IELTSFever Academic IELTS Reading Test 147

Reading Passage 1

You should spend about 20 minutes on Questions 1-13, which are based on the IELTSFever Academic IELTS Reading Test 147 Reading Passage William Henry Perkin below.

William Henry Perkin

The man who invented synthetic dyes

William Henry Perkin was born on March 12, 1838, in London, England. As a boy, Perkin's curiosity prompted early interests in the arts, sciences, photography, and engineering. But it was a chance stumbling upon a run-down, yet functional, laboratory in his late grandfather's home that solidified the young man's enthusiasm for chemistry.

As a student at the City of London School, Perkin became immersed in the study of chemistry. His talent and devotion to the subject were perceived by his teacher, Thomas Hall, who encouraged him to attend a series of lectures given by the eminent scientist Michael Faraday at the Royal Institution. Those speeches fired the young chemist's enthusiasm further, and he later went on to attend the Royal College of Chemistry, which he succeeded in entering in 1853, at the age of 15.

At the time of Perkin's enrolment, the Royal College of Chemistry was headed by the noted German chemist August Wilhelm Hofmann. Perkin's scientific gifts soon caught Hofmann's attention and, within two years, he became Hofmann's youngest assistant .Not long after that, Perkin made the scientific breakthrough that would bring him both fame and fortune.

At the time, quinine was the only viable medical treatment for malaria. The drug is derived from the bark of the cinchona tree, native to South America, and by 1856 demand for the drug was surpassing the available supply. Thus, when Hofmann made some passing comments about the desirability of a synthetic substitute for quinine, it was unsurprising that his star pupil was moved to take up the challenge.

During his vacation in 1856, Perkin spent his time in the laboratory on the top floor of his family's house. He was attempting to manufacture quinine from aniline, an inexpensive and readily available coal tar waste product. Despite his best efforts, however, he did not end up with quinine. Instead, he produced a mysterious dark sludge. Luckily, Perkin's scientific training and nature prompted him to investigate the substance further. Incorporating potassium dichromate and alcohol into the aniline at various stages of the experimental process, he finally produced a deep purple solution. And, proving the truth of the famous scientist Louis Pasteur's words 'chance favours only the prepared mind', Perkin saw the potential of his unexpected find.

Historically, textile dyes were made from such natural sources as plants and animal excretions. Some of these, such as the glandular mucus of snails, were difficult to obtain and outrageously expensive. Indeed, the purple colour extracted from a snail was once so costly that in society at the time only the rich could afford it. Further, natural dyes tended to be muddy in hue and fade quickly. It was against this backdrop that Perkin's discovery was made.

Perkin quickly grasped that his purple solution could be used to colour fabric, thus making it the world's first synthetic dye. Realising the importance of this breakthrough, he lost no time in patenting it. But perhaps the most fascinating of all Perkin's reactions to his find was his nearly instant recognition that the new dye had commercial possibilities.

Perkin originally named his dye Tyrian Purple, but it later became commonly known as mauve (from the French for the plant used to make the colour violet). He asked advice of Scottish dye works owner Robert Pullar, who assured him that manufacturing the dye would be well worth it if the colour remained fast (i.e. would not fade) and the cost was relatively low. So, over the fierce objections of his mentor Hofmann, he left college to give birth to the modern chemical industry.

With the help of his father and brother, Perkin set up a factory not far from London. Utilising the cheap and plentiful coal tar that was an almost unlimited by-product of London's gas street lighting, the dye works began producing the world's first synthetically dyed material in 1857. The company received a commercial boost from the Empress Eugenie of France, when she decided the new colour flattered her. Very soon, mauve was the necessary shade for all the fashionable ladies in that country. Not to be outdone, England's Queen Victoria also appeared in public wearing a mauve gown, thus making it all the rage in England as well. The dye was bold and fast, and the public clamour for more. Perkin went back to the drawing board.

Although Perkin's fame was achieved and fortune assured by his first discovery, the chemist continued his research. Among other dyes he developed and introduced were aniline red (1859) and aniline black (1863) and, in the late 1860s, Perkin's green. It is important to note that Perkin's synthetic dye discoveries had outcomes far beyond the merely decorative. The dyes also became vital to medical research in many ways. For instance, they were used to stain previously invisible microbes and bacteria, allowing researchers to identify such bacilli as tuberculosis, cholera, and anthrax. Artificial dyes continue to play a crucial role today. And, in what would have been particularly pleasing to Perkin, their current use is in the search for a vaccine against malaria.

