
SCHOOL
THE
LANDFILL MUTANT
VS. {INSERT YOUR SCHOOL HERE}
RESEARCH MANUAL
FOR STUDENTS
A.K.A. - MO'S GUIDE TO
SUPER COOL SCIENCE STUFF
GREENkids Inc.

THE LANDFILL MUTANT VS. <INSERT YOUR SCHOOL HERE>

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Research Manual for Students
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THIS STUDY GUIDE WAS DEVELOPED IN 2020 AND 2021 WITH THE FOLLOWING TEAM:

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Hi! I'm Mo. I'm a character in the play *The Landfill Mutant vs <Insert Your School Here>*. Some might say I'm the STAR, but I digress.

Now, I don't mean to brag, but I know quite a bit about science. If you've read or seen the play, you know I ALMOST went to Science Fair Nationals last year, which is a pretty big deal.

Some of you are probably like me - you love homework and spend your free time studying. No? Just me? Ok cool, cool, cool. That's no problem because - guess what? I made you this cheat sheet! Well, technically it's a 'research manual', but you get the idea. This manual will help you learn about some of the terms and ideas we discuss in the play and in the Study Guide (which is a document Green Kids made for your teachers that includes suggestions for some fun activities!). It's a list of words, terms, and definitions that will help you understand what the play is about and why these issues are important. They are listed in alphabetical order so you can look them up as you come across them in the script.

I've also included information from Health Canada on how to help protect our families from chemicals and pollutants. It's important to be aware of what types of chemicals are in our homes and how they should be used, handled and disposed of. (Wish I knew that last week!)

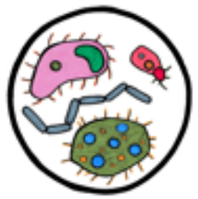
Now, without further ado, I present **MO'S GUIDE TO SUPER COOL SCIENCE STUFF!**

#ILoveHomework #NerdsRule #SaveOurPlanet

LIST OF SUPER COOL SCIENCE STUFF (DEFINITIONS AND CONCEPTS)

Acute Toxicity
Some toxic substances can do a lot of damage pretty quickly. The term 'Acute Toxicity' refers to the negative effects of a chemical caused over a short period of time (usually less than 24 hours).

Antibiotics
We might take these when we have an infection. Antibiotics are chemicals that treat bacterial infections by killing them or preventing their growth.

Bacteria

Bacteria are microscopic organisms (which means we cannot see them without a microscope). Bacteria are everywhere, both inside and outside of our bodies. Many bacteria are beneficial to our environment and play very important roles in our health. Others can make us very sick. These are called pathogens.

Carbon Dioxide (CO2)
A natural gas that can be released by human activities like burning fossil fuels (see definition of fossil fuels later in this document) but also naturally through plants and other life forms, including us when we exhale. Unfortunately, carbon dioxide is also a heat-trapping greenhouse gas that is contributing to climate change as levels in our atmosphere become too high.

Carbon Emissions

Refers to the Carbon Dioxide that is released by human activities (see above).

Carbon Monoxide
A colorless, odorless, and tasteless gas that comes from anything that burns fossil fuels, like barbecues, heaters and engines. It can also come from burning wood. Even cigarette smoke has carbon monoxide in it. Carbon monoxide can be very dangerous to humans and animals.

Climate Change
Also known as Global Warming or The Climate Crisis, refers to the warming of the atmosphere of our planet, which is having a harmful effect on all life forms. The primary cause is greenhouse gas emissions from factories, cars, power plants and other human-made sources. Greenhouse gases act like a blanket, trapping the sun's warmth near the earth's surface, and affecting the planet's climate system. These changes cause extreme and unpredictable weather patterns such as droughts, floods, hurricanes and other events that harm humans and wildlife.

Chemical(s)
Absolutely everything is made of chemicals, including us. We often group chemicals together based on common characteristics. Vitamins, minerals, household cleaners, hazardous chemicals, greenhouse gasses, corrosives and pesticides are only a few of many, many different groups of chemicals. While some chemicals can be very dangerous, simply calling something a chemical doesn't necessarily mean it's bad for us or our environment.

Colourless
An item that cannot be seen and has no colour.

Compost

Decayed organic material used as a plant fertilizer. People often compost their organic kitchen scraps to fertilize their gardens.

Corrosives
A group of dangerous chemicals that attack and chemically destroy exposed body tissues like skin. If household cleaners have the Corrosive symbol, you must take great care to protect your skin while using it. Corrosives can also damage or destroy concrete, glass and metal.

Disinfect
Cleaning to destroy bacteria.

Explosives

A strong, sudden and very dangerous reaction when certain chemicals are mixed together.

Fast Fashion
Inexpensive, and usually poorly made, clothing produced rapidly by mass-market retailers in response to the latest trends.

