



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HUMAN SCIENCES

DEPARTMENT OF EDUCATION AND LANGUAGES

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| SUPPLEMENTARY / SECOND OPPORTUNITY EXAMINATION QUESTION PAPER | |
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| INSTRUCTIONS |
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| 1. Answer ALL the questions. 2. Write clearly and neatly. 3. Number the answers clearly. |

PERMISSIBLE MATERIALS

1. Examination paper
2. Examination script

THIS QUESTION PAPER CONSISTS OF 14 PAGES (Including this front page)

SECTION A: READING COMPREHENSION

[30]

Read the article below and then answer the questions that follow.

New research on plant intelligence may forever change how you think about plants

1 The Intelligent Plant. That is the title of a recent article in The New Yorker — and new research is showing that plants have **astounding** abilities to sense and react to the world. But can a plant be intelligent? Some plant scientists insist they are — since they can sense, learn, remember and even react in ways that would be familiar to humans.

2 Michael Pollan, author of such books as "The Omnivore's Dilemma" and "The Botany of Desire," wrote the New Yorker piece about the developments in plant science. He says for the longest time, even mentioning the idea that plants could be intelligent was a quick way to being labelled "a whacko." But no more, which might be comforting to people who have long talked to their plants or played music for them.

3 The new research, he says, is in a field called plant neurobiology — which is something of a **misnomer**, because even scientists in the field don't argue that plants have neurons or brains. "They have analogous structures," Pollan explains. "They have ways of taking all the sensory data they gather in their everyday lives ... integrate it and then behave in an appropriate way in response. And they do this without brains, which, in a way, is what's incredible about it, because we automatically assume you need a brain to process information."

4 And we assume you need ears to hear. But researchers, says Pollan, have played a recording of a caterpillar munching on a leaf to plants — and the plants react. They begin to secrete defensive chemicals — even though the plant isn't really threatened, Pollan says. "It is somehow hearing what is, to it, a terrifying sound of a caterpillar munching on its leaves."

5 Pollan says plants have all the same senses as humans, and then some. In addition to hearing, taste, for example, they can sense gravity, the presence of water, or even feel that an obstruction is in the way of its roots, before coming into contact with it. Plant roots will shift direction, he says, to avoid obstacles.

6 So what about pain? Do plants feel? Pollan says they do respond to anaesthetics. "You can put a plant out with a human anaesthetic. ... And not only that, plants produce their own compounds that are anaesthetic to us." But scientists are reluctant to go as far as to say they are responding to pain. In 2107, researchers had arrested plant motion with anaesthetics and concluded that the vegetal response to anaesthetics suggests that plants are intelligent. Basically, the article argued that to lose consciousness, one must have consciousness—so if plants seem to lose consciousness under anaesthetics, they must, in some way, possess it.

7 However, plant biotechnologist Devang Mehta said that scientists are making a major leap when they suggest that plants responding to anaesthetics indicates intelligence. He explained that definitions of consciousness and intelligence are hotly contested even when talking about humans and animals. Also, plants lack a nervous system, which has long seemed **requisite** for discussion of animal-like behaviour. Thirdly, while the way in which many anaesthetics function in humans is still a mystery, there is no reason why they or other chemicals shouldn't induce a response in any organism, let alone plants.

8 How plants sense and react is still somewhat unknown. They don't have nerve cells like humans, but they do have a system for sending electrical signals and even produce neurotransmitters, like dopamine, serotonin and other chemicals the human brain uses to send signals. Pollan says that we are not certain why plants have them, whether they were just conserved through evolution or if they perform some sort of information processing function.

9 What about another human-like ability – memory? Pollan describes an experiment done by animal biologist Monica Gagliano. She presented research that suggests the *mimosa pudica* plant can learn from experience.

10 Mimosa is a plant, which looks something like a fern, that collapses its leaves temporarily when it is disturbed. So Gagliano set up a contraption that would drop the mimosa plant, without hurting it. When the plant dropped, as expected, its leaves collapsed. She kept dropping the plants every five to six seconds. After five or six drops, the plants would stop responding, as if they'd learned to tune out the **stimulus** as irrelevant. "This is a very important part of learning — to learn what you can safely ignore in your environment," Pollan says.

11 Maybe the plant was just getting worn out from all the dropping? To test that, Gagliano took the plants that had stopped responding to the drops and shook them instead. They continued to collapse, which means they had made the distinction that dropping was a signal they could safely ignore. Gagliano would retest them every week for four weeks and, for a month, they continued to remember their lesson.

