

SCIENCE, PLEASE! WORKSHOP

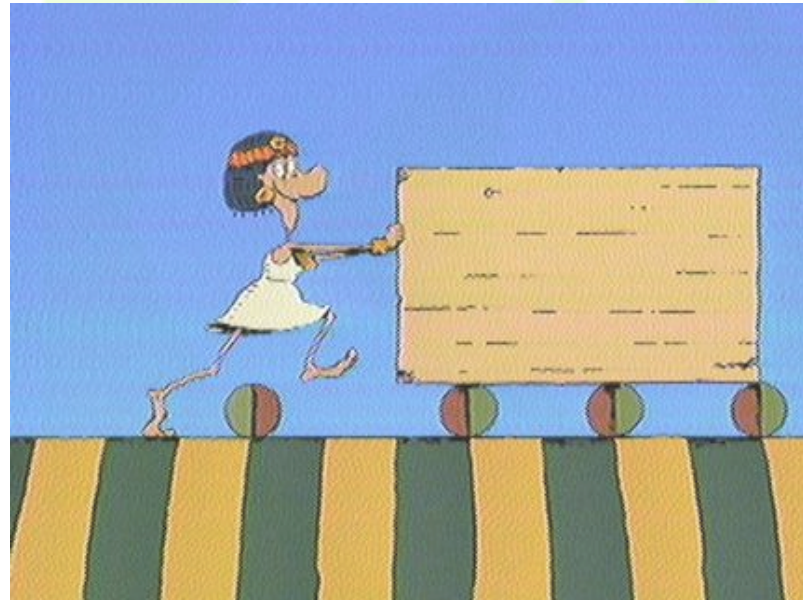


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INTRODUCTION

- Congratulations! You have in your hands (or on your screen) a copy of the animator's manual for the *Science, Please!* workshop. An exciting scientific adventure awaits you – a journey into the world of ideas and nature's mysterious phenomena!
- Better, the *Science, Please!* workshop will transform you into a fount of knowledge for a younger generation keen to learn! Yes, they will cross land and sea to hear you tell the tale of science and discovery, to witness your exuberant dabbling with neutrinos, electrodes, decibels, mice... As you unravel the mysteries of the universe to the world, souls hungry for bliss and wisdom will gather by your side, ready to stand with you... on the shoulders of giants!
- Too monumental a task, you plead? No worries. 'Cause, really...it's just [a game](#).



HOW TO USE THIS MANUAL

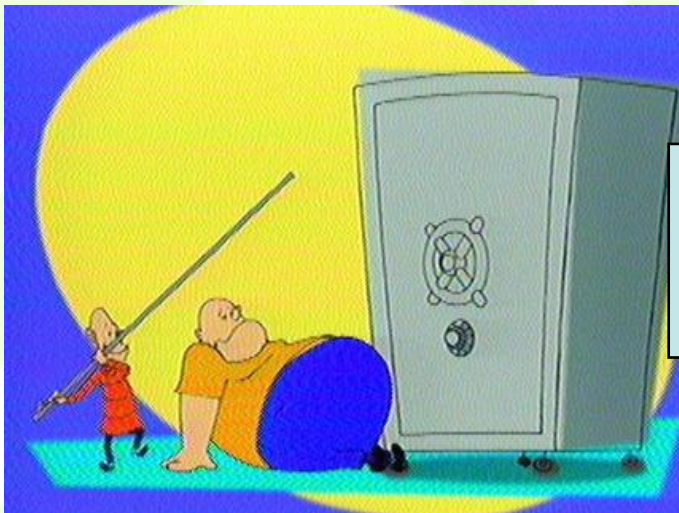
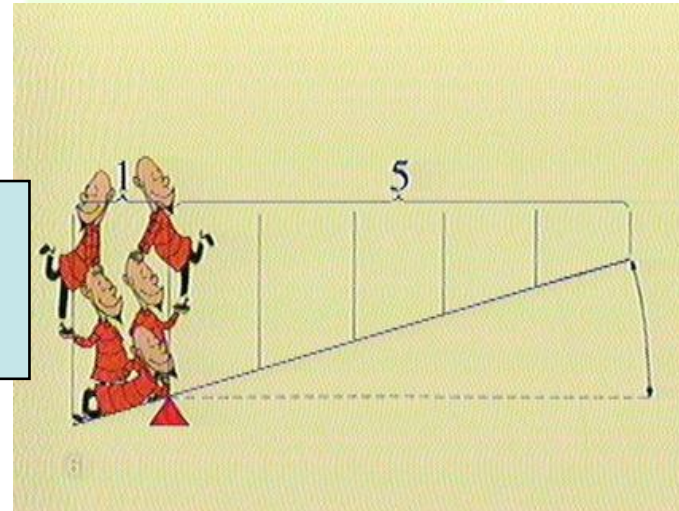
- The manual is roughly divided into [two sections](#) – one **theoretical**, and the other **practical**.
 - **The theoretical section** includes [goals](#), an [activity plan](#), and an [appendix](#).
 - **The practical section** includes [timing for the activities](#), the [workshop leader's script](#), [technical instructions](#), and a section on [logistics](#).
- This manual is **hyperlinked** – just like molecules!
 - For instance, from the [Activity Summary](#) page, you can click on the graphics and be *instantly teleported* (wow!!) to the content you wish to see. Underlined keywords are [hyperlinks](#) – just like on the Web.
- In print mode, each slide in this guide can be set up with a blank field for your notes.
 - Use it as a sandbox for your great ideas, your urgent questions, your brainstorming, your road map – whatever! If you'd like to keep your use of paper to a minimum, just print slides 13 to 26 – the ones with [the workshop leader's script](#).



