

### The Story of the Battery

When people consider today how indispensable the Internet is, they often overlook that without electricity, it would not function. Living without the Internet would be a significant inconvenience today, but without electricity, life as we know now it would collapse. Since we started using electricity, which was in the middle of the nineteenth century, we have worked on ways to move and store it easily and efficiently and one of the most common ways of storing electricity has been the battery. A battery does not actually store electricity. A battery, which is actually an electric cell, is a device that produces electricity from a chemical reaction. The story of the battery is one of people trying to create different compounds to create an electric current. The two goals on improving batteries have always been to create ones that can produce an electric current for a long time and to make them smaller and smaller.

Alessandro Volta is credited with creating in 1800 the first battery and the first practical method of generating electricity. Luigi Galvani, another Italian scientist and contemporary of Volta, almost made the discovery, but misinterpreted his research results. Using a frog's leg in an experiment, Galvani concluded that the electric current was 'animal electricity' and did not come from the apparatus he had set up. Volta's battery was made by piling up layers of silver and paper or cloth, soaked in salt, and zinc. These layers were assembled, without paper or cloth between the zinc and silver, until the current was created.

Volta's battery was not good for delivering currents for any significant duration. This restriction was overcome in the Daniell Cell in 1820. Using different chemicals, John Daniell used a copper pot, copper sulphate, sulphuric acid and mercury to produce his electric current. Although we now know better than to put mercury into batteries, this battery, which produced about 1.1 volts, was used to power telegraphs, telephones, and even to ring doorbells in homes for over 100 years.

Although many other chemical combinations were used in batteries over the years, the lead acid battery is one that stands out. First made in 1859, it was further improved in 1881 and this design even now forms the basis of the modern lead acid battery found in cars.

One very common battery used today is the lithium-ion battery, which was developed by the United States' Central Intelligence Agency (CIA) as a part of their efforts during the Cold War. The idea surrounding the lithium-ion battery was to create a power source that could provide a long-duration, high-density energy supply in a small package. In the early 1960's, both the private and public sectors were experimenting with creating batteries using lithium, but the breakthrough in the chemistry was achieved by adding the ion into the equation. Not long after its invention, the CIA shared the lithium-ion battery concept with the public and a company working on an exploratory project developed and created the first patent for the lithium-ion battery for commercial use in 1968. Used for a variety of different applications, the first lithium-ion battery was a game-changer in the medical industry, where it is used as the power source in heart pacemakers.



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Today, the lithium-ion battery is the most common type of battery used in pacemakers, because of its reliability and life span. Most lithium-ion batteries can last 10 years or longer in a cardiac pacemaker. What makes lithium-ion batteries even more valuable in cardiac pacemakers is that, when the battery nears the end of its life, the voltage begins to decrease. Because of the battery's decreasing voltage, electrical designers can design an indicator for the pacemaker that allows the device to inform the doctor a new battery is needed. The battery can then be changed safely before it completely discharges. Lithium-ion batteries can also be used for other medical applications, including neurostimulation and insulin pumps for diabetics.

Whilst people consider the mid-nineteenth century to have been when civilisation started using electricity, there has been a discovery of what could be a battery that seems to indicate that electricity was used long ago. What has become known as the Parthian Battery was found on a railway construction site in 1936. Dating back 2,000 years, the 'battery' would have comprised a clay jar filled with a vinegar solution. An iron rod was put into the middle of the jar and encircled with copper wire. Tests have shown that this 'battery' could produce 2 volts of electricity. It would have not been used for electricity as we generally use it today, but it has been theorised it could have been used for electroplating objects with metals, such as gold or silver. Most scientists reject these theories nowadays and hypothesise that the 'battery' was more likely to have been used for the storage of scrolls.

Although battery research is proceeding at a steady pace, with an average annual gain in capacity of six per cent, what scientists are hoping for is that a battery will be developed that can last even longer and be lighter and smaller. One completely different technology that is being explored is to create a battery that can power a house; size would not be such an issue, but its generating capacity and length of life would have to be something totally different from what we have yet experienced.

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### Questions 1 - 5

Complete the table below.

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

Write your answers in boxes **1 - 5** on your answer sheet.