Flammables
Things that burn easily.

Fossil Fuels (FF)

There are three main types of fossil fuels: coal, oil and natural gas. All were formed hundreds of millions of years ago by trees and plants that died, broke down, and were compacted and covered by additional materials over time. Since plants produce and store CO2 during photosynthesis, this gas is released when fossil fuels (which are formed through organic material) are burned. This is the main concern regarding human-caused climate change.

Germs
A microbe (small, living organism or bug) including bacteria, viruses, fungi and protozoa (single-cell organisms that live mainly in moist environments).

Globally Harmonized System (GHS) of Classification and Labelling of Chemicals

A way of grouping and labelling hazardous chemicals, which is done all over the world.

Greenhouse Gases (GHG)
Simply put, these are gases that absorb and trap heat in the atmosphere. The main GHGs are carbon dioxide, methane, nitrous oxide and water vapour. This group of chemicals play an important role in climate change.

Hazard / Hazardous
Anything that can cause danger or harm.

Hazard Symbol
A picture that tells you the type of danger and what part of the product is dangerous.

Irritants / Sensitizers
Cause inflammation or discomfort to the body.

Landfill
A fancy word for 'garbage dump'. A place to dispose of waste material by burying it and covering it over with soil.

Methane Emissions

Methane is a colorless, odorless flammable gas which is the main constituent of natural gas. Human activities emitting methane include leaks from natural gas systems and the raising of livestock. It is the most potent of the greenhouse gases.

Microplastics
Extremely small pieces of plastic debris released to the environment in wastewater from washing synthetic (polyester) clothing, from the improper disposal and breakdown of consumer products and industrial waste containing plastic.

Mould
A fungus that grows in the form of multicellular filaments called hyphae. Moulds produce allergens (substances that can cause an allergic reaction), irritants and, sometimes, toxic substances. Inhaling or touching mould spores may cause an allergic reaction, such as sneezing, a runny nose, red eyes and skin rash. Moulds can also cause asthma attacks.

Odourless
Item has no smell; it cannot be detected by scent.

Oxidisers
Materials that give off oxygen and help combustibles ignite (catch fire).

Personal Protective Equipment (PPE)
Items we wear (or use) to protect ourselves from hazards or hazardous materials.

Pictogram
Graphic image (picture or drawing) used to show what type of hazard is present within a chemical.

Probiotics
Live bacteria and yeasts that help keep our digestive system healthy.

Radon
A radioactive gas that comes from the breakdown of uranium in soil and rock. We can't see it, smell it or taste it. When radon gas is released from the ground outside it is diluted and is not a concern. However, in enclosed spaces like homes, it can accumulate to high levels. High radon levels can be a risk to the health of you and your family, long term exposure is the #1 cause of lung cancer for non-smokers.

Recycling
The action or process of converting waste (or garbage) into reusable material.

Reduce
In the context of the play, the term 'Reduce' means reducing the waste and emissions we create. This can be achieved through buying less or purchasing second-hand items, using active transportation, etc.

Signal word
Description of the injury that may result from exposure to the product.

Toxic (or Poisonous)
Inhaling, absorbing through the skin, eating or drinking can cause serious health problems, including death.

Toxin
A poisonous substance.

Uranium
A heavy metal that is found naturally in soil and rock. When it breaks down, radon gas is released.

Virus
A microscopic parasite, much smaller than bacteria, that can make humans sick. Many viruses use human bodies as their 'hosts' and cannot thrive and reproduce outside of a host body. A virus invades living cells and uses their chemical machinery to multiply and infect other cells, inside and outside of the host body.

Zero-Waste

The conservation of all resources by means of responsible production, consumption, reuse, and recovery of products, packaging, and materials without burning and with no discharges to land, water, or air that threaten the environment or human health.

TIPS TO PROTECT YOUR FAMILY FROM CHEMICALS AND POLLUTANTS (AND TO AVOID ACCIDENTALLY CREATING A MUTANT MONSTER)

Every day, we are exposed to chemicals and pollutants - in our air, food and water. There are chemicals in everyday products we use at work, at home and at play. While some chemicals may be beneficial to our health, others may pose a health risk if they're not handled properly.

Here are some simple steps I wish I had known about to help protect us and our families when interacting with household chemicals.

Read the label

- Always read and follow instructions on the labels of household chemical products and pesticides. Use them carefully, especially around children and pets.
- Before starting a home project ensure you have all the correct safety gear and supplies you need.

Lock up chemicals

- Keep household chemical products locked in cupboards or drawers and out of reach and sight from young children and pets.
- Do not expose chemical products to extreme temperatures. Keep them away from food, water sources, and open flames.

