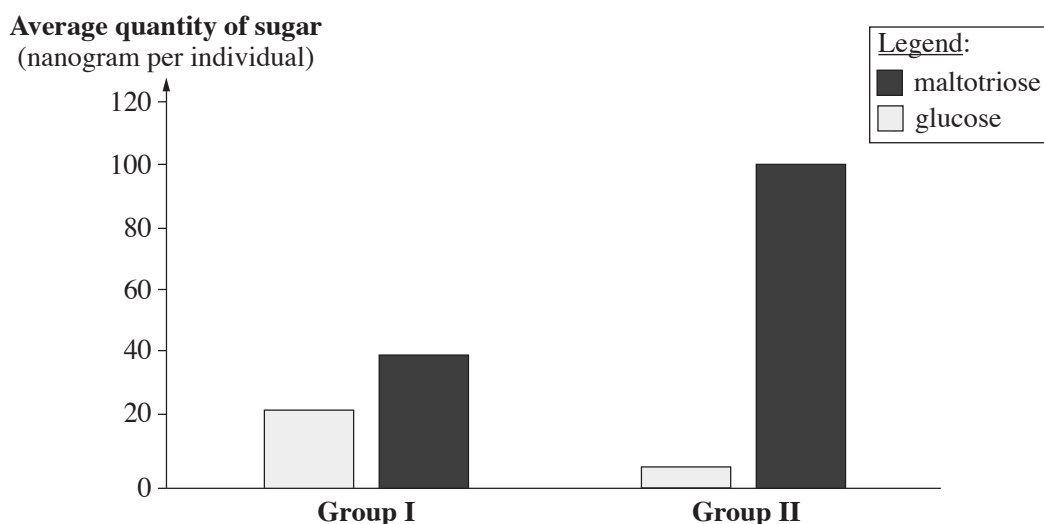
The researchers checked whether there are other differences in reproduction-related traits between individuals in the study population. One trait that they tested was the composition of the courtship liquid that males secrete.

This courtship liquid contains a mixture of sugars including glucose, which is sweet, and maltotriose, which is less sweet. Maltotriose breaks down slowly in the females' bodies into glucose units.

The researchers measured the amounts of these sugars in the courtship liquid of males from the study population, and found that these individuals can be divided into two groups (Group I and Group II) by the difference in sugar composition of their courtship liquid.

The measurements are shown in Graph 2.

Graph 2: Quantities of sugars in courtship liquid in the two groups of males



- א. (1) Use the results shown in Graph 2 to **determine** which group of males (I or II) has a higher chance of successful mating with GA females. **Explain** your answer.
- (2) Cellular respiration utilizes sugars more **slowly** in the body of females that eat the courtship liquid of Group II males, compared with females who eat the courtship liquid of Group I males.
- Explain why. In your explanation, discuss both types of sugar that are present in the courtship liquid.
- (4.5 points)
30. The study described in the passage is related to the wide use of chemical pest control.
- List two disadvantages of chemical pest-control. At least one should be based on biological considerations.
- Explain one of these disadvantages—choose a disadvantage that is based on biological considerations.
- (4 points)

Part Four (15 points)

This part includes three topics:

Topic I: Regulation of Gene Expression and Genetic Engineering – pages 15-17

Topic II: Comparative Developmental Physiology: from Unicellular Organisms to Mammals – pages 18-19

Topic III: Bacteria and Viruses in the Human Body – pages 20-21

Choose one topic and answer **two** questions from that topic, according to the directions given under the topic you chose.

(Note: The exam continues on the next page.)

Topic I — Regulation of Gene Expression and Genetic Engineering

Answer two of the questions 31-33 in your answer booklet. The point value is given at the end of each item.

31. Genetic engineering was applied to extend the shelf-life of tomatoes.

The cells of tomato plants contain Gene A which encodes an enzyme that catalyzes fruit (tomato) ripening.

Using genetic engineering methods, Gene B was inserted into a tomato plant zygote, from which a whole plant with fruit developed.

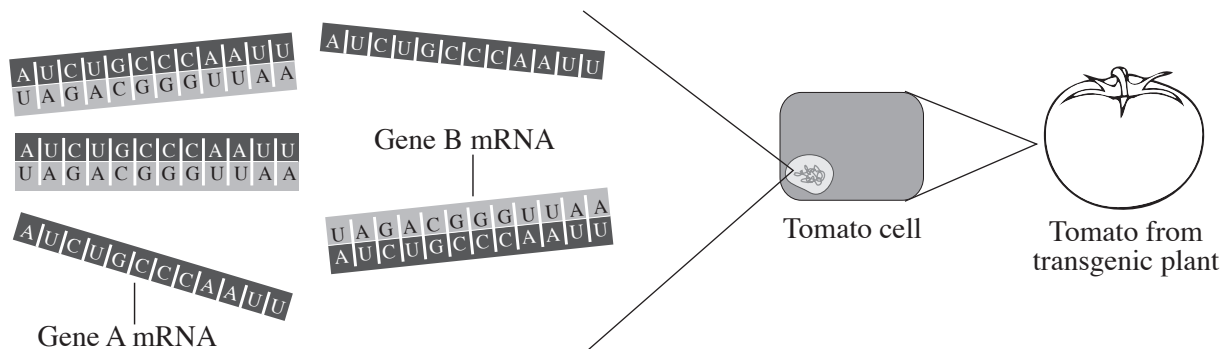
Researchers found that the fruit of the transgenic tomato plant ripened more slowly compared with the regular plant.