<b>Some Older Batteries</b>	
<b>Battery</b>	<b>Notes</b>
Volta's Battery	* Invented in 1800 * Beat his contemporary, Galvani, who made errors with his (1) _____ * Used silver, paper or cloth, salt and zinc in (2) _____ * Not good for long (3) _____
Daniell's Battery	* Made using different chemicals * Used (4) _____, which is not used any more * Produced just over 1 volt and was used for over 100 years
The Lead Acid Battery	* A significant development from 1859 that still is used in (5) _____ today

### Questions 6 - 10

Complete the sentences below.

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

Write your answers in boxes **6 - 10** on your answer sheet.

- 6 The lithium-ion battery was invented as part of the United States' contribution to the \_\_\_\_\_.
- 7 The \_\_\_\_\_ that allowed the success of the lithium-ion battery was the chemical addition of the ion to the equation.
- 8 A \_\_\_\_\_ for creating the lithium-ion battery commercially was only possible when the CIA shared its work publicly.
- 9 The lithium-ion battery is used a lot in pacemakers due to its \_\_\_\_\_ and how long it keeps its charge.
- 10 Developments in the lithium-ion batteries for pacemakers allowed an \_\_\_\_\_ to be included to show when the battery needs to be replaced.

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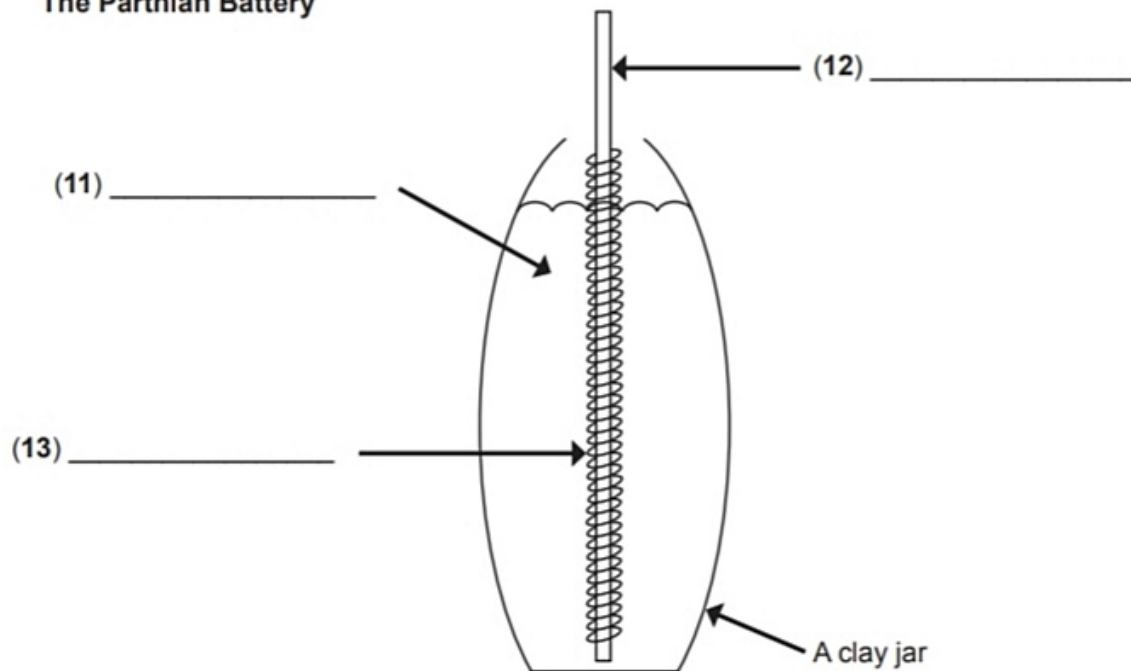
**Questions 11 - 13**

Label the diagram below.

Write **NO MORE THAN THREE WORDS** from the text for each answer.

Write your answers in boxes **11 - 13** on your answer sheet.

**The Parthian Battery**





## **Reading Passage 2**

You should spend about 20 minutes on **Questions 14 - 26**, which are based on Reading Passage 2 below.

### **Can All Reading Help Children?**

It is generally acknowledged that reading is an important part of a child's learning process. Reading is a way for children to make connections between what they already know and what they see around them. These connections help children understand the world they are in, and, through books, children are exposed to characters and cultures that they may not otherwise interact with in real life.