Questions 1-7

Do the following statements agree with the information given in Reading Passage 1?

In boxes 1- 7 on your answer sheet, write

TRUE	if the statement is True
FALSE	if the statement is false
NOT GIVEN	If the information is not given in the passage

(1) Michael Faraday was the first person to recognise Perkin's ability as a student of chemistry.

(2) Michael Faraday suggested Perkin should enrol in the Royal College of Chemistry.

(3) Perkin employed August Wilhelm Hofmann as his assistant.

(4) Perkin was still young when he made the discovery that made him rich and famous.

(5) The trees from which quinine is derived grow only in South America.

(6) Perkin hoped to manufacture a drug from a coal tar waste product.

(7) Perkin was inspired by the discoveries of the famous scientist Louis Pasteur.

Questions 8-13

Answer the questions below.

*Choose **NO MORE THAN TWO WORDS** from the passage for each answer.*

Write your answers in boxes 8-13 on your answer sheet.

(8) Before Perkin's discovery, with what group in society was the colour purple associated?

(9) What potential did Perkin immediately understand that his new dye had?

(10) What was the name finally used to refer to the first colour Perkin invented?

(11) What was the name of the person Perkin consulted before setting up his own dye works?

(12) In what country did Perkin's newly invented colour first become fashionable?

(13) According to the passage, which disease is now being targeted by researchers using synthetic dyes?

Reading Passage 2

You should spend about 20 minutes on Questions 14-27, which are based on the IELTSFever Academic IELTS Reading Test 147 Reading Passage Plant Wars below.

Plant Wars

Mention the words “chemical warfare” or “deployed armies” in any conversation, and the interlocutor might immediately assume you’re talking about wars between humans. In reality, however, there are other kinds of wars out there where these techniques are employed far more frequently and in a far more intricate manner: those waged in the plant kingdom.

We might not normally think of plants this way, but much like humans and animals, they too have to fight for survival on a daily basis. Nutrients, light and water are the three things any plant needs in order to grow; unfortunately, none of these is ample in supply, which means that the competition between plants can grow fierce. Some plants and trees are at an architectural advantage: taller trees have greater access to natural light, while plants with deeper roots have the ability to absorb more water and nutrients. Others, though, manage to defend their territory through “allelopathy”, or chemical warfare.

So how does this chemical warfare work exactly? As Dr Robin Andrews explains, plants convert the nutrients they absorb from the ground to energy with the aid of a type of organic compound known as metabolites. These metabolites can be divided into two categories: primary and secondary. Primary metabolites are what allows a plant to live, playing a direct role in its growth and development, and are thus present in every plant. Secondary metabolites, on the other hand, can vary from plant to plant and often play the role of a defence mechanism against neighbouring competitors.

Out of these secondary metabolites, there are two that are incredibly interesting: DIBOA and DIMBOA. These two cyclic hydroxamic acids were at the forefront of a study conducted by Sascha Venturelli and colleagues in 2015, which found that once they are released into the soil by the plants that produce them, they degenerate into toxic substances that have the power to inhibit growth in nearby plants once they soak them up. As Dr Claude Becker notes, “the phenomenon itself has been known for years”, but we now finally understand the “molecular mechanism” behind it – and its supreme intricacy would put to shame any chemical bombs created by humans.

But plants do not just fight wars against other plants; chemical warfare also comes into play in their defence against herbivores. As Brent Mortensen of Iowa State University describes, plants “actively resist” attacks made by herbivores through qualitative and quantitative chemical defences. What’s the difference? Qualitative defences can be lethal even in small doses, and are often employed to protect “young” or “tender leaves or seeds”. They can also be recycled when no longer necessary. Quantitative defences, in contrast, are only effective “in larger doses", but unlike qualitative defences, can protect the plant against all herbivores. Quantitative defences are also not as immediately lethal, as they usually lead to indigestion, pain, irritation of the mouth and throat, and inflammation or swelling in the skin.