א. Will Gene B that was inserted into the **zygote** pass to the offspring of the transgenic plant?

Explain your answer. (3 points)

ב. Both genes, A and B, were transcribed in the cells of the transgenic tomatoes.

After both genes were transcribed, the Gene B messenger RNA (mRNA) strands adhered to some of the Gene A mRNA strands, as shown in the illustration below:



This adherence of mRNA strands caused the tomatoes on the transgenic plant to ripen more slowly. Explain why. (4.5 points)

32. In living organisms, gene expression is regulated.

- א. Hemoglobin is a protein built of four sub-units, each of which is a chain of amino acids. There are three types of sub-units, alpha (α), beta (β), and gamma (γ). Each sub-unit is encoded by a different gene.

There are differences in hemoglobin sub-unit composition between human fetuses, newborns, and adults.

These differences are shown in the following table:

Sub-unit Stage of development	Number of sub-units		
	α	β	γ
Fetus (4 months old)	2	0	2
Newborn (one-day old baby)	2	1	1
Adult human	2	2	0

Explain how the information in the table shows that regulation of gene expression exists.

(3 points)

- ב. The root cells of certain plants produce Protein T—which is associated with absorbing nitrogen from the soil—but do not produce chlorophyll. The leaf cells of these plants do produce chlorophyll but do not produce Protein T.

Copy the following table to your answer booklet, and fill in the missing information (present/none). (4.5 points)

Cell type	Components in the cell	Root cell	Leaf cell
		(present/none)	(present/none)
1	Gene for Protein T		
2	mRNA (messenger RNA) translated to Protein T		
3	Gene for enzyme that catalyzes chlorophyll production		
4	mRNA translated into enzyme that catalyzes chlorophyll production		

33. א. Researchers cultured a certain species of bacteria on three different culture media. All three media contained an identical amount of sugars, but the sugar composition in each medium was different.

The following table shows the sugar composition of each of the culture media.

	Culture medium I	Culture medium II	Culture medium III
Sugars in the medium	100% lactose	100% glucose	50% lactose + 50% glucose

- (1) In the bacteria cultured on these media, the transcription rate of the lactose operon's structural genes was different for each of the three culture media.
Determine in which of the culture media—I, II, or III—the transcription rate of the lactose operon's structural genes was highest, and in which it was lowest.
- (2) Medium I does not contain glucose.
Explain the effect of **absence of glucose** on the rate of transcription of the lactose operon's structural genes.
In your explanation, discuss the strength of the bond between the transcription enzyme and the promoter site.
(4.5 points)
- ב. Certain bacteria have a lactose operon, but are unable to break down lactose because of a mutation.
Provide an example of a possible mutation in a lactose operon structural gene or regulatory site, and **explain** how such a mutation can prevent the bacteria from utilizing lactose in the medium.
(3 points)

Topic II — Comparative Developmental Physiology: from Unicellular Organisms to Mammals

Answer two of the questions 34-36 in your answer booklet. The point value is given at the end of each item.

34. The paramecium is a common freshwater unicellular organism. There are many studies of different species of paramecium.

- א. (1) In an experiment, paramecia of a certain species were placed in two salt solutions of different concentrations. The researcher measured the contraction rate of the contractile vacuole [בועית מתכווצת] in these paramecia. The results are shown in the following table.

	Average number of contractions per minute
Solution I	2
Solution II	9

Determine in which solution, I or II, the salt concentration was higher, and **explain** your answer based on the results.

- (2) What would be the effect of adding a substance that damages the mitochondria on the contraction rate of the paramecium's contractile vacuole?

Explain your answer.

(4.5 points)

- ב. Paramecia absorb oxygen from the external environment by diffusion, but in other organisms diffusion is insufficient and their bodies have complex systems for supplying cells with oxygen.

Name two systems in mammals that are related to oxygen supply, and **explain** why each one has a crucial role in supplying oxygen to all body cells. (3 points)

35. There are differences between the body systems of animals that live in aqueous habitats and animals that live in terrestrial habitats.

- א. (1) Certain species of snakes that inhabit freshwater excrete mostly ammonia, while species of snakes living in terrestrial habitats excrete mostly uric acid.

Explain how the type of nitrogen waste that each species excretes is an adaptation to the species' habitat—aqueous or terrestrial.