A recent debate has examined what kinds of reading are best for children and whether any type of reading is beneficial. Many children are attracted to one genre or type of book, or they may have a favourite author that they like to read time and time again. Even though children may enjoy reading a single type of literature, they can be gently introduced to other genres. 'Gently' is important, because parents or teachers do not want to push too hard and run the risk of turning the child off reading. So, why is it important for children to read a variety of books and stories? Primary school teacher, Carol Anderson explains that there are several good reasons. "The exposure to different authors and genres of books can give your child insight into other societies, worldwide locations, and new vocabulary." Child-specific genres also provide a key link from the present to the past. Anderson again explains. "These genres are often stories that are passed down from generation to generation and they can be fascinating. Folk tales, fairy tales, fables, legends and myths, while retaining much of their original flavour and content, have to evolve in subtle ways to remain meaningful in different eras. They are a great starting point to introduce children to the concept of a story and to introduce them to different types of stories or genres."

But is all reading good? There is so much written that is done so badly and with questionable content. But if those are the only books a reluctant reader will pick up, do their drawbacks outweigh the benefit of having the student finally turning pages? "I think you should be glad they're reading anything at all," says Patricia Edwards, distinguished professor of language and literacy at Michigan State University. In her area of specialisation of creating home reading environments for families, she has become accustomed to the reality that there are often not typically strong reading role models for students at the end of the day. "A lot of parents don't have reading as a tradition and there aren't any books they would suggest their children read. So if a student gravitates toward a book, even if it's not a classic from the literary canon, that shouldn't be cause for alarm."

Joining her in the any-reading-is-good camp is Deborah Wooten, a board member of the Children's Literature Assembly. Children learn how language and writing work, even when reading books dismissed by some as piffle, says Wooten. Wooten is also concerned with other issues. "There is decreased readership among children and young adults because of digital distractions." To prove her point, she cites a recent study that showed teenagers spend roughly four hours a night in front of a television or computer.

But plenty of parents put themselves in the opposite camp. Don Croft, a parent of a six-year-old boy, recently wrote in an online review of a book that he saw his child reading, that he had to stop after every other sentence and talk about how his child should not follow the examples



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he read about in this particular book. "I had to point out that we don't call people stupid, we don't judge others by the fact that you can beat them up, and you don't deal with being afraid by calling everyone names and hitting them."

Librarian, Mike Howard, disagrees. "The books that we believe to be poor quality may introduce students to reading. After they are hooked with these books, it is our job as educators and parents to slowly begin introducing new books to these students. As long as the students are able to develop the skill of visualising what they are reading, they are learning." Another point of view is that 'low quality literature' can give the opportunity to teach a child to be a critical thinker and that parents can use the child's interest as a springboard for recommendations for other, more substantive literature. Author, Judy Blume, who has had her books banned by various organisations, feels that parents worry too much about their children's reading material. "If a book is really unsuitable, the children themselves will simply self-censor themselves." Although Blume has sold over 80 million of her books worldwide, she still finds people critical of what she has written. "A lot of people want to control everything in their children's lives, or everything in other people's children's lives."

Reading for pleasure is an activity that has real consequences in the life of a child. There is a growing body of evidence that emphasises the importance of reading for pleasure, for both educational purposes as well as personal development. The evidence strongly supports the argument that those who read more are better readers and do significantly better at school. Children who read very little do not have the benefits that come with reading, and studies show that when struggling readers are not motivated to read, their opportunities to gain knowledge decrease significantly. Whether any type of reading can be considered beneficial is moot and it probably lies with parents and teachers to lay down their own beliefs in guiding children's reading patterns.

### Glossary

Piffle – nonsense or rubbish

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### **Questions 14 - 21**

Look at the following statements (questions **14 - 21**) and the list of people below.

Match each statement with the correct person's initials.

Write the correct initials in boxes **14 - 21** on your answer sheet.

- 14 Some books provide unsuitable role models.
- 15 Some adults are motivated to interfere in all aspects of children's lives.
- 16 Different book types can teach children about different cultures.
- 17 Reading books has been affected by modern media usage.
- 18 Too many children don't have parental role models who read.
- 19 Different types of children's literature is a good starting point for children to learn about how stories work.
- 20 If reading can induce the process of imagination, then it is a valuable learning experience.
- 21 Children can learn about how language functions, even from poorly written books.