Dispose of chemical products the right way

- Proper disposal of chemical products is important to prevent chemical contamination of our soil, air and water. Be sure to follow disposal instructions as stated on the product label. Do not dispose of chemical products and pharmaceuticals down the drain or by flushing them down the toilet.
- Take any toxic household materials to a hazardous waste disposal depot, where they can be disposed of safely. If you don't know where to find one, check with your municipal government or waste facility.
- Bring unused and expired prescription drugs, over-the-counter medications and natural health products to your local pharmacist for proper disposal.

Install alarms and prevent carbon monoxide poisoning

- Install a certified smoke detector and ensure there is at least one functioning carbon monoxide alarm (CO) outside of bedrooms.
- Avoid CO exposure by keeping the door between the home and garage closed.
- Watch for signs of CO poisoning, which may include mild flu-like symptoms and loss of consciousness.
- Know your rights and obligations - depending on where you live, having working alarms in the home, workplace or rental units might also be the law.

Test for radon

- Radon is an invisible and odourless radioactive gas. It is the number one cause of lung cancer in non-smokers.
- Buy a radon test kit or hire a professional; most importantly reduce the level if it is high.

Ventilate the home

- Make sure there is enough fresh air coming into the home. Health Canada's publication Ventilation and the Indoor Environment is a good source of advice.
- Exhaust fans that vent to the outside should be installed in bathrooms and above stoves to remove moisture and pollutants produced indoors. Make sure to turn them on when showering or cooking, especially when frying food or using a gas stove.
- Open windows when renovating. Make sure there's good ventilation when using products that may release chemicals into the air, such as when you are painting, varnishing, working with composite wood, or installing new carpets.
- Choose low-emission paints, varnishes, glues, wood furniture, and building products. Look for an independent certification label to help you select low-emission products (like the EcoLogo program that sets standards for sustainable products).

Wash your hands often

- Frequent hand washing often helps to prevent infection and reduce exposure to harmful substances. This is especially important before every meal and if your hands come into contact with a household chemical product.
- To clean your hands thoroughly, scrub with soap and warm water for at least 20 seconds.
- When it's not possible to wash with soap and water, use an alcohol-based sanitizer to kill harmful microbes.

Keep the home clean

- Clean floors and household surfaces with a wet cloth or mop regularly to remove dust and dirt.
- Consider installing a central vacuum that is vented outdoors or using a vacuum with a high-efficiency particle air (HEPA) filter that traps small particles.

Remove shoes at the door

- Don't track in harmful substances from outside. Keep a strict barrier between outside dirt and contaminants in the home.
- This may be particularly important if there are young children who spend a lot of time playing on the floor.

Prevent mould

- Mould grows in damp or wet areas. Mould spores can be released into the air in the home and get into your lungs. Mould in the home may cause eye, nose and throat irritation, coughing and wheezing, and make asthma and allergy symptoms worse.

- Eliminate mould by keeping indoor moisture levels and humidity low, allowing for proper ventilation throughout the home, and cleaning up spills immediately. If a small amount of mould is found, remove it with water and dish soap. There is no need for bleach.

Let tap water run until it's cold

- Lead from old pipes and plumbing materials can leach into water if it has been sitting in the pipes for several hours (like overnight).

- If you know or suspect there is lead in your drinking water, reduce your exposure by letting the tap water run until cold before using it for drinking, cooking, or making baby formula.

MO'S FAVOURITE EDUCATIONAL VIDEOS FOR STUDENTS

Bill Nye the Science Guy – Germs (YouTube)
https://youtu.be/YynQmc4qurs

Bill Nye the Science Guy – National Geographic talk on Climate Change (YouTube)
https://youtu.be/EtW2rrLHs08

CBC Kids News – How our Plastic is Harming the Environment
https://youtu.be/dC5zUU1TSYg

Health Canada – Radon: What you need to know
https://www.youtube.com/watch?v=zHzLSGGExjU

MO'S FAVOURITE REFERENCE MATERIALS AND HELPFUL WEBSITES

Health Canada's information on Healthy Homes
www.Canada.ca/healthy-home

Canadian Centre for Occupational Health and Safety (CCOHS)
www.ccohs.ca

Environment and Climate Change Canada
https://www.canada.ca/en/environment-climate-change.html

Government of Canada – web page on Chemical Safety
https://www.canada.ca/en/health-canada/topics/chemical-safety.html

Government of Canada's information on Mould
https://www.canada.ca/en/health-canada/services/air-quality/indoor-air-contaminants/reduce-humidity-moisture-mould.html

Government of Canada information on Radon
Canada.ca/radon

Kids Health - website with information on health issues as explained to kids, teens, parents and educators
www.kidshealth.org

Take Action on Radon - website to learn more about radon health effects, testing for radon in your home, and how to reduce high levels.
https://takeactiononradon.ca

Children Changing the World

www.greenkids.com

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