

# IELTSFever Academic IELTS Reading Test 106

## Reading Passage 1

*You should spend about 20 minutes on Questions 1-13, which are based on the IELTSFever Academic IELTS Reading Test 106 Reading Passage Rulers of light below.*

### Rulers of light

**{A}** In the blink of an eye, a wave of visible light completes a quadrillion oscillations, or cycles. That very large number presents both opportunities and a challenge. The opportunities promise numerous applications both inside and outside of laboratories. They go to the heart of our ability to measure frequencies and times with extremely high precision, a skill that scientists rely on for some of the best tests of laws of nature—and one that GPS systems, for instance, depend on. The challenge has centered on the impossibility of manipulating light with the techniques that work so well for electromagnetic waves of much lower frequencies, such as microwaves.

**{B}** Now, thanks to a decade of revolutionary advances in laser physics, researchers have at hand technologies that can unlock the latent potential that visible light's high frequencies previously kept us from realizing. In particular, scientists have developed the tools to exploit a type of laser light known as an optical frequency comb. Like a versatile ruler of light with tens or hundreds of thousands of closely spaced "tick marks," an optical frequency comb provides exquisitely precise measurements of light. Such a comb can form a bridge spanning the huge frequency gap from microwaves to visible light: very precise microwave measurements can, with an optical comb, produce equally exact data about light.

**{C}** Myriad applications are in the pipeline. Optical combs will enable a new generation of more precise atomic clocks, ultrasensitive chemical detectors and the means to control chemical reactions using lasers. The combs could greatly boost the sensitivity and range of lidar (light detection and ranging)—and also provide a vast increase in the number of signals traveling through optical fiber.

**{D}** Combs will greatly simplify the task of measuring optical frequencies with extremely high precision. In the 20th century such a measurement would have required a team of Ph.D.s running rooms full of single-frequency lasers. Today a graduate student can achieve similar results with a simple apparatus using optical frequency combs. The new optical atomic clocks also spring from this simplification. Much as a pendulum in a grandfather clock requires gears to record its swings and slowly turn the clock's hands, an optical atomic clock uses an optical frequency comb to count the oscillations of light and convert them into a useful electronic signal. In just the past year, researchers have used optical combs to surpass the cesium-based atomic clocks that have been the best system available for decades.



**{E}** In some respects, the scene-changing advent of optical combs is similar to the leap forward that resulted from the invention of the oscilloscope about 100 years ago. That device heralded the modern age of electronics by allowing signals to be

displayed directly, which facilitated development of everything from television to the iPhone. Light, however, oscillates 10,000 times faster than the speed of the fastest available oscilloscopes. With optical combs, the same capability to display the waveform is becoming available for light.

**{F}** Optical frequency comb applications require exquisite control of light across a broad spectrum of frequencies. This level of control has been available for radio waves for a long time but is only now becoming possible for light. An analogy to music helps in understanding the required level of control. Before the development of combs, lasers could produce a single color, like a single optical tone. They were akin to a violin with only one string and no fingerboard, capable of playing only one note (ignore for the moment that musical notes are much richer than pure tones). To play even a simple piece would require many different instruments, each painstakingly tuned. Each violin would require its own musician, just as every single-frequency laser requires its own operator.

**{G}** In contrast, one operator can use an optical comb to cover the entire optical spectrum, not merely like a pianist at a piano but like a keyboardist playing an electronic synthesizer that can be programmed to mimic any musical instrument or even an entire orchestra. Comb technology, in effect, enables symphonies of hundreds of thousands of pure optical tones.

**{H}** Optical frequency combs are generated by devices called mode-locked lasers, which create ultrashort pulses of light. To understand the important features of such pulses, begin by imagining the light wave of the other chief kind of laser, a continuous-wave (CW) laser. Ideally, such a wave would be an endless stream of perfectly regular oscillations (representing the light wave's electric field), every wave crest and trough having the same amplitude and arriving at an unchanging rate. A pulse from a mode-locked laser, in contrast, is a short series of wave crests and troughs whose amplitude rises from zero to a maximum and then falls back to zero. The shortest pulses, with durations of less than 10 femtoseconds, contain just a few full oscillations of the light wave. The general outline of the pulse—its overall rise and fall—is called its envelope. One can think of the pulse as being like the earlier continuous wave (the "carrier wave"), with that wave's amplitude multiplied by the changing height of the envelope.