TABLE OF CONTENTS

- Theory Stuff

- [FAQ](#)
- [Goals](#)
- [Activity Plan](#)
- [Appendices](#)



- Practical Stuff

- [Time-table](#)
- [Script](#)
- [Logistics](#)
- [Technical Procedures](#)



SCIENCE, PLEASE! – THE GAME: FAQ

- First question: What is *Science, Please!*
 - *Science, Please!* is a collection of 26 short films, each one minute long. With a dab of slapstick humour, each film looks at a single phenomenon or scientific discovery, and explains it in a way that makes scientific ideas accessible and fun for young people. The films use archival images and animation, along with an effective and hilarious narration track.
- OK. So what about the *Science, Please!* workshop?
 - It's really less of a workshop and more of an activity – a game in the style of TV quiz shows. By participating in the game, young people learn scientific basics by being part of the quiz, conducting entertaining science experiments, and screening the fun and fast-paced *Science, Please!* movies. Participants are divided into teams that amass points and compete against each other.
- Why create an activity based on these short science movies?
 - One of the reasons is to allow more people to discover the excellent and fun-filled *Science, Please!* collection of films. We want the NFB's work to be accessible to children, teachers, and parents, and to show how they can be both educational and fun at the same time.



SCIENCE, PLEASE! – THE GAME: FAQ (ii)

- OK, but how does this type of activity fit in with the NFB's mandate?
 - The NFB has long played an important role in Canadian education circles, by making high-quality educational audio-visual resources available to teachers, parents and children. Today, the majority of the clientele attending events at the NFB's CineRobotheque in Montreal and its Mediatheque in Toronto still come from the world of education. As a result, it makes perfect sense for the NFB to take advantage of the popularity of the *Science, Please!* series by launching a hilarious educational quiz-game to accompany it.
- What other science-oriented field trips are available to school groups in Montreal? Compared to them, what is the advantage of the NFB's *Science, Please!* game?
 - Other science-related field trip destinations include the Planetarium, the Montreal Science Centre located in Old Montreal, and, of course, the *Expo-sciences* science and technology fairs. What sets our activity apart is its clever blend of fun and intellectual rigour; its interactive, multi-sensorial approach; its effectiveness in bringing children together to have fun, through structured challenges; and its educational audio-visual support. Finally, it is also very affordable!



SCIENCE, PLEASE! – THE GAME: FAQ (iii)

- How long does the activity take?
 - Two hours.
- How many can participate?
 - A minimum of 20 and a maximum of 40. We could push it to 50 if the client really can't make other arrangements, but we'd rather not because... Wait! We're about to answer that question next!
- Why a maximum of 40 participants?
 - Because we have to divide up the group into four teams. The maximum number of people per team is 10; if there are more, we won't have enough room for them to do the experiments. Also, if there are too many people, it makes it hard for them to effectively consult with each other on the correct answers, and to accomplish the tasks that have been set.
- What is the age range for participants?
 - The workshop has been designed for ages 9-15. The workshop really does not work well with children younger than 9, as their understanding of science is not yet up to the appropriate level.
- How much previous scientific experience does the workshop leader need?
 - The concepts that come up in the workshop are relatively simple. Workshop leaders do not need any previous scientific experience. As long as they have read the [workshop leader's script](#) and the [appendices](#) included in this manual, and feel comfortable with the concepts raised, they will be fine. Besides, most of the information is delivered through quiz questions printed on cards – along with the answers.