12 "Plants can do incredible things. They do seem to remember stresses and events. They do have the ability to respond to 15 to 20 environmental variables," Pollan says. "The issue is, is it right to call it learning or intelligence? Is it right, even, to call what they do as consciousness? Some of these plant neurobiologists believe that plants are conscious — not self-conscious, but conscious in the sense they know where they are in space ... and react appropriately to their position in space."

13

Danny Chamovitz, director of the Manna Centre for Plant Biosciences at Tel Aviv University in Israel, says that plants are neither conscious nor intelligent, though they are incredibly complex. Plant awareness shouldn't be confused with the human experience of existence. He says, "All organisms, even bacteria, have to be able to find the exact niche that will enable them to survive. It's not anything that's unique to people. Are they self-aware? No. We care about plants; do plants care about us? No."

14 The thing is, Chamovitz can't prove that plants don't care about us. No one can, really. We know that hugging trees, literally, makes us feel better. It has a medicinal effect. But we can't test the **reciprocity** of this—whether plants love us back or feel good when we care for them.

15 Philosopher Michael Marder admits that we can't know if plants are self-conscious, because we define both the self and consciousness based on our human selves and limitations. Marder points out that plant cuttings can survive and grow independently. That suggests that if plants do have a self, it is likely dispersed and unconfined, unlike the human sense of self. He further argues that because plants communicate with one another, defend their health, and make decisions, among other things, they may well have some sense of self, too.

16 Pollan says there is no agreed definition of intelligence. There are basically nine different definitions and about half of them depend on a brain — they refer to abstract reasoning or judgment. The other half merely refer to a problem-solving ability. "So, intelligence may well be a property of life and our difference from other creatures **may be a matter of difference of degree rather than kind**. We may just have more of this problem-solving ability and we may do it in different ways," Pollan explains. Pollan says that what really freaks people out is "that **the line between plants and animals might be a little softer than we traditionally think of it as.**"

[Compiled and adapted from www.sciencetimes.com and <https://awkwardbotany.com>]

Answer the following questions in your answer book.

1. State whether the following statement is true or false. Quote a phrase from the passage to motivate your answer.

"Scientists agree that plants have neurons and brains." (2)

2. Describe the functions of the analogous structures of plants. (3)

3. Explain the purpose and finding of the experiment where researchers played a recording of the sound of a caterpillar eating leaves to plants. (2)

4. Apart from hearing and taste, what other senses do plants have according to Michael Pollan? (3)

5. Why does Devang Mehta reject the assumption that plants responding to anaesthetics is an indication of intelligence? (3)
6. Give two possible explanations for the presence of neurotransmitters in plants. (2)
7. Why do some plant neurobiologists argue that plants are conscious? (2)
8. Why does Pollan dispute Chamovitz's claim that plants do not care about humans? (1)
9. List Michael Marder's three main arguments in support of his claim that plants do have some sort of sense of self. (3)
10. Explain the following phrases as used in the last paragraph in your own words:
 - (i) "may be a difference of degree rather than kind"
 - (ii) "the line between plants and animals might be a little softer than we traditionally think"(4)
11. **Vocabulary** (5)

For each of the terms below, choose the explanation that best describes the word as used in the passage from the list given below the words. In the answer book, write down only the letter of the meaning of your choice next to the word.

1. astounding (paragraph 1)
2. misnomer (paragraph 3)
3. requisite (paragraph 7)
4. stimulus (paragraph 10)
5. reciprocity (paragraph 14)

- A A name or word that is not appropriate or accurate
- B A situation in which two things provide the same feelings or advantages to each other
- C Excellent and amazing
- D Surprising and unbelievable
- E Something that is controversial
- F Something that produces a reaction
- G Necessary for a particular purpose

SECTION B: GRAMMAR

[30]

Read the passage below and then answer the questions that follow.

Plants Have Incredible 'Brains' That Are Actually cells

1 The inner life of plants (i) (to arouse) the passions of even the mildest-mannered naturalists. A debate over plant consciousness and intelligence (ii) (to rage) in scientific circles for well over a century—at least since Charles Darwin observed in 1880 that stressed-out flora can't rest.

There's no doubt that plants are extremely complex. Biologists believe that plants communicate with one another, fungi, and animals by releasing chemicals via their roots, branches, and leaves. Plants also send seeds that supply information, working as data packets. They even sustain weak members of their own species by providing nutrients to their peers, which (iii) (to indicate) a sense of kinship.