**{I}** The carrier wave consists of light of one pure frequency. A plot of its spectrum would have a single spike at that frequency, representing the presence of that frequency alone. You might expect that the pulse you are imagining would also consist of light only at that frequency—after all, it is just the single-frequency carrier wave with its amplitudes changed but that is not how waves and spectra work. Instead the pulse is made up of light of many frequencies all traveling together. The frequencies form a small, continuous band centered on the carrier frequency. The shorter the pulse, the broader the spread of frequencies.

**{J}** Two additional features of the pulses emitted by mode-locked lasers are keys to the development of optical frequency combs. First, shifting the envelope a little relative to the carrier

wave results in slightly different pulses. The peak of the pulse envelope may occur at the same time as a crest of the carrier, but it may also be shifted to any other stage of the oscillation. The amount of displacement is called the phase of the pulse. Second, mode-locked lasers emit trains of pulses at a

very regular rate, called the repetition rate. The frequency spectrum of such a train of pulses does not form a continuum spread on each side of the carrier frequency but rather breaks into many discrete frequencies. Plotted, the spectrum looks like the teeth of a hair comb, spaced at precisely the laser's repetition rate.

### Questions 1-5

Do the following statements agree with the information given in Reading Passage 1? In boxes 1-5 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) The number of loops that a fluctuation of optical light can achieve within a really short time is too large to believe.
- (2) A new device makes it possible for scientists to survey the frequencies across a wide range.
- (3) No other surveying instruments could do a better job than the optical combs do in the next few decades.
- (4) The story about the optical combs resembles that of the oscilloscope.
- (5) The radar waves are still in the plight that it is not applicable to have precise control over them.

### Questions 6-9

The reading Passage has seven paragraphs A-J.

Which paragraph contains the following information?

*Write the correct letter A-J, in boxes 6-9 on your answer sheet.*



**NB You may use the letter A-J more than once.**

- (6) the subtle differences in the pulses caused by the little shifts of the envelope
- (7) a certain ratio relationship between the pulse and the range of the frequency
- (8) unexpected working mechanism for waves and spectra
- (9) a term used to depict the overview of a pulse

### Questions 10-13

Complete the following summary of the paragraphs of Reading Passage, using no more than three words from the Reading Passage for each answer. Write your answers in boxes 10-13 on your answer sheet.

A key prerequisite for validates of the optical frequency combs is precise .....10..... ranging from a wide selection of frequencies. To better understand what it means, a violin without .....11..... can help describe the case. Likewise, a specific manipulator is required for each .....12.....while the availability of optical combs makes .....13..... comprising several optical tones possible.

### Reading Passage 2

You should spend about 20 minutes on Questions 14-26, which are based on the IELTSFever Academic IELTS Reading Test 106 Reading Passage Saving the British Bitterns below.

#### Saving the British Bitterns

**{A}** Breeding bitterns became extinct in the UK by 1886 but, following re-colonisation early last century, numbers rose to a peak of about 70 booming (singing) males in the 1950s, falling to fewer than 20 by the 1990s. In the late 1980s it was clear that the bittern was in trouble, but there was little information on which to base recovery actions.

**{B}** Bitterns have cryptic plumage and a shy nature, usually remaining hidden within the cover of reedbed vegetation. Our first challenge was to develop standard methods to monitor their numbers. The boom of the male bittern is its most distinctive feature during the breeding season, and we developed a method to count them using the sound patterns unique to each

individual. This not only allows us to be much more certain of the number of booming males in the UK, but also enables us to estimate local survival of males from one year to the next.

**{C}** Our first direct understanding of the habitat needs of breeding bitterns came from comparisons of reedbed sites that had lost their booming birds with those that retained them. This research showed that bitterns had been retained in reedbeds where the natural process of succession, or drying out, had been slowed through management. Based on this work, broad recommendations on how to manage and rehabilitate reedbeds for bitterns were made, and funding was provided through the EU LIFE Fund to manage 13 sites within the core breeding range. This project, though led by the RSPB, involved many other organisations.