SCIENCE, PLEASE! – THE GAME: FAQ (iv)

- Are the experiments messy? Do they require a lot of materials?
 - This concern was very much in our minds as we designed the workshop. As a result, it is simple and easy to set up (and tear down) and can be run very efficiently.
- Will I have to do a lot of disciplining?
 - Not really. The fact that the children are competing with each other focuses their attention and lets them express their enthusiasm when they come up with the right answers. If a team is truly unruly, all you have to do is threaten to take away points for their lack of cooperation. Since most members of a team will want to win the challenge, they will likely take care of enforcing discipline with their teammates, if necessary.
- Is the workshop accompanied by a DVD?
 - Version 1.0 of the workshop uses only the original *Science, Please!* DVD. With version 2.0 we are planning to have a DVD to support the entire workshop, for instance, by showing the game board on a screen.



OBJECTIVES AND EDUCATIONAL GOALS

- This workshop combines entertainment and cinematographic approaches with more traditional teaching techniques, with the aim of awakening an interest in science in young people, ages 9 to 12.
- The *Science, Please!* Workshop will:
 - explore different phenomena that are encountered in everyday life;
 - encourage participants to develop the techniques of scientific investigation;
 - popularize scientific concepts such as the elements of matter, atomic theory, chemical reactions, the law of gravity, Archimedes' principle, and more...
- By the end of the activity, participants should be able to:
 - name a few important concepts in physics and chemistry;
 - identify the key steps in scientific exploration, based on experimentation and observation;
 - adopt strategies of cooperation to resolve problems.



ACTIVITY SUMMARY

Group divided into 4 teams

Introduction to the game

Unit 1
It's a Gas! game

Points totalled

Unit 2
Gravity game

Points totalled

Unit 4
Sounds Off game

Points totalled

Unit 3
Sink or Swim game

Points totalled



Endgame!!



ACTIVITY TIMING (i)

ACTIVITY	LENGTH (in minutes)
INTRODUCTION	
Group divided into teams in the theatre	5
A word of welcome	1
Introduction to the game	4
Discussion: what is science?	5
Film: <i>The Atom</i>	1
UNIT 1: The State of Matter	
Discussion: Matter in all its states	5
Film: <i>The State of Matter</i>	1
<i>The State of Matter</i> quiz questions	3
Experiment #1: It's a Gas! game + inflating glove demo	7
Thematic quiz questions for Unit 1 + team point totals so far	3
UNIT 2: GRAVITY	
Discussion: The astronaut experience	5
Film: <i>Gravity</i>	1
<i>Gravity</i> quiz questions	3
Expériment # 2: Gravity game	7
Thematic quiz questions for Unit 2 + team point totals so far	3



ACTIVITY TIMING (ii)

ACTIVITY	LENGTH (in minutes)
UNIT 3: THE FORCE OF WATER	
Discussion: Can you walk on water?	5
Film: <i>The Force of Water</i>	1
<i>The Force of Water</i> quiz questions	3
Experiment #3: Sink or Swim game + floating egg demo	7
Thematic quiz questions for Unit 3 + team point totals so far	3
UNIT 4: SOUND IS VIBRATION	
Discussion: What is an echo?	5
Film: <i>Sound is vibration</i>	1
<i>Sound is vibration</i> quiz questions	3
Experiment #4: Sounds Off game	5
Thematic quiz questions for Unit 4 + team point totals so far	3
END OF ACTIVITY	
Final sprint	Variable length
Awarding of prizes	optional



