

## UNIT 5

**Complete the sentences with the correct words.**

accomplish	anonymous	phenomenon	shrewd	synchronize
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- The manager cited her \_\_\_\_\_ decision-making as the reason she was asked to lead the team.
- A hundred people were asked to complete the feedback form. They were allowed to either leave their names or remain \_\_\_\_\_.
- It is an amazing \_\_\_\_\_ to watch, thousands of adult salmon swimming upstream against the current of the water.
- We asked the runners to \_\_\_\_\_ their watches before they set out on the day's leg of the cross-country race.
- The two companies working together were able to \_\_\_\_\_ their goals in half the projected time.

ANSWERS: 1. shrewd, 2. anonymous, 3. phenomenon, 4. synchronize, 5. accomplish

POINTS: 5

**Choose the correct word to complete each sentence.**

- Lyrebirds are known for their amazing ability to \_\_\_\_\_ almost any sound they hear.
  - realistically
  - imitate
  - coordinate

ANSWER: b

POINTS: 1

LEVEL 4 Assessment Answer Key

7. We will need to hire a project manager to \_\_\_\_\_ the multi-media marketing campaign.
- a. accomplish
  - b. imitate
  - c. coordinate

ANSWER: c

POINTS: 1

8. Minute traces of an unidentified chemical were \_\_\_\_\_ in the drinking water supply.
- a. accomplished
  - b. detected
  - c. coordinated

ANSWER: b

POINTS: 1

9. There is still a lot of \_\_\_\_\_ about the long-term effects of this drug, so we need more data.
- a. uncertainty
  - b. complexity
  - c. capability

ANSWER: a

POINTS: 1

10. The insects live \_\_\_\_\_ lives for most of the year, rarely interacting with other members of their species.
- a. synchronized
  - b. shrewd
  - c. solitary

ANSWER: c

POINTS: 1

LEVEL 4 Assessment Answer Key

**Match the words to the sentences.**

- |  |   |                  |
|--|---|------------------|
| 11. Running into my childhood friend at the airport was a remarkable _____, as we hadn't seen each other in over a decade. | ● | ● a. complement  |
| 12. Their costumes perfectly _____ the type of music they're playing.  | ● | ● b. collision   |
| 13. The driver applied the brakes just in time to avoid a _____ with an animal that suddenly crossed the road.             | ● | ● c. coincidence |

ANSWERS: 11. c, 12. a, 13. c

POINTS: 3

**Choose the correct word to complete each sentence.**

14. Pressing the green button will immediately \_\_\_\_\_ the alarm system throughout the building.
- a. activate
  - b. activation

ANSWER: a

POINTS: 1

15. The performance \_\_\_\_\_ conducted by the manager will provide valuable feedback about areas for improvement.
- a. evaluate
  - b. evaluation

ANSWER: b

POINTS: 1

16. The success of your presentation will depend on how effectively you \_\_\_\_\_ your vision to the listeners.
- a. communicate
  - b. communication

