Journal of Interdisciplinary Science Topics

Which Is The Most Offensively Powerful Starter Pokémon?

Thomas Codd

The Centre for Interdisciplinary Science, University of Leicester
19/02/2016

Abstract

In the game of Pokémon, the player is initially given a starter Pokémon from their local Pokémon Professor. These Pokémon always either a fire type, a water type or a grass type. But which is the most powerful in its fully evolved form? Or rather, which of the fully evolved forms has the most powerful signature move? By analysing the anime and based on their signature moves, Charizard is the most powerful fully evolved original starter Pokémon by a considerable margin, and Blastoise is around twice as powerful as Venusaur.

Introduction

At the start of each Pokémon game, the player is given a choice of starter Pokémon. The options are almost always a choice between a fire type, a water type and a grass type. In most ways the most iconic of the starter Pokémon across all Pokémon generations are the original three; Charmander, Squirtle and Bulbasaur, which will fully evolve into Charizard, Blastoise and Venusaur respectively. Each of these Pokémon also have a signature move, one which is closely linked to them through the course of the anime and the games. For Charizard this is Flamethrower, for Blastoise this is Hydro Pump and for Venusaur this is Solar Beam. Through analysis of the anime series, the power of each of these moves has been calculated, and thus the main offensive power of each of these Pokémon has been estimated.

Venusaur

Venusaur's most powerful (and iconic) offensive move is Solar Beam. In this move, the Pokémon spends a "turn" absorbing light, and then unleashes it in a powerful beam. It is also worth noting that in the 437th episode of the Pokémon anime, *Cutting the ties that bind*, Spencer's Venusaur seems to increase the intensity of the sunlight while absorbing light for this move [1]. In order to account for this, the intensity of sunlight during the gathering stage of the move is being treated as twice that at the equator, so 2060Wm[-2] [2].

Venusaur gathers the light by using the centre of its flower [4]. However, this is only a small area, so for this calculation instead it is treated as if the entire flower area is able to gather the light. By analysing the image in Figure 1 using ImageJ [5] to measure the flower in the image, and knowing that Venusaur is 2.0 meters tall [6] and using this as a scale, the flower is calculated to be 1.907m in diameter. This gives it an area of 2.856m[2] via equation 1.

Figure 1) Venusaur [3].

$$Area = \pi r^2 \qquad (1)$$

Multiplying this by the Intensity of sunlight presumed above (2060Wm[-2]) and assuming in Venusaur's favour that it can absorb and reuse the energy with 100% efficiency, means that for every second Venusaur can absorb 5880J.

Venusaur absorbs light for 33 seconds in its gathering stage [4], equating to 194,000J of energy being released in its solar beam blast.

Blastoise

Figure 2) Blastoise [8].

Blastoise is a 1.6 meter tall water type Pokémon [7] whose iconic offensive move is Hydro Pump, a move that involves it projecting high pressure water with great force against its opponents from its two cannons. By knowing Blastoise's height, and using ImageJ to analyse the image in Figure 2 it was determined that his cannons each have a diameter of 0.148m, giving it an area of 0.0172m^2 (via equation 1). Frame by frame analysis and estimations from the anime show that Blastoise projects water at a velocity of at least 8ms^{-1}[9]. In Blastoise's favour, this has been adjusted to 12ms^{-1} as the 8ms^{-1} is a minimum, and for such a powerful attack, the raise to 12ms^{-1} seemed appropriate and was still in keeping with the possible velocity from the TV series [9]. The column of water projected in a one second burst has a volume of 0.2064m^3 (12m x 0.0172m^2=0.2064m^3). As 1m^3 of water weights 1000kg, this equates to a weight of 206.4kg of water per second for a single cannon. The conversion to energy uses equation 2 and comes out to 14860.8J per second of Hydro pump.

$$KE = \frac{1}{2}mv^2 \qquad (2)$$

Blastoise can project this blast for on average 13 seconds [9] resulting in a projected energy of 193000J, and as Blastoise has two cannons, this is doubled to give Hydro Pump's energy output to be 386,000 J.

Charizard

Charizard is a 1.7m tall Fire/Flying type Pokémon. Its signature move is Flamethrower, where it breathes fire over its opponent. It has been used for other uses in battle also, however. In the Pokémon episode *"Can't Beat the Heat!"* Charizard succeeds in using its flamethrower move to melt an entire Pokémon battleground to gain the upper hand against its opponent.
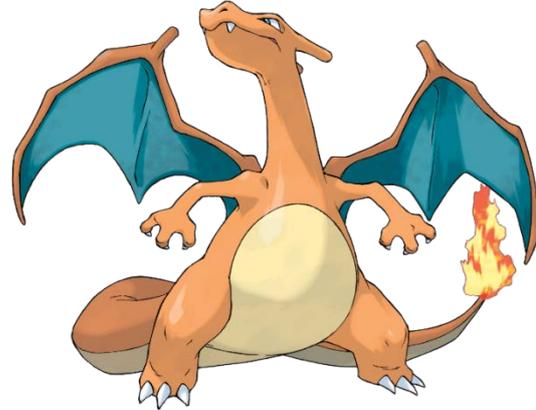
Figure 3) Charizard [10].