WORKSHOP LEADER'S SCRIPT - INTRODUCTION

- **A Word of Welcome!**
 - **A few words about the NFB and the *Science, Please!* series of films.**
- **Introduction to the game: What kind of game is this, anyway?**
 - **It's a team competition designed to accompany the popular *Science, Please!* series of films.**
 - **It's like a TV game show, with teams competing against each other. The team with the most points wins.**
 - **The idea behind the game is to help you discover some of the wonders of the world of science. You'll learn about some of the scientific ideas that have revolutionized the way we understand the natural world, and prepared the way for our modern technological world. You will also become familiar with an activity that's unique to the world of science: *the scientific method*.**
 - **Last but not least, the most important goal is to have fun together!**



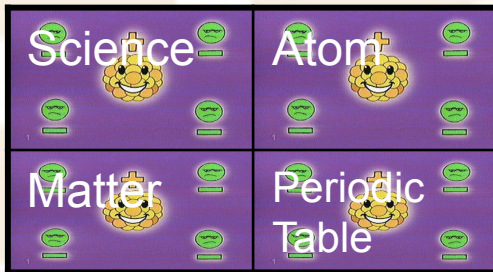
WORKSHOP LEADER'S SCRIPT – RULES OF THE GAME

- Teams earn points, allowing them to advance their marker towards the winning square (“the winning atom”) on the periodic table.
- There are **two ways** to earn points:
 - By correctly answering **quiz questions** on a variety of scientific facts (with the number of points depending on the difficulty of the question)
 - By successfully completing a **scientific experiment**; your team can earn up to 10 points for each experiment!
- In this game, you can earn the most points by completing scientific experiments. This is important to remember. You can earn the most points through your skill in conducting experiments, and your powers of observation, deduction and – most importantly – collaboration!