ANSWER: a

POINTS: 1

## LEVEL 4 Assessment Answer Key

**Read the passage.****The Smart Swarm (by Peter Miller)**

- A** How do the simple actions of individuals add up to the complex behavior of a group? How do hundreds of honeybees make a critical decision about their hive if many of them disagree? What enables a school of herring to coordinate its movements so precisely it can change direction in a flash—like a single, silvery organism? The answer has to do with a remarkable phenomenon I call the smart swarm.
- B** A smart swarm is a group of individuals who respond to one another and to their environment in ways that give them the power, as a group, to cope with uncertainty, complexity, and change. Take birds, for example. There's a small park near the White House in Washington, D.C., where I like to watch flocks of pigeons swirl over the traffic and trees. Sooner or later, the birds come to rest on ledges of buildings surrounding the park. Then something disrupts them, and they're off again in synchronized flight.
- C** The birds don't have a leader. No pigeon is telling the others what to do. Instead, they're each paying close attention to the pigeons next to them, each bird following simple rules as they wheel across the sky. These rules add up to a kind of swarm intelligence—one that has to do with precisely coordinating movement.
- D** Craig Reynolds, a computer graphics researcher, was curious about what these rules might be. So, in 1986, he created a deceptively simple steering program called boids. In this simulation, generic birdlike objects, or boids, were each given three instructions: (1) avoid crowding nearby boids, (2) fly in the average direction of nearby boids, and (3) stay close to nearby boids. The result, when set in motion on a computer screen, was a convincing simulation of flocking, including lifelike and unpredictable movements.
- E** At the time, Reynolds was looking for ways to depict animals realistically in TV shows and movies. (Batman Returns in 1992 was the first movie to use his approach, portraying a swarm of bats and an army of penguins.) He later went on to work at Sony, doing research for games, such as for an algorithm that simulated in real-time as many as 15,000 interacting birds, fish, or people.
- F** By demonstrating the power of self-organizing models to mimic swarm behavior, Reynolds was also blazing the trail for robotics engineers. A team of robots that could coordinate its actions like a flock of birds could offer significant advantages over a solitary robot. Spread out over a large area, a group could function as a powerful mobile sensor net, gathering information about what's out there. If the group encountered something unexpected, it could adjust and respond quickly, even if the robots in the group weren't very sophisticated—just as ants are able to come up with various options by trial and error. If one member of the group were to break down, others could take its place. And, most important, control of the group could be decentralized, not dependent on a leader.
- G** "In biology, if you look at groups with large numbers, there are very few examples where you have a central agent," says Vijay Kumar, a professor of mechanical engineering at the University of Pennsylvania. "Everything is very distributed: They don't all talk to each other. They act on local information. And they're all anonymous. I don't care who moves the chair, as long as somebody moves the chair. To go from one robot to multiple robots, you need all three of those ideas."

## LEVEL 4 Assessment Answer Key

- H** In the future, Kumar hopes to put a networked team of robotic vehicles in the field. One purpose might be as first responders. “Let’s say there’s a 911 call,” he says. “The fire alarm goes off. You don’t want humans to respond. You want machines to respond, to tell you what’s happening. Before you send firemen into a burning building, why not send in a group of robots?”
- I** Taking this idea one step further, computer scientist Marco Dorigo’s group in Brussels is leading a European effort to create a “swarmanoid,” a group of cooperating robots with complementary abilities: “foot-bots” to transport things on the ground, “handbots” to climb walls and manipulate objects, and “eyebots” to fly around, providing information to the other units.
- J** The military is eager to acquire similar capabilities. In one experiment, researchers released a swarm of 66 pintsize robots into an empty office building at Fort A. P. Hill, a training center near Fredericksburg, Virginia. The mission: Find targets hidden in the building.
- K** Zippering down the main hallway, the 30-centimeter-long (one-foot) red robots pivoted this way and that on their three wheels, resembling a group of large insects. Eight sonars on each unit helped them avoid collisions with walls and other robots. As they spread out, entering one room after another, each robot searched for objects of interest with a small camera. When one robot encountered another, it used wireless network gear to exchange information. (“Hey, I’ve already explored that part of the building. Look somewhere else.”)
- L** In the back of one room, a robot spotted something suspicious: a pink ball in an open closet (the swarm had been trained to look for anything pink). The robot froze, sending an image to its human supervisor. Soon, several more robots arrived to form a perimeter around the pink intruder. Within half an hour, the mission had been accomplished—all six of the hidden objects had been found. The research team conducting the experiment declared the run a success. Then they started a new test.
- M** The demonstration was part of the Centibots project, an investigation to see if as many as a hundred robots could collaborate on a mission. If they could, teams of robots might someday be sent into a hostile village to flush out terrorists or locate prisoners; into an earthquake-damaged building to find victims; onto chemical-spill sites to examine hazardous waste; or along borders to watch for intruders. Military agencies such as DARPA (Defense Advanced Research Projects Agency) have funded a number of robotics programs using collaborative flocks of helicopters and fixed-wing aircraft, schools of torpedo-shaped underwater gliders, and herds of unmanned ground vehicles. But, at the time, this was the largest swarm of robots ever tested.
- N** “When we started Centibots, we were all thinking, this is a crazy idea, it’s impossible to do,” says Régis Vincent, a researcher at SRI International in Menlo Park, California. “Now we’re looking to see if we can do it with a thousand robots.”