**{D}** To refine these recommendations and provide fine-scale, quantitative habitat prescriptions on the bitterns' preferred feeding habitat, we radio-tracked male bitterns on the RSPB's Minsmere and Leighton Moss reserves. This showed clear preferences for feeding in the wetter reedbed margins, particularly within the reedbed next to larger open pools. The average home range sizes of the male bitterns we followed (about 20 hectares) provided a good indication of the area of reedbed needed when managing or creating habitat for this species. Female bitterns undertake all the incubation and care of the young, so it was important to understand their needs as well. Over the course of our research, we located 87 bittern nests and found that female bitterns preferred to nest in areas of continuous vegetation, well into the reedbed, but where water was still present during the driest part of the breeding season.

**{E}** The success of the habitat prescriptions developed from this research has been spectacular. For instance, at Minsmere, booming bittern numbers gradually increased from one to 10 following reed bed lowering, a management technique designed to halt the drying out process. After a low point of 11 booming males in 1997, bittern numbers in Britain responded to all the habitat management work and started to increase for the first time since the 1950s.

**{F}** The final phase of research involved understanding the diet, survival and dispersal of bittern chicks. To do this we fitted small radio tags to young bittern chicks in the nest, to determine their fate through to fledging and beyond. Many chicks did not survive to fledging and starvation was found to be the most likely reason for their demise. The fish prey fed to chicks was dominated by those species penetrating into the reed edge. So, an important element of recent studies (including a PhD with the University of Hull) has been the development of recommendations on habitat and water conditions to promote healthy native fish populations.

**{G}** Once independent, radio-tagged young bitterns were found to seek out new sites during their first winter; a proportion of these would remain on new sites to breed if the conditions were suitable. A second EU LIFE funded project aims to provide these suitable sites in new areas. A network of 19 sites developed through this partnership project will secure a more sustainable UK bittern population with successful breeding outside of the core area, less vulnerable to chance events and sea level rise.

**{H}** By 2004, the number of booming male bitterns in the UK had increased to 55, with almost all of the increase being on those sites undertaking management based on advice derived from our research. Although science has been at the core of the bittern story, success has only been



achieved through the trust, hard work and dedication of all the managers, owners and wardens of sites that have implemented, in some cases very drastic, management to secure the future of this wetland species in the UK. The constructed bunds and five major sluices now control the water level over 82 ha, with a further 50 ha coming under control in the winter of 2005/06. Reed establishment has principally used natural regeneration or planted seedlings to provide small core areas that will in time expand to create a bigger reed area. To date nearly 275,000 seedlings have been planted and reed cover is extensive. Over 3 km of new ditches have been formed, 3.7 km of existing ditch have been re-profiled and 2.2 km of old meander (former estuarine features) have been cleaned out.

{I} Bitterns now regularly winter on the site with some indication that they are staying longer into the spring. No breeding has yet occurred but a booming male was present in the spring of 2004. A range of wildfowl breeds, as well as a good number of reedbed passerines including reed bunting, reed, sedge and grasshopper warblers. Numbers of wintering shovellers have increased so that the site now holds a UK important wintering population. Malltraeth Reserve now forms part of the UK network of key sites for water vole (a UK priority species) and 12 monitoring transects have been established. Otter and brown-hare occur on the site as does the rare plant, pillwort.

### Questions 14-20

*The reading passage has seven paragraphs, A-H*

*Choose the correct heading for paragraphs A-H from the list below.*

**Write the correct number, i-viii, in boxes 14-20 on your answer sheet.**

*List of Headings research findings into habitats and decisions made*

- (I) fluctuation in bittern number
- (II) protect the young bittern
- (III) international cooperation works
- (IV) Began in calculation of the number
- (V) importance of food
- (VI) Research has been successful.
- (VII) research into the reedbed
- (VIII) reserve established holding bittern in winter

### (14) Paragraph A

(15) Paragraph B

(16) Paragraph C

(17) Paragraph D

**Example**

**Paragraph E   vii**

(18) Paragraph F

(19) Paragraph G

(20) Paragraph H

**Questions 21-26**

Answer the questions below.