2 Scientists (iv) (to find) out that not only humans and animals have brains, but also plants. Mail Online reported that plants have more incredible brains than people had known before. Their brains are actually the decision-maker which decides when is the right moment to germinate. If the plant germinates too soon, harsh winter conditions will damage it. If it germinates too late other fast-growing plants will out-compete it. Plants are extremely sensitive to their environments and they are constantly processing information. The research has important implications for understanding how crops and weeds grow. The new knowledge

can be applied to commercial plants in order to enhance and synchronise germination, increasing crop yields and decreasing herbicide use.

3 Plants also have memories, and can learn from experience. One 2014 experiment, for example, involved dropping potted plants called *Mimosa Pudicas* a short distance. At first, when the plants were dropped, they curled up their leaves defensively. But soon the plants (v) (to learn) that no harm would come to them, and they stopped protecting themselves.

4 It has been proved that the small group of cells located in the plant's embryo (vi) (to operate) in the same way as the human brain particularly in the decision-making process. The said decision-making centre that acts as the brains of plants is called the Arabidopsis or the thale cress. The Arabidopsis has two types of cells- one is concerned with germination, while the other one promotes seed dormancy. Both the groups directly communicate with each other through moving hormones. Its method of communication is a similar mechanism in the human brain in the decision-making process that is related to the motor skills.

5 But does any of this qualify as consciousness? The answer to that question seems to depend largely on linguistics, rather than science—how humans choose to define our conceptions of the self and intelligence.

6 Plant biotechnologist Devang Mehta, for one, says the answer to the question of whether plants are conscious “is unreservedly no.” He said, “I published an article for Massive Science in February last year to oppose the notion that plants can be conscious or intelligent and I vow to stick to my convictions.”

7 Currently, scientists (vii) (to conduct) more experiments to prove that plants are indeed intelligent. They (viii) (to publish) their findings early next year.

[Compiled and adapted from www.sciencetimes.com and <https://qz.com/1294941/>]

1. Change the verbs numbered (i) – (viii) in the passage above into the correct verb tense. (8)

2. From paragraph 2 identify and write down one example of the following: (4)

(i) a past participle

(ii) a present participle

(iii) a gerund

(iv) an infinitive

3. Identify whether the sentences below are in the active or passive voice. (3)

(i) Scientists are studying plant intelligence.

(ii) It has been proven that the thale cress operates in the same way as the human brain.

(iii) The scientist dropped the plants several times.

4. Write the sentences in question 3 above in the opposite voice. (3)

5. Write the following sentence in reported speech. (5)

Devan Metha said, "I published an article for Massive Science in February last year to oppose the notion that plants can be conscious or intelligent and I will not be convinced otherwise."

6.1 Identify the type of conditional used in the following sentences. (2)

(i) If the plant germinates too soon, harsh winter conditions will damage it.

(ii) If plants were exposed to varying environments, more seeds would germinate.

6.2 Change the sentences at 6.1(i) and (ii) into a third conditional. (4)

6.3 Complete the following conditional sentence with any suitable result clause. (1)

If plants were intelligent,

SECTION C: CRITICAL READING

[40]

Part 1: Critical Reading

(10x2=20)

Read the passage below and then answer the questions that follow. After you have answered the first 10 questions you will answer a summary question. The passage is adapted from: TOEFL_reading1.

The Creators of Grammar

1 No student of a foreign language needs to be told that grammar is complex. By changing word sequences and by adding a range of auxiliary verbs and suffixes, we are able to communicate tiny variations in meaning. We can turn a statement into a question, state whether an action has taken place or is soon to take place, and perform many other word tricks to convey subtle differences in meaning. Nor is this complexity inherent to the English language. All languages, even those of so-called 'primitive' tribes have clever grammatical components. The Cherokee pronoun system, for example, can distinguish between 'you and I', 'several other people and I' and 'you, another person and I'. In English, all these meanings are summed up in the one, crude pronoun 'we'. Grammar is universal and plays a part in every language, no matter how widespread it is. So the question which has baffled many linguists is - who created grammar?

2 At first, it would appear that this question is impossible to answer. To find out how grammar is created, someone needs to be present at the time of a language's creation, documenting its emergence. Many historical linguists are able to trace modern complex languages back to earlier languages, but in order to answer the question of how complex languages are actually *formed*, the researcher needs to observe how languages are started *from scratch*. Amazingly, however, this is possible.