## LEVEL 4 Assessment Answer Key

**Choose the correct answers.**

17. Which position in paragraph **C** (1, 2, 3, or 4) is the best place to add the sentence below?

*Scientists describe such a system as self-organizing.*

The birds don't have a leader. **1** No pigeon is telling the others what to do. **2** Instead, they're each paying close attention to the pigeon next to them, each bird following simple rules as they wheel across the sky. **3** These rules add up to a kind of swarm intelligence, one that has to do with precisely coordinating movement. **4**

- a. 1
- b. 2
- c. 3
- d. 4

ANSWER: c

POINTS: 1

18. What is the main idea of paragraph **D**?

- a. to show how Craig Reynolds was able to imitate the movement of a flock of birds
- b. to show the importance of simplicity in computer programs
- c. to show the difficulty of simulating the flight patterns of bird
- d. to show how unpredictable generic birdlike objects can be

ANSWER: a

POINTS: 1

19. The passage does NOT mention Reynold's programs being used in \_\_\_\_\_.

- a. computer games
- b. TV and movies
- c. robotics
- d. traffic control

ANSWER: d

POINTS: 1

20. The military robots described in paragraphs **K** and **L** were able to identify targets by their \_\_\_\_\_.

- a. smell
- b. shape
- c. color
- d. size

ANSWER: c

POINTS: 1

## LEVEL 4 Assessment Answer Key

21. The word *they* in the last sentence of paragraph L refers to the \_\_\_\_\_.
- a. small objects
  - b. robots
  - c. missions
  - d. research team

ANSWER: d

POINTS: 1

**Read the passage.****Serotonin: The Swarm Maker (by Ed Yong)**

- A** Serotonin is a chemical with many functions. It carries messages between the cells of the brain, and in doing so, controls everything from anger to sleep, body temperature, and appetite. But for one species of insect, serotonin is also the cause of some of the most destructive swarm behavior found on this planet. It is the chemical responsible for turning solitary desert locusts into massive, destructive plagues.
- B** Locust swarms have been known to destroy food crops across huge areas of land, causing entire populations to go hungry. The desert locust is especially known for causing this sort of destruction. A single swarm can spread over thousands of square kilometers, with each locust able to eat its own weight in plants every day. Desert locusts can be found in about 60 countries throughout Africa, the Middle East, and Asia. They are thought to threaten the lives of around a tenth of the world's human population. However, there is another side to the desert locust. For most of their lives, they actually live alone, avoiding other locusts. So what causes them to change their behavior so drastically?
- C** During dry spells, solitary locusts are forced to gather in the few areas of land with remaining vegetation. Their numbers increase to the point of overcrowding, and that flicks a chemical switch in them that changes their bodies and behavior. In as little as two hours, the solitary, green locusts transform into the extremely sociable yellow or red versions of themselves. When the rains return and food becomes more abundant, the now sociable locusts reproduce rapidly. This increases their numbers even more, resulting in huge hungry swarms that are sometimes several billion strong.
- D** The transformation that happens within each locust is a complicated one. It involves over 500 genes and is triggered by the presence of other locusts close by. Most of these details were discovered by Stephen Simpson at the University of Oxford and Malcolm Burrows at Cambridge. They found that the change that happens in locusts boils down to a single choice—to stay alone or move together—and that choice is controlled by serotonin. This single chemical is capable of causing the change all on its own, and without it, the locusts won't transform. Put more scientifically, it is necessary and sufficient for bringing out the sociable side of locusts.
- E** In a previous study, Simpson and Burrows found that the locust's change is caused by a short but intense increase in serotonin in the locusts' nerves. Through new research, two members of their labs, Michael Anstey and Steve Rogers, also discovered that the more serotonin they found in the locusts, the more

## LEVEL 4 Assessment Answer Key

sociable they were. To prove this, Anstey and Rogers created groups of different locusts with varying levels of sociable behavior. The most sociable locusts were found to have three times as much serotonin as the ones that lived alone.