And what about the "deployed armies" I mentioned before? Well, chemical attacks are not the only way plants elect to defend themselves against herbivores. Some plants, such as the African acacia, also recruit armies to assist them in their war. As Angela White of the University of Sheffield explains, the acacia tree has "hollowed-out structures" which invite ant colonies to build a home in them by providing not just shelter, but also food in the form of a special nectar. In return, ants protect them against herbivores – and this includes not just the small ones like bugs, but also the ones as big as giraffes.

At this point, of course, you might be wondering what all this has to do with you. The territorial nature of plants might be fascinating in its own right, but what is its application in real life?

Well, Dr Venturelli of the 2015 study mentioned before has an answer for you: apparently, certain allelochemicals – the aforementioned chemical compounds that are responsible for stunting growth in plants – have been found to have an effect on human cancer cells, too. According to Michael Bitzer and Ulrich Lauer of the same study, "clinical trials at the University Clinics Tubingen currently assess the efficacy of these plant toxins in cancer patients". This means that comprehending the way plants defend themselves against the enemies in their environment might not just be of interest to plant biologists alone, but to medical researchers as well.

Questions 14-20

Complete the sentences below.

*Choose **NO MORE THAN THREE WORDS** from Reading Passage 2 for each answer.*

(14) Plants are very similar to____________ as they also struggle to stay alive every day.

(15) The height of a tree or plant can affect how much____________ it receives.

(16) Chemical warfare in plants also goes by the name of ____________.

(17) Water and nutrients are both taken from the soil, and the latter is later turned into ____________ .

(18) Secondary metabolites are an____________ that functions as a defence mechanism for plants.

(19) DIBOA and DIMBOA are two types of secondary metabolites that can____________ once absorbed by a plant.

(20) The 2015 study by Sascha Venturelli and colleagues examined the____________ of chemical warfare in plants.

Plant Defences Against Herbivores

Qualitative

– can kill a herbivore in **21**____________

– can be recycled when no longer necessary

Secondary

– only works in larger doses

– effective against **22** ____________

– causes a variety of symptoms, none **23** ____________

Indirect

– uses the help of ant colonies that reside in its **24**____________

– ants can protect it against herbivores of all sizes, even **25** ____________

Questions 26-27

Do the following statements agree with the information given in Reading Passage 2?

TRUE	if the statement is True
FALSE	if the statement is false
NOT GIVEN	If the information is not given in the passage

(26) Allelochemicals are secondary metabolites.

(27) Plant biologists and medical researchers are currently cooperating to assess the efficacy of plant toxins in preventing the growth of cancer cells.

Reading Passage 3

You should spend about 20 minutes on Questions 28-40, which are based on the IELTSFever Academic IELTS Reading Test 147 Reading Passage The Birth of Scientific English below.

The Birth of Scientific English

World science is dominated today by a small number of languages, including Japanese, German and French, but it is English which is probably the most popular global language of science. This is not just because of the importance of English-speaking countries such as the USA in scientific research; the scientists of many non-English-speaking countries find that they need to write their research papers in English to reach a wide international audience. Given the prominence of scientific English today, it may seem surprising that no one really knew how to write science in English before the 17th century. Before that, Latin was regarded as the lingua franca for European intellectuals.

The European Renaissance (circa 14th-16th century) is sometimes called the 'revival of learning', a time of renewed interest in the 'lost knowledge' of classical times. At the same time, however, scholars also began to test and extend this knowledge. The emergent nation states of Europe developed competitive interests in world exploration and the development of trade. Such expansion, which was to take the English language west to America and east to India, was supported by scientific developments such as the discovery of magnetism (and hence the invention of the compass), improvements in cartography and perhaps the most important scientific revolution of them all – the new theories of astronomy and the movement of the Earth in relation to the planets and stars, developed by Copernicus (1473-1543).

England was one of the first countries where scientists adopted and publicised Copernican ideas with enthusiasm. Some of these scholars, including two with interests in language – John Wall's and John Wilkins – helped Found the Royal Society in 1660 in order to promote empirical scientific research.

Across Europe similar academies and societies arose, creating new national traditions of science. In the initial stages of the scientific revolution, most publications in the national languages were popular works, encyclopaedias, educational textbooks and translations.

