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July 2020

Week 14 #SolveItWithSTEM@Home Experiment Pack for Secondary Schools *featuring Alice and Eddie - our STEM Gurus*

Reminder: Make sure you do the experiment safely and with an adult present!



Hey everybody...we have reached Week 14 and it is our last pack (for the summer). Alice and I hope you have enjoyed the past 14 weeks and we are looking forward to bringing you something new and exciting soon.

Our last pack includes another amazing STEM figure....have a look at who it is!
See you soon!



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Inspirational STEM Figure: Stephen Hawking (1942-2018)

For the final week, before the Fawley STEM team take a break for the summer, we have decided our last STEM figure is Stephen Hawking! For those of you who are not aware of Stephen Hawking – he was a British physicist whose theory of exploding black holes drew upon both relativity theory and quantum mechanics.

Hawking began his university education at University College, Oxford at the age of 17. Here Hawking received a first-class BA degree in physics. He continued his education at Cambridge where he obtained his PhD degree in applied mathematics and theoretical physics, specialising in general relativity and cosmology.

During his studies, in 1963, Hawking was diagnosed with an early-onset slow-progressing form of motor neurone disease (MND). An initial diagnosis stated he had only two years to live but Stephen Hawking lived until 2018.

Hawking Radiation

Hawking's scientific works included a collaboration with Roger Penrose on gravitational singularity theorems in the framework of general relativity and the theoretical prediction that black holes emit radiation, often called Hawking radiation.

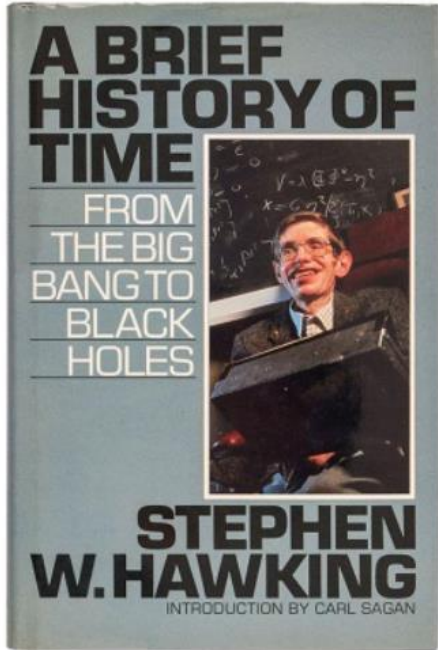


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Information taken from [Britannica](#) and [Wikipedia](#)

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Inspirational STEM Figure: Stephen Hawking

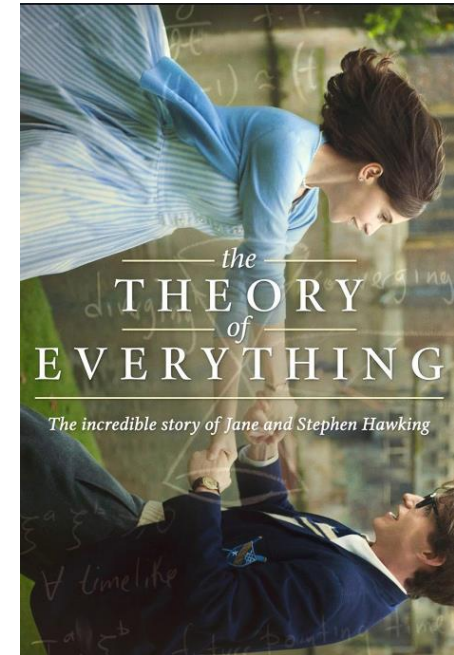


Hawking's contributions to physics earned him many exceptional honours. In 1974 the Royal Society elected him one of its youngest fellows. He became professor of gravitational physics at Cambridge in 1977, and in 1979 he was appointed to Cambridge's Lucasian professorship of mathematics, a post once held by Isaac Newton. Hawking was made a Commander of the British Empire (CBE) in 1982 and a Companion of Honour in 1989. He also received the Copley Medal from the Royal Society in 2006 and the U.S. Presidential Medal of Freedom in 2009. In 2008 he accepted a visiting research chair at the Perimeter Institute for Theoretical Physics in Waterloo, Ontario, Canada.

Stephen Hawking has many publications, including *A Brief History of Time: From the Big Bang to Black Holes* (1988) – a book Stephen created for everyone to understand his theories.

In 2014, a film was released called *The Theory of Everything*, based on the life of Stephen Hawking. It details Stephen's relationship, the diagnosis of MND and his success in the field of physics. The film received positive reviews including five Academy Award nominations, ten BAFTA nominations and much more!

The film is rated 12A – definitely worth a watch!



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Experiment #22: Erupting black holes

(Make sure you have an adult help you with this experiment)

Items Required:

- Baking soda (500g)
- Black food colouring
- ¼ cup of water
- Silicone mould (preferably donut shaped)
- Glitter and stars (optional)
- Vinegar
- Washing up liquid
- Pipette or syringe
- Disposable gloves
- Large deep sided tray or dish
- Large mixing bowl
- Small cup or dish

This recipe will make six black holes.

Instructions

- In a large mixing bowl, add a box of baking soda (500g). Add a teaspoon of black food colouring.
- Mix it together with a spoon or gloved hands. A tablespoon at a time, add water and mix it together. Stop when it forms a thick paste, almost like wet sand (in total approximately ¼ a cup).
- If necessary, add more food colouring to ensure you have a nice dark colour and not grey.
- Mix in some glitter if you wish!
- Pack the mixture into the silicone donut mould, filling them to about the halfway point.
- Place the tray in the freezer until frozen solid.
- Once frozen solid – carefully pop out the black holes from the silicone mould into the large deep sided tray.
- Sprinkle washing up liquid around the deep sided tray as this will help create more bubble action when the reaction starts!
- **Ensure an adult takes control with this part of the experiment.** Fill a small cup with vinegar – fill up the pipettes with vinegar and squirt over the top of the black holes.
- Enjoy the erupting, bubbly reaction!



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This experiment is from the [steam powered family website](#) – check it out!

Week 14 – Maths brain teasers!

Work it out here...

An aeroplane covers its outwards journey at 600mph. It returns, exactly the same distance, at 400mph. What is the average speed of the aeroplane over the entire journey?

The answer will be given this week on a separate document...



Answers to Week 13 Secondary Pack

This section must contain two different digits which multiply together to make 8



| | | | |
|-----------------|----------|----------------|-----------------|
| 8x 4 | 2 | 4+ 3 | 1 |
| 10+ 3 | 4 | 4x 1 | 2 |
| 1 1 | 3 | 2 | 11+ 4 |
| 3+ 2 | 1 | 4 | 3 |

This section must contain two different digits which add together to make 3



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We hope you enjoyed the Week 14 activities.

Just to let you know, Week 14 is our last #SolveItWithSTEM week as we take a break during the Summer Holidays – we hope you have found the packs fun and educational! Keep an eye out for new packs next term!

Best wishes

The ExxonMobil Fawley #SolveItWithSTEM Team!