<b>CA</b>	Carol Anderson
<b>PE</b>	Patricia Edwards
<b>DW</b>	Deborah Wooten
<b>DC</b>	Don Croft
<b>MH</b>	Mike Howard
<b>JB</b>	Judy Blume

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### **Questions 22 - 25**

Complete the sentences below.

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

Write your answers in boxes **22 - 25** on your answer sheet.

- 22 Poor books can also teach a child to be a \_\_\_\_\_, as he or she recognises what is bad.
- 23 Children have the ability to \_\_\_\_\_ their reading if they find it inappropriate.
- 24 Reading for enjoyment can have a significant impact on children's educational and \_\_\_\_\_ growth.
- 25 Children who miss out on reading a lot can find their \_\_\_\_\_ for learning are considerably diminished.

### **Question 26**

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

Write the correct letter in box **26** on your answer sheet.

- 26 What is the writer's purpose in Reading Passage 2?
- A** To discuss which genres are best for child readers.
- B** To explain what reading parents and teachers should help children avoid.
- C** To discuss whether all reading can be beneficial for children.
- D** To explain how reading is beneficial for children.



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### **Reading Passage 3**

You should spend about 20 minutes on **Questions 27 - 40**, which are based on Reading Passage 3 below.

#### **The Spanish Influenza Pandemic of 1918**

The Spanish influenza pandemic of 1918 to 1919, which caused around 50 million deaths worldwide, remains an ominous warning to public health.

##### **Paragraph A**

Before and after 1918, most influenza pandemics developed in Asia and spread from there to the rest of the world more or less simultaneously. Historical data are inadequate to identify the geographic source of the 1918 virus. The name 'Spanish' influenza merely reflects that Spain, which was neutral in World War 1, did not censor their news agencies from publicising the severity of the pandemic in the country, and this made it seem to other countries that the disease was worse there.

##### **Paragraph B**

The pandemic did not occur evenly over 1918 and 1919, but came in three severe waves. The first, or so-called spring wave, began in March 1918 and spread unevenly through the United States, Europe, and possibly Asia over the next six months. Illness rates were high, but death rates in most locales were not appreciably above normal. A second or autumn wave spread globally from September to November 1918, was highly fatal and, in many nations, a third wave occurred in early 1919. Clinical similarities led contemporary observers to conclude initially that they were observing the same disease in the successive waves. The differences between the waves seemed to be primarily in the much higher frequency of complicated, severe, and fatal cases in the last two waves. These three extensive pandemic waves of influenza within one year, occurring in rapid succession, with only the briefest of quieter intervals between them, were unprecedented.

##### **Paragraph C**

All of these deaths caused a severe disruption in the US economy. Claims against life insurance policies skyrocketed, with one insurance company reporting a 745 per cent rise in the number of claims made. Small businesses, many of which had been unable to operate during the pandemic, went bankrupt. The world economy as a whole was not significantly affected and the 1920's actually heralded a growth boom, until the 1929 Wall Street Crash. The US had a great influence on world economics and, although over 650,000 people died in the US, it could have been a lot worse. Throughout history, influenza viruses have mutated and caused pandemics or global epidemics. In 1890, an especially virulent influenza pandemic struck, killing many Americans. Those who survived that pandemic and lived to experience the 1918 pandemic tended to be less susceptible to the disease and so a lot more Americans lived than would have otherwise been the case.

##### **Paragraph D**

In the years following 1919, people seemed eager to forget the pandemic. Given its devastating impact, the reasons for this forgetfulness are puzzling. It is possible, however, that the

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pandemic's close association with World War I may have caused this short memory. While more people died from the pandemic than from World War I, the war had lasted longer than the pandemic and caused greater and more immediate changes in American society. Influenza hit areas quickly and often, but it disappeared within a few weeks of its arrival. Many people did not have time to fully realise just how great was the danger.

### **Paragraph E**

The 1918 Spanish Influenza pandemic had some curious features. Firstly, overall, nearly half of the influenza-related deaths in the 1918 pandemic were in young adults of 20 to 40 years of age, a phenomenon unique to that pandemic year. The 1918 pandemic is also unique among influenza pandemics in that the absolute risk of influenza death was higher in those under 65 years of age than in those over 65. Influenza is usually more dangerous for the very young and the old, as their immune systems are weaker. Secondly, the pandemic was particularly widespread during the summer and autumn, whilst usually influenza is more widespread in the colder winter months. Finally, in 1918, three separate recurrences of influenza followed each other with unusual rapidity, resulting in three explosive pandemic waves within a year's time.