- F** In nature, there are generally two different ways in which the transformation in locusts can be triggered. The first is simply by sight or smell, and the second is by physical contact, when the sensitive hairs on the locusts' legs touch other locusts. The different types of stimuli affect the locusts in very different ways, but both ultimately increase their serotonin levels and their social behavior. Anstey and Rogers found that they could also trigger the transformation by simply applying serotonin directly onto a locust. But perhaps more importantly, they discovered that there were ways to prevent the locusts from becoming sociable. They could inject the insects with either chemicals that prevented the serotonin from taking effect, or that stopped the locusts from producing the chemical in the first place.
- G** It is not clear what keeps a locust sociable once the transformation has taken place. The serotonin spikes locusts experience are only temporary, and after living together for a while, the sociable locusts actually have lower serotonin levels than individuals living alone. Anstey and Rogers believe that the serotonin spike starts a long-term program of gene activation and transformation. Furthermore, prolonged crowding firmly ingrains sociable behavior in the locust's brain and body. Essentially, new memories are formed.
- H** Unfortunately, it is unlikely that any of these discoveries will help us control actual locust swarms, at least in the near future. Since serotonin only kickstarts social behavior, any anti-serotonin chemicals would have to be used while the locusts live alone, and at that point, locusts live too far apart to be targeted effectively—about three per 100 square meters of desert. Serotonin is also common in the rest of the animal world, so chemicals that target it run a heavy risk of negatively affecting other species. To avoid that, any drug produced would have to be designed to affect only locusts. As of now, we don't have that ability.

**Choose True, False or Not Given.**

22. Serotonin is a chemical only found in locusts.
- True
  - False
  - Not Given

ANSWER: b

POINTS: 1

23. As they change their behavior, desert locusts also change color.
- True
  - False
  - Not Given

ANSWER: a

POINTS: 1



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24. The degree of sociability in locusts is related to the amount of serotonin in their bodies.
- a. True
  - b. False
  - c. Not Given

ANSWER: a

POINTS: 1

25. Anstey and Rogers created the chemical that blocks the effects of serotonin.
- a. True
  - b. False
  - c. Not Given

ANSWER: c

POINTS: 1

26. The author believes that scientific researchers will be able to prevent the destructive swarming of locusts in the near future.
- a. True
  - b. False
  - c. Not Given

ANSWER: b

POINTS: 1

**Choose the correct answers.**

27. Which option best paraphrases this sentence from paragraph C?

“In as little as two hours, the solitary, green locusts transform into the extremely sociable yellow or red versions of themselves.”

- a. In less than two hours, the yellow or red locusts become green and much less sociable.
- b. It takes more than two hours for green locusts to turn red or yellow and become more sociable.
- c. Reclusive green locusts can become sociable yellow or red locusts in under two hours.

ANSWER: c

POINTS: 1

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28. Which option best paraphrases this sentence from paragraph H?

“Serotonin is also common in the rest of the animal world, so chemicals that target it run a heavy risk of negatively affecting other species.”

- a. Because serotonin is found in many different species, chemicals that counteract it are likely to impact not just locusts.
- b. To reduce risk, the chemicals that target locusts need to be different than the serotonin found in other animal species.
- c. Many animals will have to be targeted in other for the chemicals that counteract serotonin to be effective and risk-free.

ANSWER: a

POINTS: 1

**Complete each sentence with the correct form of the word in parentheses.**

29. The \_\_\_\_\_ (**responsible**) lies with the chemical serotonin for turning solitary desert locusts into massive, destructive plagues.

ANSWER: responsibility

POINTS: 1

30. Swarms of locust can bring \_\_\_\_\_ (**devastate**) to villages by wiping out entire harvests.

ANSWER: devastation

POINTS: 1

31. The \_\_\_\_\_ (**discover**) of this chemical reaction could completely change the way we control pests in the future.

ANSWER: discovery

POINTS: 1

32. The \_\_\_\_\_ (**transform**) of solitary, green locusts into very sociable red or yellow locusts is extreme.

ANSWER: transformation

POINTS: 1

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33. The chemical serotonin is \_\_\_\_\_ (**need**) to induce the change in the physiology of the locusts.

ANSWER: needed

POINTS: 1

34. There is a very marked change in \_\_\_\_\_ (**behave**) seen when locusts change color from green to yellow.

ANSWER: behavior

POINTS: 1

**Choose all the possible synonyms for each underlined word.**

35. The leader of the wolf pack issues orders, which the submissive members in the pack are expected to follow.

☐

gives

☐

delivers

☐

contains

ANSWERS: gives, delivers

POINTS: 2

36. Honeybees collaborate to communicate the location of a food source through complex dance moves.

☐

detect

☐

coordinate

☐

evaluate

ANSWER: coordinate

POINTS: 1

LEVEL 4 Assessment Answer Key

37. During dry spells, locusts congregate in areas where food can still be found.

- ☐ assemble
- ☐ disperse
- ☐ gather

ANSWERS: assemble, gather

POINTS: 2

38. Ants haul food back to their colony, following the most efficient path around obstacles.

- ☐ digest
- ☐ consume
- ☐ carry

ANSWER: carry

POINTS: 1

39. They began the experiment by segregating the different groups of insects, to prevent them from communicating with each other.

