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July 2020

Week 13 #SolveItWithSTEM@Home Experiment Pack for Secondary Schools *featuring Alice and Eddie - our STEM Gurus*



Hello everyone, it's my turn this week! I can't quite believe we are on Week 13 – the weeks have gone so quickly.

Like last week, we have another *Inspirational STEM Figure* – this time, it is Gregor Mendel. Gregor played an important role in understanding genetics! Why don't you have a look...

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



Inspirational STEM Figure: Gregor Mendel

For the next two weeks, we will be focussing on inspirational STEM figures from around the world. This week, our STEM figure is Gregor Mendel! Johann Gregor Mendel (1822 – 1844), often called the “father of genetics,” was a teacher, lifelong learner, scientist, and man of faith. Gregor was the first person to lay the mathematical foundation of science of genetics, in what came to be called Mendelism!



What is Mendelism you ask?

Mendelism is the principles of heredity. These principles compose what is known as the system of particulate inheritance by units, or genes. The later discovery of chromosomes as the carriers of genetic units supported Mendel’s two basic laws – **the law of segregation** and **the law of independent assortment**.

← **You will learn more about this on the next page...**

Background / Early life

Mendel was raised in a rural setting, his academic abilities were recognised by the local priest, who persuaded his parents to send him away to school at the age of 11. Mendel entered a two-year program in philosophy at the Philosophical Institute of the University of Olmütz, where he excelled in physics and mathematics, completing his studies in 1843. His initial years away from home were hard, because his family could not sufficiently support him. He tutored other students to make ends meet, and twice he suffered serious depression and had to return home to recover. As his father’s only son, Mendel was expected to take over the small family farm, but he preferred a different solution to his predicament, choosing to enter the Altbrünn monastery as a novitiate of the Augustinian order, where he was given the name Gregor. Abbot Cyril Napp found him a substitute-teaching position at Znaim, where he proved very successful. However, in 1850 Mendel failed an exam – introduced through new legislation for teacher certification – and was sent to the University of Vienna for two years to benefit from a new program of scientific instruction. As at Olmütz, Mendel devoted his time at Vienna to physics and mathematics. He also studied the anatomy and physiology of plants and the use of the microscope.

Imagery and information from: [Britannica](#), [Khan Academy](#)

Inspirational STEM Figure: Gregor Mendel

Gregor Mendel studied **inheritance of traits** in pea plants. He proposed a model where pairs of "heritable elements," or genes, specified traits. Genes come in different versions, or **alleles**. A **dominant allele** hides a **recessive allele** and determines the organism's appearance. When an organism makes **gametes (egg or sperm cell)**, each gamete receives just one gene copy, which is selected randomly. When an egg and a sperm join in fertilization, they form a new organism, whose genotype consists of the alleles (dominant and recessive traits) contained in the gametes. This is known as the **law of segregation**.

		Father's Genes	
		B	b
Mother's Genes	B	BB	Bb
	b	Bb	bb

It's a lot of information to take in...for bite size chunks, why not take a look at the [Khan Academy website](#) which breaks down this information and provides examples/activities so it is easier to understand!

The law of segregation lets us predict how a single feature associated with a single gene is inherited. In some cases, though, we might want to predict the **inheritance of two characteristics** associated with **two different genes**. To make an accurate prediction, we need to know whether the two genes are inherited independently or not. That is, we need to know whether they "ignore" one another when they're sorted into gametes, or whether they "stick together" and get inherited as a unit. Mendel found that different genes were inherited independently of one another, following what's called **the law of independent assortment**.

If you were looking at pea plants, an example would be studying the pea colour as well as the pea shape and cross breeding the two.

Experiment #21: Identifying fingerprints

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

Items Required:

- Microscope slide or a smooth piece of glass or plastic
- Fingerprint powder such as talcum powder or cornflour
- Small brush with soft bristles
- Clear sticky tape
- Moisturiser
- Dark coloured paper (black or blue)



Instructions:

1. Get an adult or household member to moisturize their hands (as this will leave more residue) and to place their fingers on the smooth piece of glass or plastic.
2. Lift their fingers off and sprinkle some powder over the prints.
3. Gently brush the powder off.
4. Stick the tape over the fingerprint and lift it up – this should leave the print on the tape.
5. Stick the tape to the piece of paper to keep a record of the print.
6. Repeat this method with other household members – keep records of the prints and then try to identify them from objects around the home, such as doorknobs and handles!

Like this
experiment? Taken
from [kidadl](#)
website!

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Why not check out this [forensics experiment](#) on
how experts lift fingerprints!

Week 13 – Maths brain teasers!

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



8x		4+	
10+		4x	
1			11+
3+			

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



Complete the following KenKen puzzle. Each row and column must contain the numbers 1-4 without any digit being repeated. The small numbers and the operation show the totals that should be reached within each section outlined in bold. Answers will be given in next week's pack.



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Answers to Week 12 Secondary Pack

Maths Brain Teaser Slide (Page 7)

Which 4-digit number multiplied by 4 gives the same number in reverse?

Answer: when multiplied by 4, the number 2178 is 8712.

What number should replace the question mark?

Answer:

$$(A+B)=76$$

$$-A+B=-38$$

If it is added together, $2B=38$, $B=19$ is found

A = 57 and if **B = 19**

$$57/19 = 3$$

Space puzzles and activities slide (Page 6)

Hidden Word answers:

1. Swimsuit
2. Mattress
3. Vacuum
4. Toothpaste
5. Tennis racket
6. Ski boots
7. Flashlight
8. Cooler
9. Sunglasses
10. Baby food

Hidden Word: TECHNOLOGY

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We hope you enjoyed the Week 13 activities.

Week 14 will be coming soon.

Just to let you know, Week 14 will be 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!