Analysing a screengrab from the battlefield [9] and estimating its size based on Ash as a typical 10 year old of 140cm [11], the width of the pitch was estimated to be 42m. the pitches are a 2:3 ratio, so the length is 63m, giving it a rough area of 2646m^2. Assuming that Charizard melts the top 1m of this, this results in a volume of 2646m^3 melted in 32 seconds [9]. The energy this involved is calculated in equation 3.

$$q = mc\Delta T \qquad (3)$$

Assuming the rock melted is granite, which has a melting temperature of 1533.15K [12] (which has 293.15K taken from it to give a dT value of 1240), a density of 2700kgm^{-3} [13] (which is multiplied by the volume of 2646 m^3 to give a mass of 7144200kg), and a specific heat capacity of 790 Jkg^{-1} [14]. Inputting these values into equation 3 gives us an energy requirement for this feat of 6.998x10^{12}J. This means that in a 32 second blast, Charizard used 6.998x10^{12}J. For a more usual 12 second blast [9] this results in 2.62x10^{12}J.

Conclusion

During the Quantitative analysis of each of the fully evolved starter Pokémon's signature moves, It was discovered that Venusaur's Solar Beam had an energy output of 194,000J, Blastoise's Hydro Pump had an energy output of 386,000J and Charizard had an output ~x10^6 greater than them, at 2.62x10^{12}J. This is calculated from the amount of energy required to produce each of the 3 iconic attacks.

References

[1]   "Cutting the ties that bind". *The Pokémon animated series*. 09.02.2006. Television. [Accessed: 09/02/2016].

[2]   Burgess, P. (2016) *Variation in light intensity at different latitudes and seasons, effects of cloud cover, and the amounts of direct and diffused light*, Cranfield: University of Cranfield, Available: http://www.ccfg.org.uk/conferences/downloads/P_Burgess.pdf [Accessed: 09/02/ 2016].

[3]   The Pokémon Company, *Venusaur's Fire Red or Leaf Green artwork*. 2005. Available: http://bulbapedia.bulbagarden.net/wiki/File:003Venusaur.png [Accessed: 09/02/2016].

[4]   "Enter the Dragonite". *The Pokémon animated series*. 09.09.1999. Television. [Accessed: 09/02/2016].

[5]   Rasband, W.S., ImageJ, U. S. National Institutes of Health, Bethesda, Maryland, USA, http://imagej.nih.gov/ij/, 1997-2016. [Accessed: 09/02/2016].

[6]   Bulbapedia.bulbagarden.net, "Venusaur (Pokémon) - Bulbapedia, the community-driven Pokémon encyclopedia", 2016. [Online]. Available at: http://bulbapedia.bulbagarden.net/wiki/Venusaur_(Pok%C3%A9mon) [Accessed: 09/02/2016].

[7]   Bulbapedia.bulbagarden.net, "Blastoise (Pokémon) - Bulbapedia, the community-driven Pokémon encyclopedia", 2016. [Online]. Available at: http://bulbapedia.bulbagarden.net/wiki/Blastoise_(Pok%C3%A9mon) [Accessed: 09/02/2016].

[8]   Static.comicvine.com, "Blastoise", 1999. [Online]. Available at: http://static.comicvine.com/uploads/original/2/29361/627069-stardustftl.jpg [Accessed: 09/02/2016].

[9]   "Can't beat the heat!". *The Pokémon animated series*. 17.02.2002. Television. [Accessed: 09/02/2016].

[10] Cdn.bulbagarden.net, "Charizard", 2005. [Online]. Available at: http://cdn.bulbagarden.net/upload/archive/7/7e/20130904124734%21006Charizard.png [Accessed: 09/02/2016].

[11] D. Halls, "The growth chart of average height of boys - Moose and Doc", *Moose and Doc*, 2016. [Online]. Availableat : http://halls.md/chart-boys-height-w/ [Accessed: 09/02/2016].

[12] Minsocam.org, "Temperature of magmas", 2016. [Online]. Available at: http://www.minsocam.org/msa/collectors_corner/arc/tempmagmas.htm [Accessed: 09/02/2016].

[13] Engineeringtoolbox.com, "Densities of Solids", 2016. [Online]. Available at: http://www.engineeringtoolbox.com/density-solids-d_1265.html [Accessed: 09/02/2016].

[14] Engineeringtoolbox.com, "Solids - Specific Heats", 2016. [Online]. Available at: http://www.engineeringtoolbox.com/specific-heat-solids-d_154.html [Accessed: 09/02/2016].