3 Some of the most recent languages evolved due to the Atlantic slave trade. At that time, slaves from a number of different ethnicities were forced to work together under colonizer's rule. Since they had no opportunity to learn each other's languages, they developed a **make-shift** language called a *pidgin*. Pidgins are strings of words copied from the language of the landowner. They have little in the way of grammar, and in many cases it is difficult for a listener to deduce when an event happened, and who did what to whom. [A] Speakers need to use circumlocution in order to make their meaning understood. [B] Interestingly, however, all it takes for a pidgin to become a complex language is for a group of children to be exposed to it at the time when they learn their mother tongue. [C] Slave children did not simply copy the strings of words uttered by their elders, they adapted their words to create a new, expressive language. [D] Complex grammar systems which emerge from pidgins are termed creoles, and they are invented by children.

4 Further evidence of this can be seen in studying sign languages for the deaf. Sign languages are not simply a series of gestures; they utilise the same grammatical machinery that is found in spoken languages. Moreover, there are many different languages used worldwide. The creation of one such language was documented quite recently in Nicaragua. Previously, all deaf people were isolated from each other, but in 1979 a new government introduced schools for the deaf. Although children were taught speech and lip reading in the classroom, in the playgrounds they began to invent their own sign system, using the gestures that they used at home. It was basically a pidgin. Each child used the signs differently, and there was no **consistent** grammar. However, children who joined the school later, when this inventive sign system was already around, developed a quite different sign language.

5 Although it was based on the signs of the older children, the younger children's language was more fluid and compact, and it utilised a large range of grammatical devices to clarify meaning. What is more, all the children used the signs in the same way. A new creole was born. Some linguists believe that many of the world's most established languages were creoles at first. The English past tense -ed ending may have evolved from the verb 'do'. 'It ended' may once have been 'It end-did'. Therefore, it would appear that even the most widespread languages were partly created by children. Children appear to have innate

grammatical machinery in their brains, which springs to life when they are first trying to make sense of the world around them. Their minds can serve to create logical, complex structures, even when there is no grammar present for them to copy.

1. Why does the author include information about Cherokee language in paragraph 1?
 - A To show how English grammar differs from Cherokee grammar
 - B To show how simple traditional cultures can have complicated grammar structures
 - C To demonstrate how difficult it is to learn the Cherokee language
 - D To prove that complex grammar structures were invented by the Cherokees.

2. The slaves' pidgin languages are discussed in the passage. What can be concluded about them?
 - A It was created by the land-owners.
 - B It contained complex grammar.
 - C It was based on many different languages.
 - D It was difficult to understand, even among slaves.

3. Where can the following sentence in italics be placed in paragraph 3?

It included standardised word orders and grammatical markers that existed in neither the pidgin language, nor the language of the colonizers.

 - A
 - B
 - C
 - D

4. Which of the following sentences about Nicaraguan sign language is not true?
 - A The language is based on speech and lip reading.
 - B The language has been created since 1979.
 - C The language was perfected by younger children.
 - D The language incorporates signs which children used at home.

5. All of the following are features of the new Nicaraguan sign language EXCEPT:
- A New gestures were created for everyday objects and activities.
 - B The hand movements were smoother and smaller.
 - C All children used the same gestures to show meaning.
 - D The meaning was clearer than the previous sign language.
6. From the sentences below, which sentence is closest in meaning to the bolded sentence?
Grammar is universal and plays a part in every language, no matter how widespread it is.
- A Some languages include a lot of grammar, whereas other languages contain a little.
 - B All languages, whether they are spoken by a few people or a many people, contain grammar.
 - C Languages which contain a lot of grammar are more common than languages that contain a little.
 - D The grammar of all languages is the same, no matter where the languages evolved.
7. In paragraph 2, the phrase '**From scratch**' is closest in meaning to:
- A by using written information
 - B From various cultures
 - C from the very beginning
 - D By copying someone else
8. '**Make-shift**' in paragraph 3 is closest in meaning to:
- A Private and personal
 - B Simple and temporary
 - C Extensive and diverse
 - D Complicated and expressive
9. Which of the following words could best replace the word '**consistent**' in paragraph 4?
- A Uniform
 - B Imaginable

C Predictable

D Natural

10. Which idea is presented in the final paragraph?

A The English past tense system is inaccurate.

B Children say English past tenses differently from adults.

C Linguists have proven that English was created by children.

D English was probably once a creole.

Part 2: Summary

(20)

In brief summarise the author's main claim and the main supporting ideas given to support the claim. Keep your summary to 100 words. Use your own words as far as possible.