

Biology

Reform for Meaningful Learning Program

Instructions for examinees

- א. Duration of the exam: Two hours
- ב. Exam structure and breakdown of points:
This exam has two parts.
Part One — 50 points
Part Two — 50 points
Total — 100 points
- ג. Material that may be used during the exam:
A Hebrew-foreign language/foreign language-
Hebrew dictionary.

- ד. Special instructions:
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 exam may be disqualified!

Good Luck!

ביולוגיה

על פי תכנית הרפורמה ללמידה משמעותית

הוראות לנבחן

- א. משך הבחינה: שעותיים.
- ב. מבנה השאלון ומפתח ההערכה:
בשאלון זה שני פרקים.
פרק ראשון — 50 נקודות
פרק שני — 50 נקודות
סה"כ — 100 נקודות
- ג. חומר עזר מותר בשימוש:
מילון עברי-לועזי / לועזי-עברי.
- ד. הוראות מיוחדות:
את תשובותיך לשאלות 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!

Questions

Part One (50 points)

Animal Behavior

There are four questions in Part One, 1-4.

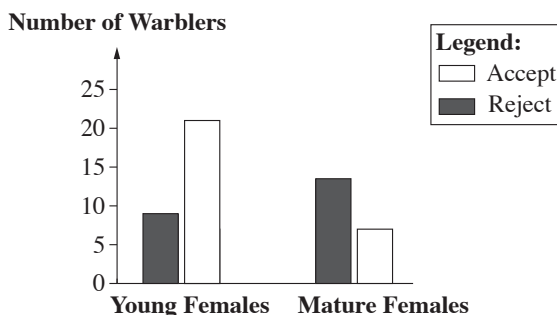
Answer three questions: Question 1 (required) (26 points) and two of the Questions 2-4 (2×12 points).

Answer Question 1 (**mandatory**).

1. The cuckoo is a song-bird that is parasitic on many other song-birds, including the great reed warbler [קניית אירופית]. During the warbler's nesting season, a cuckoo will lay a single egg in a warbler's nest. Often, after the cuckoo chick hatches, it throws all the warbler's eggs or chicks out of the nest.
 - א. The cuckoo's offspring is a nidicolous chick. List three differences between nidicolous [גחל] and nidifugous [אפרוח] chicks. (4 points)
 - ב. Cuckoos lay their eggs only in some of the warblers' nests. What do you think would happen to the cuckoo population if cuckoos laid their eggs in all the warblers' nests. Explain your answer. (6 points)

Researchers have found that a warbler responds to a cuckoo egg in its nest by accepting or rejecting it. They tested the reaction to cuckoo eggs in young female warblers (first-time layers) and in mature warblers. The study's results are shown in the diagram below.

Graph: Response of young and mature female warblers to cuckoo eggs



- א. (1) What was the research question?
(2) What can one conclude from this study's results?
(8 points)

(Note: Item 7 of this question is on the next page)

/continued on page 3/

7. Described below are the two behaviors (1) and (2), that are mentioned in the question.

For each behavior, determine if it is an innate or a learned behavior or both:

- (1) Behavior of a cuckoo chick in a warbler's nest: throwing out all the warbler eggs or chicks.
(2) Warbler behavior: accepting or rejecting the cuckoo egg.

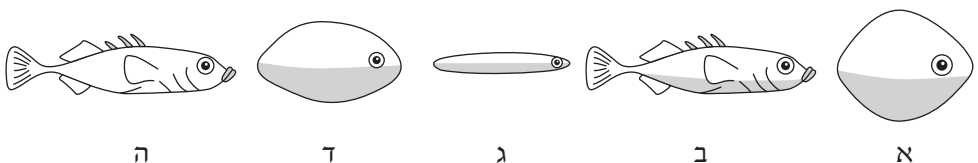
Justify both answers.

(8 points)

Answer two of the Questions 2-4.

2. When two male stickleback fish [דג עיקצן] meet during the breeding season, they attack each other. An experiment was conducted to discover the external stimulus that triggers this reaction.

In the experiment, a male stickleback was shown artificial models with red-painted abdomens (underside), as shown in Figures 7-8 (gray areas), and the fish reacted aggressively. When the fish was shown an accurate model of a male fish with an abdomen that was not red (Figure 9), it did not react at all.