- (2) The food of snakes that live in the sea is rich in salt. These snakes have a gland that excretes a concentrated salt solution into the environment.

Explain the importance of this gland to the normal functioning of these snakes' body cells.

(5 points)

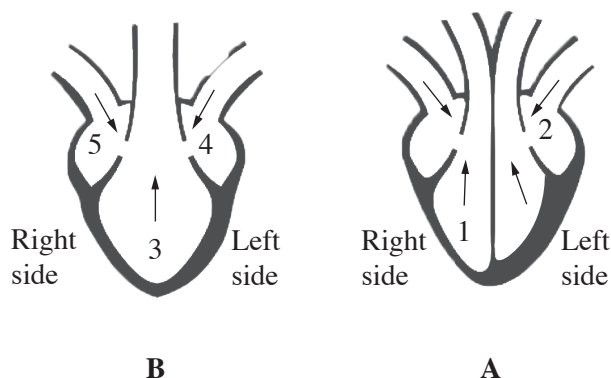
- ב. Fertilization takes place in a moist environment in animals that live in water and also in animals that live on land.

List one reason why a moist environment is crucial to the fertilization process.

(2.5 points)

36. The house mouse and the European green toad are two species found in Israel. The mouse is a mammal and the toad is an amphibian.

- א. One of the following illustrations of hearts is of a mouse heart and one is of a toad heart. The arrows represent the direction of blood flow.



- (1) **Determine** which illustration, A or B, describes the heart of a toad, and **explain** your answer.

- (2) Determine for each of the chambers labeled 1, 2, 3, 4, 5 whether the blood flowing through it is oxygen-poor, oxygen-rich, or mixed.

(4.5 points)

- ב. What change would occur in the metabolic rate of the toad cells if the ambient temperature rose from 10°C to 20°C? Explain what causes this change. (3 points)

Topic III: Bacteria and Viruses in the Human Body

Answer two of the questions 37–39 in your answer booklet. The point value is given at the end of each item.

37. א. Researchers investigated the effect of two antibiotic substances—penicillin and erythromycin—on a certain species of bacteria.

The effect of each of the substances was tested in bacteria cultured in two solutions, each of a different salt concentration. One solution was hypotonic to these bacteria and the other was isotonic.

The results are shown in the following table:

Effect of antibiotic on the presence of bacteria in the solutions

Antibiotic substance Solution type	Substance A	Substance B
Hypotonic solution	no live bacteria	no live bacteria
Isotonic solution	no live bacteria	live bacteria present

- (1) **Determine** which of the two antibiotic substances, A or B, is penicillin. **Explain** your answer based on the results obtained in both solutions that you decided contained penicillin. In your answer, discuss how penicillin works.
- (2) **Determine** which of the two antibiotic substances, A or B, is erythromycin. **Explain** your answer based on the results obtained in both solutions that you decided contained erythromycin. In your answer, discuss how erythromycin works.

(4.5 points)

- ב. The gastrointestinal system of a healthy human contains many species of bacteria, including a small population of Kd bacteria, a species which can cause severe gastroenteritis (stomach flu). A certain antibiotic kills different types of bacteria, but does not harm Kd bacteria.

Explain why prolonged use of this medicine increases the risk of severe gastroenteritis.

(3 points).

38. In many places in the world, people do not have access to clean water. To provide them with potable (drinkable) water, there are several methods available for disinfecting water.

א. (1) One method of water disinfection uses ultraviolet (UV) radiation. This type of radiation has many effects, one of which is inhibition of the transcription process.

Inhibiting transcription is an effective means of damaging bacteria in water, but it is not effective against viruses present in the water.

Explain both parts of this statement.

(2) Boiling is another method of disinfecting water. Explain why boiling water is harmful both to bacteria and to viruses.

(4.5 points)

ב. Cholera is a common disease in areas with contaminated drinking water. Explain why the **first** treatment given to a cholera patient is fluids. In your answer, discuss the way that the cholera bacteria causes the disease's symptoms. (3 points)

39. א. In a study of HIV, the virus that causes AIDS, researchers investigated viral proliferation in lymphocytes. They split lymphocytes into two groups, I and II and then:

- infected the lymphocytes in Group I with whole HIV viruses;
- inserted **only** the genetic material of HIV viruses into Group II lymphocytes.

The viruses in Group I proliferated, but the viruses in Group II did not proliferate.

List one viral component that was missing in Group II, and **explain** the importance of this component to the proliferation of viruses. (3 points)

ב. An innovative idea for treating people who get infected with AIDS involves injecting antibodies that bind to the cell-membrane receptors that HIV viruses are able to bind to.

(1) Explain how this treatment can slow down the spread of the virus through the body of a person who becomes infected with AIDS.

(2) Although it is innovative, treating people with antibodies that bind to cell-membrane receptors can interfere with the normal function of the body's cells. Explain why.

(4.5 points)

Good Luck!

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