Choose **NO MORE THAN THREE WORDS AND/OR A NUMBER** from the passage for each answer.

(21) When did the bird of bitten reach its peak of number?

(22) What does the author describe the bittern's character?

(23) What is the main cause for the chick bittern's death?

(24) What is the main food for chick bittern?

(25) What system does it secure for the stability for bittern's population?

(26) Besides bittern and rare vegetation, what mammal does the protection plan benefit?

**Questions 27**

Choose the correct letter, A, B, C or D.

Write your answers in boxes 27 on your answer sheet.

(27) What is the main purpose of this passage?

(A) Main characteristic of a bird called bittern.

(B) Cooperation can protect an endangered species.

(C) The difficulty of accessing information about a bittern's habitat and diet.

(D) To save wetland and reedbeds in the UK.



**Reading Passage 3**

You should spend about 20 minutes on Questions 28-40, which are based on the IELTSFever Academic IELTS Reading Test 107 Reading Passage Education Philosophy below.

## Education Philosophy

**{A}** In 1660s, while there are few accurate statistics for child mortality in the preindustrial world, there is evidence that as many as 30 percent of all children died before they were 14 days old. Few families survived intact. All parents expected to bury some of their children and they found it difficult to invest emotionally in such a tenuous existence as a newborn child. When the loss of a child was commonplace, parents protected themselves from the emotional consequences of the death by refusing to make an emotional commitment to the infant. How else can we explain mothers who call the infant "it," or leave dying babies in gutters, or mention the death of a child in the same paragraph with a reference to pickles?

**{B}** One of the most important social changes to take place in the Western world in the 18th century was the result of the movement from an agrarian economy to an industrial one. Increasingly, families left the farms and their small-town life and moved to cities where life was very different for them. Social supports that had previously existed in the smaller community disappeared, and problems of poverty, crime, substandard housing and disease increased. For the poorest children, childhood could be painfully short, as additional income was needed to help support the family and young children were forced into early employment. Children as young as 7 might be required to work full-time jobs, often under unpleasant and unhealthy circumstances, from factories to prostitution. Although such a role for children has disappeared in most economically strong nations, the practice of childhood employment has hardly disappeared entirely and remains a staple in many undeveloped nations.

**{C}** Over the course of the 1800s, the lives of children in the United States began to change drastically. Previously, children in both rural and urban families were expected to take part in the everyday labor of the home, as the bulk of manual work had to be completed there. However, establishing a background the technological advances of the mid-1800s, coupled with the creation of a middle class and the redefinition of roles of family members, meant that work and home became less synonymous over the course of time. People began to buy their children toys and books to read. As the country slowly became more dependent upon machines for work, both in rural and in urban areas, it became less necessary for children to work inside the home. This trend, which had been rising slowly over the course of the nineteenth century, took off exponentially after the Civil War, with the beginning of the Industrial Revolution. John Locke was one of the most influential writers of his period. His writings on the role of government are seen as foundational to many political movements and activities, including the American Revolution and the drafting of the Declaration of Independence. His ideas are equally foundational to several areas of psychology. As the father of "British empiricism," Locke made the first clear and comprehensive statement of the "environmental position" and, by so doing, became the father of modern learning theory. His teachings about child care were highly regarded during the colonial period in America.



**{D}** Jean Jacques Rousseau lived during an era of the American and French Revolution. His works condemn distinctions of wealth, property, and prestige. In the original state of nature, according to Rousseau, people were "noble savages", innocent, free and uncorrupted. Rousseau conveyed his educational philosophy through his famous novel *Emile*, in 1762, which tells the story of a boy's education from infancy to adulthood. Rousseau observed children and adolescents extensively and spoke of children's individuality, but he based much of his developmental theory on observation in writing the book, and on the memories of his own childhood. Rousseau contrasts children to Developmental Psychology in Historical Perspective adults and describes age-specific characteristics. Johan Heinrich Pestalozzi lived during the early stages of the industrial revolution, he sought to develop schools that would nurture children's development. He agreed with Rousseau that humans are naturally good but were spoiled by a corrupt society. Pestalozzi's approach to teaching can be divided into the general and special methods. The theory was designed to create an emotionally healthy homelike learning environment that had to be in place before more specific instruction occurred.