8. List two conclusions that can be drawn from this experiment's results.

(4 points)

9. The abdomen of a male stickleback only turns red during the breeding season. Explain the advantage of the fish's abdomen turning red during breeding season.

(5 points)

10. A red abdomen is a sign stimulus in sticklebacks. Provide another example of a sign stimulus.

(3 points)

3. For many animals, odor is a means of communication.
- א. List one advantage and one drawback of this means of communication. (4 points).
- ב. In an experiment, young female mice were divided into two groups. The test group was placed in a cage with a partition which allowed only volatile substances to pass through it. Urine of an adult male mouse was applied on the other side of the partition. The other group was the control.
- The researchers found that females in the test group reached sexual maturity earlier than those in the control group.
- (1) List one possible difference between experiment conditions of the control group and those of the test group.
- (2) Researchers concluded that the substance that accelerated sexual maturation of the females in the test group is a primer pheromone. List one argument to support the conclusion that the substance is a **pheromone** and one argument to support the conclusion that the substance is a **primer** pheromone. (8 points)
4. *Micrurus* is a genus of venomous coral snake [פתן אלמוגי] with black, red, and yellow bands. These colors convey a visual message.
- א. What is the visual message conveyed by the colors of the coral snake, and who is it directed at? (4.5 points)
- ב. The milk snake [נחש זעמן אלמוגי] has a banding pattern that closely resembles the banding of the coral snake, but it is not venomous. What is the phenomenon displayed by this resemblance? List its advantage to the milk snake. (4.5 points)
- ג. Determine whether a predator that does not have cones in its retina is able to see warning colors. Justify your answer. (3 points)

Part Two (50 points)

From Seed to Seed

There are four questions, 5-8, in Part Two.

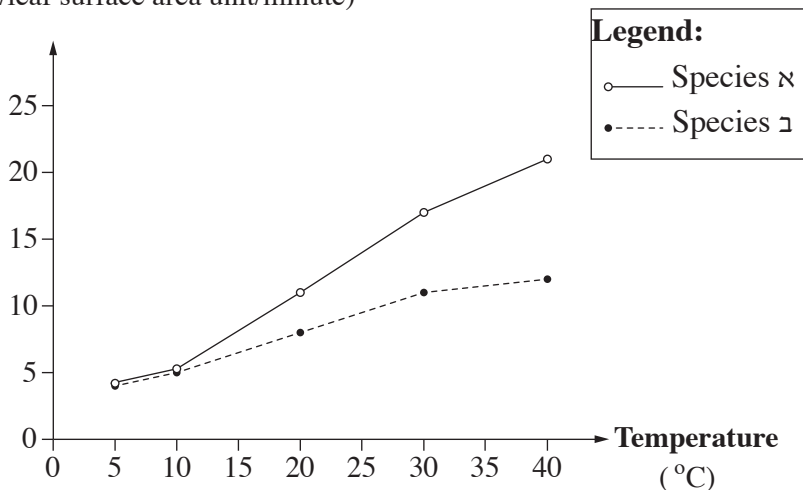
Answer three questions: Question 5 (required) (26 points), and two of the Questions 6-8 (2×12 points).

Answer Question 5 (**required**).

5. Several species of saltbush grow in Israel in various habitats, including the desert. In an experiment the rate of CO_2 absorption at various temperatures was measured in two different species of saltbush.

The graph below shows the obtained measurements.

Graph: Rate of CO_2 absorption in two different species of saltbush
Rate of CO_2 absorption
(milimole/leaf surface area unit/minute)



- א. The rate of CO_2 absorption is used in this experiment as a measure of a process that is taking place inside the plant.

What is this process? (2 points)

- ב. What are the independent variables in this experiment? (4 points)

(Note: This question continues on the next page.)

- ג. List two factors that must remain constant during the experiment.
Explain why it is important to keep them constant. (6 points)
- ד. Which of the saltbush species is better adapted to desert conditions?
Use the data from the graph to justify your answer. (7 points)
- ה. One characteristic of a desert habitat is the limited water supply. Why is water essential to germination? List one reason and explain it. (7 points)

Answer two of the questions 6-8.