WORKSHOP LEADER'S SCRIPT – INTRO TO SCIENCE

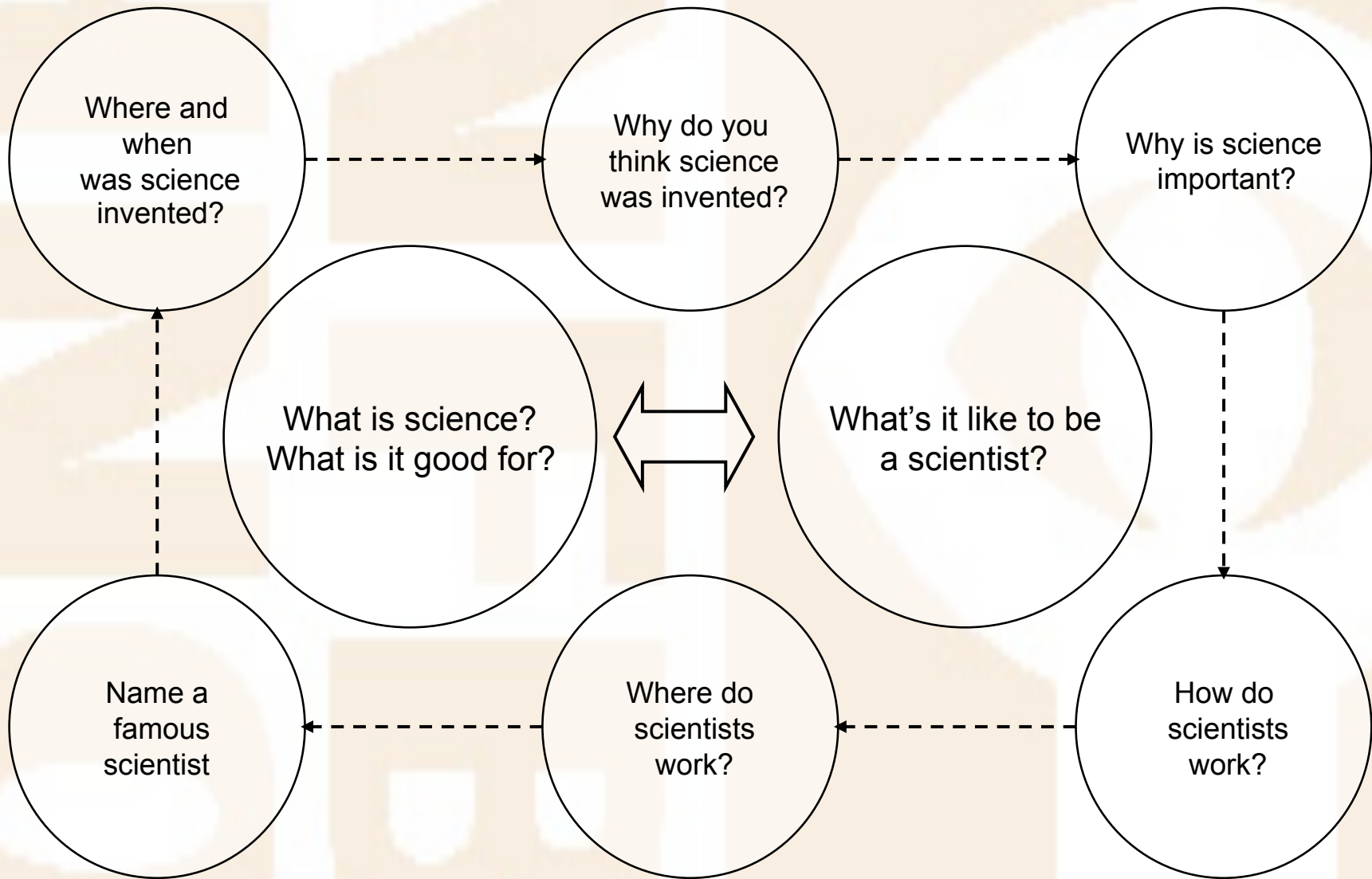
CONCEPTS



- [Why science?](#)
- *Ever since the dawn of time, humans have been asking themselves big questions: Why do we exist? Where are we? What is the universe? Was it created by a God or gods – by powerful, supernatural beings? (Some say yes, others say no.)*
- *Here's another big question that a lot of people have thought about: **How was the universe created?** Ever since ancient times, priests, shamans, thinkers and philosophers have tried to answer this question. Some have looked for an answer by changing the scope of the question: **what is the universe made of?***
- *How about you? Do you know what the universe is made of? What is matter? How about air? Is that matter too? Well, let's start by looking at what scientists today have to say about that question. With the help of a short little film, we're going to learn about what scientists say "lies behind" everything that exists – everything we can see, touch...and even breathe!*
- **Screening of the film *The Atom***

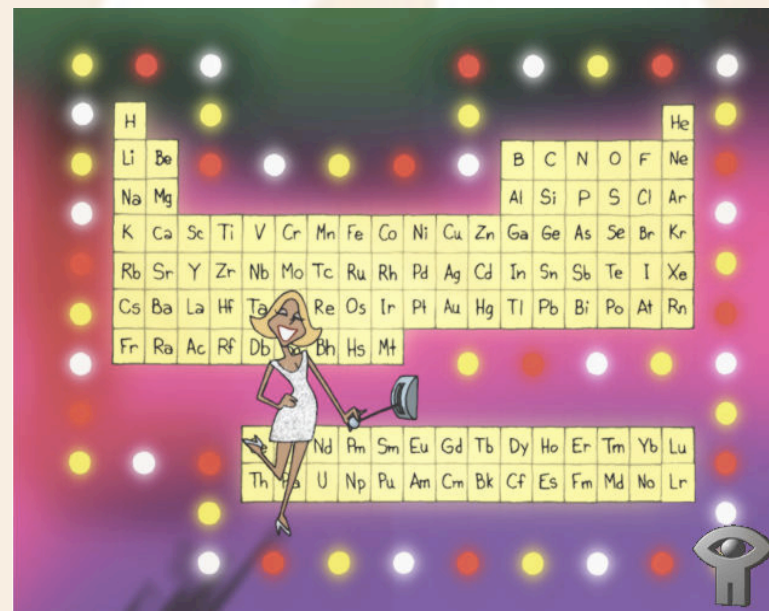


WORKSHOP LEADER'S SCRIPT – WHAT IS SCIENCE?



WORKSHOP LEADER'S SCRIPT – THE PERIODIC TABLE

- You must have noticed our game board up there on the screen when we watched the film *The Atom*. What we're using as a game board is actually an important tool that physicists and chemists use for their scientific inquiries. It's called the periodic table of the elements.
- As you heard in the film, scientists tell us that atoms make up all of the matter in the universe. All of it! The thing is, they are infinitesimally microscopic. In other words, even with the powerful and sophisticated microscopes we have today, nobody has ever seen an atom!
- Since we can't see atoms, how can we prove they exist? As a first step in answering that question, we can try to identify and differentiate the elements that make up all matter – from the most common to the most rare.
- For this purpose scientists have created this table – the periodic table of the elements – to organize their discoveries and their knowledge about all the known matter in the universe.
- In our game, every point your team earns gives you points on the periodic table game board. By earning points you can advance your game piece towards THE WINNING ATOM!



