

## IELTS Exam Training Courses GT Reading Test 10 Section 3

### Serendipity - accidental discoveries in science

What do photography, dynamite, insulin and artificial sweetener have in common? Serendipity! These diverse discoveries, which have made our everyday living more convenient, were discovered partly by chance. However, Louis Pasteur noted the additional requirement involved in serendipity when he said, '...chance favours only the prepared mind'.



The discovery of modern photography provides an example of serendipity. In 1838, L.J.M Daguerre was attempting to 'fix' images onto a copper photographic plate. After adding a silver coating to the plate and exposing it to iodine vapour he found that the photographic image was improved but still very weak. Desperate after an investigation lasting several months, Daguerre placed a lightly exposed photographic plate in the cupboard in which laboratory chemicals such as alcohol and collodion were stored. To his amazement, when he removed the plate several days later, Daguerre found a strong image on its surface.

This image had been created by chance. It was at this point that Louis Pasteur's 'additional requirement' came into play: Daguerre's training told him that one or more of the chemicals in the cupboard was responsible for intensifying the image. After a break of two weeks, Daguerre systematically placed new photographic plates in the cupboard, removing one chemical each day. Unpredictably, good photographic images were created even after all chemicals had been removed. Daguerre then noticed that some mercury had spilled onto the cupboard shelf, and he concluded that the mercury vapour must have improved the photographic result. From this discovery came the universal adoption of the silver-mercury process to develop photographs.

Daguerre's serendipitous research effort was rewarded, a year later, with a medal conferred by the French government. Many great scientists have benefited from serendipity, including Nobel Prize winners. In fact the scientist who established the Nobel Prize was himself blessed with serendipity. In 1861 the Nobel family built a factory in Stockholm to produce nitroglycerine, a colourless and highly explosive oil that had first been prepared by an Italian chemist fifteen years earlier. Nitroglycerine was known to be volatile and unpredictable, often exploding as a result of very small knocks. But the Nobel family believed that this new explosive could solve a major problem facing the Swedish State Railways - the need to dig channels and tunnels through mountains so that the developing railway system could expand.

However, as turnover increased, so did the number of accidental explosions resulting from the use of nitroglycerine. Some people blamed the people who used the explosive more than the substance itself, because nitroglycerine had become popular for inappropriate purposes such as polishing the leather of shoes.

At the age of thirty, Alfred Nobel made the first of his major inventions: an innovative blasting cap, a device designed to control the nitroglycerine explosion. Nobel was also determined to discover a way to make this explosive safer to manufacture, transport and use. Firstly he experimented with adding chemicals to nitroglycerine, but because the chemicals required huge amounts of resources and energy to wash out, this process was considered to be impractical. He then tried to use fibrous material such as sawdust, charcoal or paper to stabilise the explosive, but these combustible materials tended to catch fire when placed near nitroglycerine. As an alternative, he added powdered brick dust to tame the explosive as he knew that brick dust would not catch fire. However, the brick dust reduced the explosive power of the product, and so was also found to be unsatisfactory.



## IELTS Exam Training Courses GT Reading Test 10 Section 3

According to one version of how the eventual solution was found, a metal container of nitroglycerine sprang a leak and some of the liquid soaked into packaging material that lay around the container. Nobel immediately set to work to examine the connection between the two materials and found that when the packaging material was mixed with nitroglycerine it could be pressed into a compact solid. This solid retained the explosive power of the liquid but was entirely safe and reliable because it would not ignite until set off by a blasting cap.

As a scientist who had worked systematically towards a solution for a number of years, Nobel immediately understood the importance of this discovery. But the discovery had only come about because of his perseverance. Through Nobel's clear vision, systematic research and his quick grasp of the significance of his discovery he set himself apart from the many scientists who were not 'fortunate' enough to create new products that would make them famous.

Alfred Nobel, a lifelong pacifist, hoped that his explosive would be a powerful deterrent to warfare. Nobel sought to achieve permanent worldwide peace. In setting up the Nobel Foundation and the Nobel Peace Prizes, he hoped to accomplish what he had not been able to do during his lifetime: to encourage research and activities that would bestow the 'greatest benefit to mankind', especially peace and fraternity between nations.

### Questions 28 - 31

**Complete each sentence with the correct ending, A - G below.**

**Write the correct letter, A - G in boxes 28 - 31 on your answer sheet.**

- 28 Nobel found that adding chemicals  
29 Nobel found that adding sawdust and paper  
30 Nobel found that adding brick dust  
31 Nobel found that mixing nitroglycerine with packaging
- A decreased the energy of the explosion  
B lengthened the time required.  
C made the process unworkable.  
D reduced the manufacturing costs.  
E made the process safer.  
F increased the flammability of the mixture.  
G resulted in lower reliability.

### Questions 32 - 37

**Look at the following statements and the list of options below.**

**Match each statement with the correct option A, B or C.**

**NB You may use any letter more than once.**



IELTS Exam Training Courses  
GT Reading Test 10 Section 3

- 32 He recognised the significance of an unexpected result.
- 33 He depended on the help of colleagues to solve a problem.
- 34 He used different methods to find a solution to the problem.
- 35 He was encouraged to do this research by his government.
- 36 He received an award in recognition of his scientific work.
- 37 He worked for a long time to find a way of keeping a process under control.