Original science was not done in English until the second half of the 17th century. For example, Newton published his mathematical treatise, known as the Principia, in Latin, but published his later work on the properties of light – Optics – in English.

There were several reasons why original science continued to be written in Latin. The first was simply a matter of audience. Latin was suitable for an international audience of scholars, whereas English reached a socially wider, but more local, audience. Hence, popular science was written in English.

A second reason for writing in Latin may, perversely, have been a concern for secrecy. Open publication had dangers in putting into the public domain preliminary ideas which had not yet been fully exploited by their 'author' . This growing concern about intellectual property rights was a feature of the period – it reflected both the humanist notion of the individual, rational scientist who invents and discovers through private intellectual labour, and the growing connection between original science and commercial exploitation. There was something of a social distinction between 'scholars and gentlemen' who understood Latin, and men of trade who lacked a classical education. And in the mid-17th century it was common practice for mathematicians to keep their discoveries and proofs secret, by writing them in cipher, in obscure languages, or in private messages deposited in a sealed box with the Royal Society. Some scientists might have felt more comfortable with Latin precisely because its audience, though international, was socially restricted. Doctors clung the most keenly to Latin as an 'insider language'.

A third reason why the writing of original science in English was delayed may have been to do with the linguistic inadequacy of English in the early modern period. English was not well equipped to deal with scientific argument. First, it lacked the necessary technical vocabulary. Second, it lacked the grammatical resources required to represent the world in an objective and impersonal way, and to discuss the relations, such as cause and effect, that might hold between complex and hypothetical entities. Fortunately, several members of the Royal Society possessed an interest in language and became engaged in various linguistic projects. Although a proposal in 1664 to establish a committee for improving the English language came to little, the society's members did a great deal to foster the publication of science in English and to encourage the development of a suitable writing style. Many members of the Royal Society also published monographs in English. One of the first was by Robert Hooke, the society's first curator of experiments, who described his experiments with microscopes in Micrographia (1665). This work is largely narrative in style, based on a transcript of oral demonstrations and lectures.

In 1665 a new scientific journal, Philosophical Transactions, was inaugurated. Perhaps the first international English-language scientific journal, it encouraged a new genre of scientific writing, that of short, focused accounts of particular experiments.

The 17th century was thus a formative period in the establishment of scientific English. In the following century much of this momentum was lost as German established itself as the leading European language of science. It is estimated that by the end of the 18th century 401 German scientific journals had been established as opposed to 96 in France and 50 in England. However, in the 19th century scientific English again enjoyed substantial lexical growth as the industrial revolution created the need for new technical vocabulary, and new, specialised, professional societies were instituted to promote and publish in the new disciplines.

Questions 28-34

Complete the summary.

For answers to questions 28-34 choose ***NO MORE THAN TWO WORDS*** *from the passage.*

In Europe modern science emerged at the same time as the nation state. At first, the scientific language of choice remained **28**_________ . It allowed scientists to communicate with other socially privileged thinkers while protecting their work from unwanted exploitation. Sometimes the desire to protect ideas seems to have been stronger than the desire to communicate them, particularly in the case of mathematicians and **29**_________ . In Britain, moreover, scientists worried that English had neither the **30**_________ nor the **31**_________scientists associated with the **32** _________to express their ideas. This situation only changed after 1660 when it was set about developing English. An early scientific journal fostered a new kind of writing based on short descriptions of specific experiments. Although English was then overtaken by **33**_________ , it developed again in the 19th century as a direct result of the **34**_________ .

Questions 35-37

Do the following statements agree with the information given in Reading Passage 3?For questions 35-37, write

YES	if the statement agrees with the writer
NO	if the statement does not agree with the writer
NOT GIVEN	if there is no information about this in the passage

(35) There was strong competition between scientists in Renaissance Europe.

(36) The most important scientific development of the Renaissance period was the discovery of magnetism.

(37) In 17th century Britain, leading thinkers combined their interest in science with an interest in how to express ideas.

Questions 38-40

*Complete the table. Choose **NO MORE THAN TWO WORDS** from the passage for each answer.*

Science written in the first half of the 17th century		
Language used	Latin	English
Type of science	Original	**38**__________
Examples	**39**___________	Encyclopedias
Target audience	International scholars	**40**________ but socially wider