6. Below are data for the dry weight (without water) of pea seedlings that germinated and grew in the light for 30 days.

Seedling age (days)	Average dry weight (mg)			
	Cotyledons (seed leaves)	Shoot	Root	Whole seedling
0	186	—	—	186
10	78	32	22	132
20	42	60	30	132
30	38	84	36	158

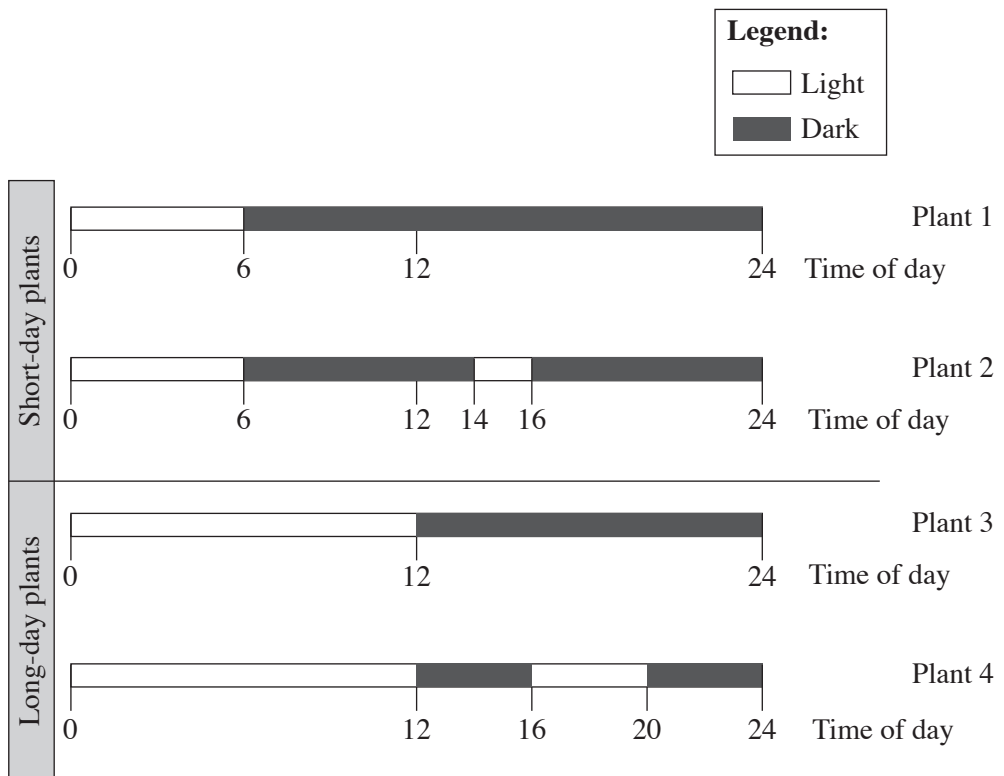
- א. Describe and explain the changes in dry weight of the whole seedling on days 0-10 and on days 20-30 from the beginning of germination. (7 points)
- ב. Researchers germinated and grew pea seedlings in the dark. Try to think what the change in weight of the whole seedling would be if it grew in the dark for 30 days. Explain your hypothesis. (5 points)

7. Two species of a plant were studied in an experiment: one species is a short-day plant and the other species is a long-day plant.

The short-day plants that were studied will flower when night is 14 hours or more.

The long-day plants that were studied will flower when night is 10 hours or less.

Two short-day plants (Plants 1-2) and two long-day plants (Plants 3-4) were selected. All four plants were illuminated with white light, but each was exposed to a different illumination regime, as shown in the figure below.



- א. For each of the plants 1-4, determine if it is expected to flower.

(5 points)

- ב. Justify each of your statements in Item א. (7 points)

/continued on page 8/

8. א. List two mechanisms that prevent self-pollination in plants.

(4 points)

ב. Three plant species are growing in a certain field:

- Species א reproduces by means of runners (stolons)
- Species ב cross-pollinates
- Species ג self-pollinates

Rank the species א-ג by the degree of genetic variability between each species' offspring: start with the species with offspring that are most genetically variable and end with the species with offspring that are least genetically variable. Justify your ranking. (8 points)

Good Luck!

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בהצלחה!

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