- ☐ separating
- ☐ isolating
- ☐ preserving

ANSWERS: separating, isolating

POINTS: 2

**Read the extract from *The Smart Swarm*.**

Wikipedia, a free collaborative encyclopedia, has also proved to be a big success, with millions of articles in more than 200 languages about everything under the sun, each of which can be contributed by anyone or edited by anyone. “It’s now possible for huge numbers of people to think together in ways we never imagined a few decades ago,” says Thomas Malone of MIT’s Center for Collective Intelligence. “No single person knows everything that’s needed to deal with problems we face as a society, such as health care or climate change, but collectively we know far more than we’ve been able to tap so far.”

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**Complete the summary with the correct words.**

collective	complex	demonstrates	individual	praises
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40. Thomas Malone from MIT's Center for Collective Intelligence \_\_\_\_\_ the remarkable success of Wikipedia, a collaborative encyclopedia that is available at no cost. Wikipedia boasts millions of articles in over 200 languages. These articles cover an extremely wide range of topics and can be contributed by or edited by anyone. The website \_\_\_\_\_ how large groups of individuals are now able to engage in collective thinking in ways that weren't possible before. Malone describes the potential of such collective thinking, explaining that no \_\_\_\_\_ possesses all the knowledge required to tackle \_\_\_\_\_ societal challenges like healthcare or climate change. However, our \_\_\_\_\_ knowledge far surpasses what any one person knows.

ANSWERS: praises, demonstrates, individual, complex, collective

POINTS: 5

**You are going to write an essay summarizing one of the following two articles.**

41. **Topic 1:** Summarize "Serotonin: The Swarm Maker." Include an introduction, paragraphs, and a conclusion.

**Topic 2:** Summarize another reading passage from Units 1 to 4 of your Student's Book.

**A. OUTLINE Plan an outline for your essay.**

Read the passage. Highlight and note the information you think is important.

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Write down the main ideas in your own words. Include any important details.

Write some synonyms for the key words from the passage.

**B. Think of some words and phrases you can use in your essay. Write them in the box.**

The words and phrases below can be useful for introducing an author's ideas in a summary.

- **The topic:** analyzes, explores, examines, discusses
- **Facts:** reports, provides, explains, states
- **Opinions:** argues, claims, believes, disputes
- **Requests:** urges, calls for, suggests, recommends
- **Questions:** asks, questions, wonders, speculates

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- C. Write your essay based on your outline. Use the model to help you. Remember to use the vocabulary you wrote down.**

**Model:**

*In the passage "Serotonin: The Swarm Maker," author Ed Yong describes the effect of the chemical serotonin on locusts. In humans, serotonin affects a variety of bodily functions, such as our feelings, sleep patterns, body temperatures, and appetites. However, in desert locusts, it is responsible for a much more extreme change. It transforms solitary desert locusts into insects that congregate in massive swarms and wipe out crops, causing widespread hunger.*