### **Paragraph F**

The 1918 Spanish Flu pandemic was particularly fatal with more than twice the fatalities of World War 1. Scientists today have isolated the virus and researched why it was so particularly lethal. The theory is that it often killed through an over-stimulation of people's immune systems, a process known as a cytokine storm. This is when there is an overproduction of immune cells and associated compounds to fight an infection. As the infection was influenza, the cells congregated in the lungs, and their large numbers led to inflammation followed by secondary bacterial pneumonia. This secondary disease was the cause of the many deaths, particularly in healthy young adults, because of their robust immune systems that could produce so many cytokines. Ironically, the health of the young adults made them the most affected.

### **Paragraph G**

In its disease course, the 1918 pandemic was different in degree, but not in kind, from previous and subsequent pandemics. Despite the extraordinary number of global deaths, most influenza cases in 1918 were mild and essentially indistinguishable from influenza cases today. Although laboratory experiments on influenza genes from the 1918 virus suggest that the 1918 and 1918-like viruses seem to be as sensitive as other typical virus strains to today's anti-influenza drugs and even with today's prevention knowledge, the return of a pandemic virus similar to the virus of 1918 would likely kill over 100 million people worldwide, as the ease of travel in today's globalised society would aid the movement of the virus. However, although some characteristics of the 1918 pandemic appear unique, scientists have concluded that, since it happened once, similar or more favourable conditions could lead to another equally devastating pandemic.

### **Glossary**

A pandemic – a disease active over the whole world or over a country.

Epidemiology – the science of the origins, spread and control of a disease.

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### **Questions 27 - 33**

The text on the previous pages has 7 paragraphs (**A – G**).

Choose the correct heading for each paragraph from the list of headings below.

Write the correct number (**i – x**) in boxes **27 – 33** on your answer sheet.

- |      |                            |
|------|----------------------------|
| i    | Out of Mind                |
| ii   | Economic Effects           |
| iii  | Inadequate Vaccines        |
| iv   | Origins of the Name        |
| v    | The Risks Today            |
| vi   | The Course of the Pandemic |
| vii  | A Famous Doctor            |
| viii | Unusual Aspects            |
| ix   | Why so Deadly?             |
| x    | Influenza in the War Zone  |

- |    |             |
|----|-------------|
| 27 | Paragraph A |
| 28 | Paragraph B |
| 29 | Paragraph C |
| 30 | Paragraph D |
| 31 | Paragraph E |
| 32 | Paragraph F |
| 33 | Paragraph G |

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### **Questions 34 - 37**

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

Write the correct letter in boxes **34 - 37** on your answer sheet.

- 34 Spanish influenza received its name because
- A it was first diagnosed in Spain.
  - B Spain's soldiers coming home from World War 1 were the most severely affected.
  - C the Spanish media publicised the effects more.
  - D a Spaniard first transferred the virus to the United States.
- 35 The attack of the virus in three waves
- A had never been experienced before.
  - B allowed doctors to treat the later cases more effectively.
  - C led to the government learning from previous mistakes.
  - D meant sickness was most severe at the start.
- 36 The 1918 Spanish influenza pandemic
- A indirectly led to great prosperity in the 1920's.
  - B had a severe effect on the world economy in the following years.
  - C had no appreciable influence on the world economy.
  - D indirectly led to the 1929 Wall Street Crash.
- 37 A previous influenza pandemic
- A meant that the United States had more fatalities than expected in the 1918 Spanish influenza pandemic.
  - B led to many Americans surviving the 1918 Spanish influenza pandemic.
  - C meant many Americans caught the 1918 Spanish influenza virus more easily.
  - D was brought to the United States from South America.



## Questions 38 - 40

Do the following statements agree with the information given in the text?

In boxes **38 – 40** on your answer sheet write:

**TRUE**                      *if the statement agrees with the information*

**FALSE**                     *if the statement contradicts the information*

**NOT GIVEN**             *if there is no information on this*

- 38 Because Spanish influenza was often only active for a short time in some communities, its impact was not always appreciated.
- 39 The 1918 Spanish influenza virus was first identified in Asia.
- 40 The very young, sick and old were more at risk from 1918 Spanish influenza pandemic.