WORKSHOP LEADER'S SCRIPT – THE STATE OF THE MATTER

CONCEPTS

Matter (substance)	States of matter: solid, liquid, gas
Transformations of matter	Energy



- *What's the difference between the water you drink, and ice and steam? In fact, they are all the same on the molecular level – but they are in three different states, or phases. All matter can exist in three states. Who can name the three states of matter? What causes a substance to exist in one state or in another?*
- *The state of a substance depends mainly on its temperature. More ice forms in the Arctic than in Mexico, because there isn't a lot of heat in the Far North. Here's a short film that tells you more about this subject...*
- **Screening of the film *The State of the Matter***



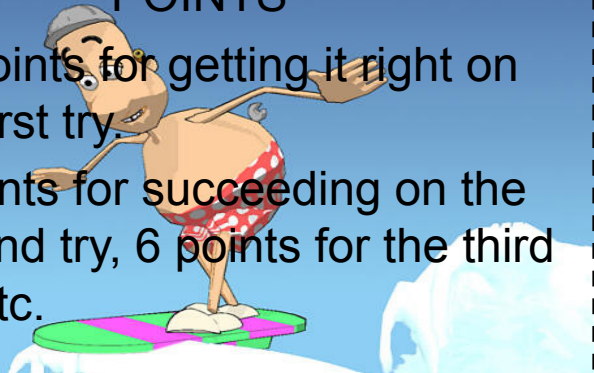
GAME – IT'S A GAS!

OBJECT

- **Identify** two substances (one liquid and one solid) that will *produce a gas when they are mixed.*
- **Explain** “the magical blend” -- how you can produce a gas by mixing a liquid and a solid – using the concept of *chemical reactions, or the transformation of matter.*

POINTS

- 10 points for getting it right on the first try.
- 8 points for succeeding on the second try, 6 points for the third try, etc.



RULES AND PROCEDURE

- There are all kinds of vials or beakers spread all over the experiment table. Half contain solids, the other half liquids. There is also an assortment of "laboratory" instruments on hand with which to manipulate the materials.
- The leader launches the challenge: “For 10 points, can you find the gas hidden on this table? You can use anything you see on the table to help you find the hidden gas. There is only one rule: No tasting the solids and liquids!”
- If no team has succeeded after one minute, the workshop leader launches the challenge again, for 8 points. This time, add a clue (“create a gas”) and remove some of the non-essential accessories.
- If no team has succeeded after another minute, the animator launches the challenge once again, this time for 6 points. Another clue should be given (“create a gas using a liquid and a solid”), and all items removed from the table, with the exception of the clear bowl and the vials or beakers with the materials.
- Finally, the workshop leader validates the experiment's results (the production of a gas by chemical reaction) by performing the inflatable glove demonstration.



WORKSHOP LEADER'S SCRIPT -- GRAVITY

CONCEPTS

Gravity	Weight
Mass	Gravitational force



- *Does anyone here want to be an astronaut? You've probably seen images of astronauts on the moon...*
- *When you watch them move, it looks like they weigh less, doesn't it. But if the astronauts got a scale out of their spacecraft and actually weighed themselves on the moon, would they really weigh less?*
- *Yes! They really would! How can that be? They haven't lost any weight, and their space suits are pretty heavy too. So how can they weigh less than they do on Earth?*
- *The answer is that gravity is different on the moon than on Earth. Let's take a look at this short film. It explains how gravity works, and also tells us about the law of gravity.*
- **Screening of the film *Gravity***



GAME – GRAVITY

OBJECT

- There are 6 tins of "space snacks" and it is up to the team on stage to determine which planet each tin is on. The idea is that it is the same can, but its weight is different on each planet.

POINTS

- Each wrong answer subtracts 2 points from a total of a possible 10.