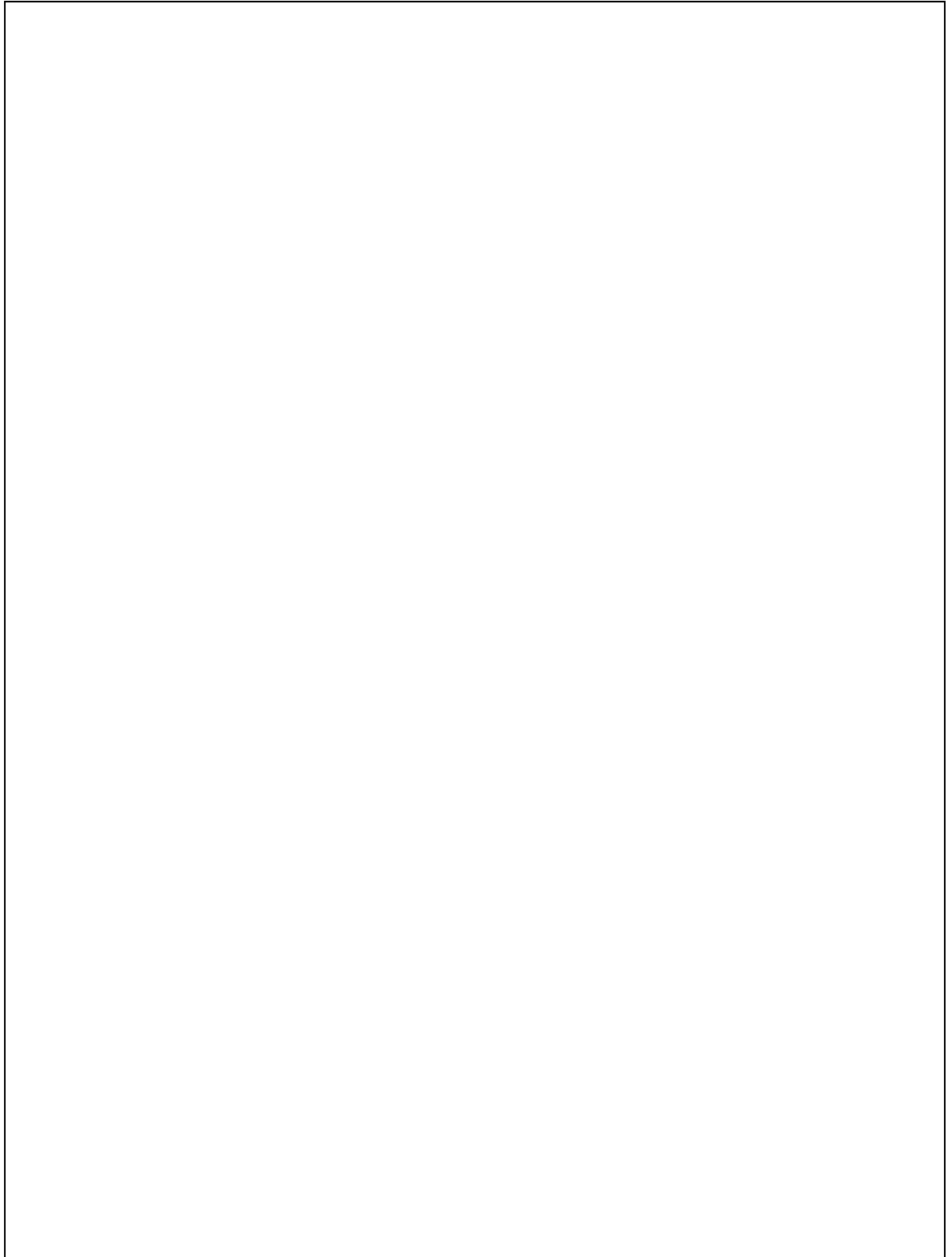
*Desert locusts typically live alone, avoiding contact with other locusts. The dramatic shift in their behavior generally happens during dry periods, when locusts are forced to gather in the few areas that still have vegetation. This overcrowding induces a chemical transformation in the locusts. They change from green to yellow or red and become highly social. When the dry season ends and food becomes more available, the yellow or red locusts breed rapidly and form enormous swarms numbering billions.*

*Stephen Simpson at the University of Oxford and Malcolm Burrows at Cambridge discovered that serotonin is the chemical solely responsible for this change. Further research by Michael Anstey and Steve Rogers revealed a direct correlation between serotonin levels and the degree of sociability in locusts: The most sociable locusts were found to possess the most serotonin.*

*In nature, the serotonin spike that transforms locusts is initiated through sight, smell, or physical contact with other locusts. However, in a laboratory, serotonin applied externally was also found to induce the transformation. Further studies revealed that it is possible to prevent the transformation of locusts by either introducing chemicals that inhibit serotonin's effects or chemicals that block its production.*

*The author does not believe that these discoveries will lead to solutions for controlling locust swarms anytime soon. Anti-serotonin chemicals would need to be administered pre-transformation when locusts are solitary and difficult to target. Additionally, chemicals that affect serotonin will likely impact other animal species, necessitating the development of locust-specific drugs. Currently, this is beyond our capabilities.*

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ANSWER: Answers will vary. See Writing Rubric.

POINTS: 12