List of Options

- A true of both Daguerre and Nobel
- B true of neither Daguerre nor Nobel
- C true of only one of them.

Questions 38 - 40

Complete the summary below.

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

Daguerre's Experiments

Daguerre's work illustrated the comment made by Louis Pasteur that in order to take full advantage of a lucky discovery, scientists need to have a **38** \_\_\_\_\_. He found that exposure to **39**. \_\_\_\_\_ had the desired effect on a silver-coated photographic plate, but only to a very limited extent. To his great surprise the image then became much clearer when it was stored in a cupboard. By a process of elimination, he discovered that collodion and alcohol were not responsible for this improvement. In fact, the removal of all the **40** \_\_\_\_\_ did not affect the quality of the image. It was some spilt mercury that had produced the effect.

Answers

Questions 28 - 31

Complete each sentence with the correct ending, A - G below.  
Write the correct letter, A - G in boxes 28 - 31 on your answer sheet.

28 Nobel found that adding chemicals **C made the process unworkable.**

*Firstly he experimented with adding chemicals to nitroglycerine, but because the chemicals required huge amounts of resources and energy to wash out, this process was considered to be impractical.*



## IELTS Exam Training Courses GT Reading Test 10 Section 3

29 Nobel found that adding sawdust and paper **F increased the flammability** of the mixture.

*He then tried to use fibrous material such as **sawdust**, charcoal or **paper** to stabilise the explosive, but these combustible materials **tended to catch fire** when placed near nitroglycerine.*

30 Nobel found that adding brick dust **A decreased the energy** of the explosion.

*As an alternative, he added powdered **brick dust** to tame the explosive as he knew that brick dust would not catch fire. However, the brick dust **reduced the explosive power** of the product, and so was also found to be **unsatisfactory**.*

31 Nobel found that mixing nitroglycerine with packaging **E made the process safer**.

*Nobel immediately set to work to examine the connection between the two materials and found that when the **packaging material was mixed with nitroglycerine** it could be pressed into a compact solid. This solid retained the explosive power of the liquid **but was entirely safe** and reliable because it would not ignite until set off by a blasting cap.*

32 He recognised the significance of an unexpected result. **A\* - both**

*Nobel immediately understood the importance of this discovery.*

*\*Daguerre\* - there are no exact synonyms, but it is understood that he recognised the significance by the amount of time and effort he spent trying to discover which chemical intensified the image.*

33 He depended on the help of colleagues to solve a problem. **B**

*There is no mention of colleagues.*

34 He used different methods to find a solution to the problem. **C - only Nobel.**

***Nobel** - tried different methods. Daguerre used the same method - removing individual chemicals to find out which chemical was responsible.*

35 He was encouraged to do this research by his government. **B**

*There is no mention of encouragement from the government. Daguerre got a medal **AFTER** his discovery.*

36 He received an award in recognition of his scientific work. **C - Daguerre**

*Daguerre's serendipitous research effort was rewarded a year later with a medal.*

37 He worked for a long time to find a way of keeping a process under control. **C - Nobel**

*Nitroglycerine was 'volatile and unpredictable'. Nobel was determined to discover a way to make this explosive safer to manufacture, transport and use.*

### List of Options

**A** true of both Daguerre and Nobel

**B** true of neither Daguerre nor Nobel

**C** true of only one of them.



## IELTS Exam Training Courses GT Reading Test 10 Section 3

### Daguerre's Experiments

Daguerre's work illustrated the comment made by **Louis Pasteur** that in order to take full advantage of a **lucky discovery**, scientists need to have a **38 prepared mind**.

*38. What do photography, dynamite, insulin and artificial sweetener have in common? Serendipity! These diverse **discoveries**, which have made our everyday living more convenient, were **discovered partly by chance**. However, **Louis Pasteur** noted the **additional requirement** involved in serendipity when he said, '...chance favours only the **prepared mind**'.*

He found that exposure to **39. iodine vapour** had the desired effect on a **silver-coated photographic plate**, but **only to a very limited extent**. To his great surprise the image then became much clearer when it was stored in a cupboard.

*39. In 1838, L.J.M Daguerre was attempting to 'fix' images onto a copper photographic plate. After adding a silver coating to the plate and exposing it to **iodine vapour** he found that the photographic image was improved but still very weak.*

By a process of elimination, he discovered that **collodion and alcohol** were not responsible for this improvement. In fact, the removal of all the **40 chemicals** did not affect the quality of the image. It was some spilt mercury that had produced the effect.

*Daguerre placed a lightly exposed photographic plate in the cupboard in which laboratory chemicals such as **alcohol and collodion** were stored. To his amazement, when he removed the plate several days later, Daguerre found a strong image on its surface.*

.....

*After a break of two weeks, Daguerre systematically placed new photographic plates in the cupboard, **removing one chemical each day**. Unpredictably, good photographic images were created **even after all chemicals had been removed**. Daguerre then noticed that some mercury had spilled onto the cupboard shelf, and he concluded that the mercury vapour must have improved the photographic result.*



**Stop looking around for the best IELTS advice! Find everything you need in the Members Academy - where everything's in one place!**