**{E}** One of the best documented cases of all the so-called feral children concerned a young man who was captured in a small town in the south of France in 1800, and who was later named Victor. The young man had been seen in the area for months before his final capture – pre-pubescent, mute, and naked, perhaps 11 or 12 years old, foraging for food in the gardens of the locals and sometimes accepting their direct offers of food. Eventually he was brought to Paris, where it was hoped that he would be able to answer some of the profound questions about the nature of man, but that goal was quashed very early. Jean-Marc-Gaspard Itard, a young physician who had become interested in working with the deaf, was more optimistic about a future for Victor and embarked on a five-year plan of education to civilize him and teach him to speak. With a subsidy from the government, Itard spent an enormous amount of time and effort working with Victor. He was able to enlist the help of a local woman, Madame Guerin, to assist in his efforts and provide a semblance of a home for Victor. But, after five years and despite all of his efforts, Itard considered the experiment to be a failure. Although Victor had learned some elementary forms of communication, he never learned the basics of speech, which, for Itard, was the goal. Victor's lessons were discontinued, although he continued to live with Madame Guerin until his death, approximately at the age of 40.

**{F}** Other educators were beginning to respond to the simple truth that was embedded in the philosophy of Rousseau. Identifying the stages of development of children was not enough. Education had to be geared to those stages. One of the early examples of this approach was the invention of the kindergarten ("the children's garden") - a word and a movement created by Friedrich Froebel in 1840, a German-born educator. Froebel placed particular emphasis on the importance of play in a child's learning. His invention, in different forms, would eventually find its way around the world. His ideas about education were initially developed through his association with Johann Heinrich Pestalozzi. Froebel spent five years teaching at one of Pestalozzi's model schools in Frankfurt, and later he studied with Pestalozzi himself. Eventually he was able to open his own schools to test his educational theories. One of his innovative ideas was his belief that women could serve as appropriate educators of young children - an unpopular view at the time. At the age of 58, after almost four decades as a teacher, Froebel introduced the notion of kindergarten. It was to be a haven and a preparation for children who were about to enter the regimented educational system. A cornerstone of his kindergarten education was the use of guided or structured play. For Froebel, play was the most significant aspect of development at this time of life. Play serves as the means

for a child to grow emotionally and to achieve a sense of self-worth. The role of the teacher was to organize materials and a structured environment in which each child, as an individual, could achieve these goals. By the time of Froebel's death in 1852, dozens of kindergartens had been created in Germany. Their use increased in Europe and the movement eventually reached and flourished in the United States in the 20th century.

### Questions 28-31

The reading passage has seven paragraphs, A-E Choose the correct heading for paragraphs A-E from the list below. Write the correct number, i-vii, in boxes 28-31 on your answer sheet.

#### List of Headings

- (I) Reasons of unusual experiments implemented by several thinkers
- (II) Children had to work to alleviate burden on family
- (III) Why children are not highly valued
- (IV) Children died in hospital at their early age
- (V) Politics related philosophy appeared
- (VI) Creative learning method was applied on certain wild kid
- (VII) Emerge and spread of called kindergarten

(28) Paragraph A

#### Example

Paragraph B ii Children have to work

(29) Paragraph C

(30) Paragraph D

(31) Paragraph E

### Questions 32-35

Use the information in the passage to match the time (listed A-C) with correct event below. Write the appropriate letters A-F in boxes 1-4 on your answer sheet.

**A 18th century**

**B 19th century**

**C 20th century**



- (32) need for children to work
- (33) rise of middle class
- (34) emergence of a kindergarten
- (35) the kindergarten in the spread around US

### Questions 36-40

Use the information in the passage to match the people (listed A-D) with opinions or deeds below. Write the appropriate letters A-D in boxes 36-40 on your answer sheet.

**[A]** Jean Jacquesd Rousseau

**[B]** Jean-Marc-Gaspard Itard

**[C]** Johan Heinrich Pestalozzi

**[D]** Friedrich Froebel

- (36) was not successful to prove the theory
- (37) observed a child's record
- (38) promoted some practical activities between school and family
- (39) corruption is not a characteristic in people's nature
- (40) responsible for the increase in the number of a type of school