RULES AND PROCEDURE

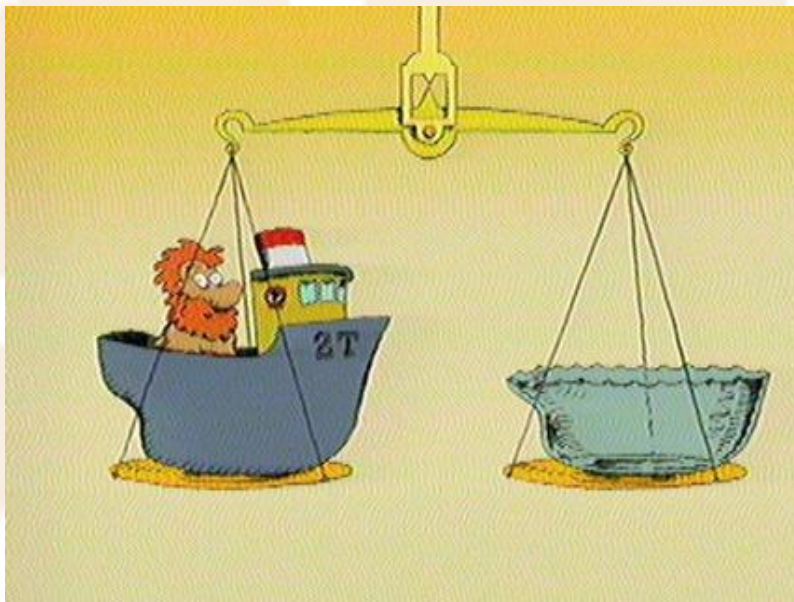
- Six "identical" cans of food sit on the table. There is a chart showing the planets in the background.
- Since the cans are "identical" (except for the fact that their weights differ to the touch), the workshop leader explains why the weight of each can is different. Each can on the planet Earth weighs theoretical 1 kg.
- The team has one minute to assign each box to the correct planet (by placing it on the appropriate label). They do this by manually comparing the weights of the cans. No scale is used.
- Check the answers with the help of a camera and a scale, then award points.



WORKSHOP LEADER'S SCRIPT – BUOYANCY

CONCEPTS

Buoyancy	Weight
Shape	Volume



- *Has anyone in the room ever walked on water?*
- *Really? You've walked on water? (If the child is joking, quip back that maybe he or she should be named Jesus)*
- *If one of the kids explains, demonstrate using a floating object. What causes an object to float? Let's find out.*
- **Screening of the film *The Force of Water***



GAME – SINK OR SWIM

OBJECT

- To earn points, sort objects into groups depending on whether or not they will float.

POINTS

- 1 point for each item categorized correctly



RULES AND PROCEDURE

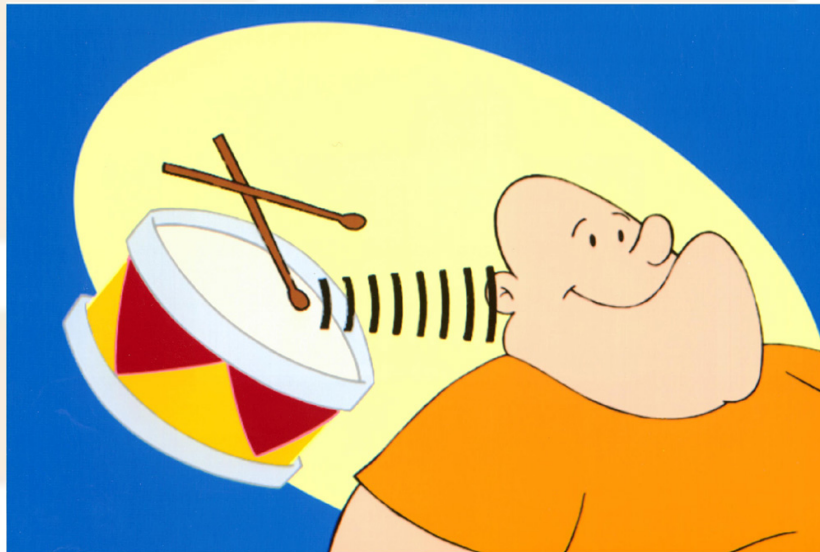
- *Part 1: Sink or Swim*
 - The team on stage stands by a bowlful of water. Their task is to sort a group of 10 objects into two categories: things that float, and things that sink. The team members can hold the objects, but they cannot put them in the bowl of water.
 - The leader checks the team's hypotheses by placing the objects in the water, and then awards points accordingly.
- *Part 2: Understanding buoyancy – a complement to the experiment*
 - The workshop leader introduces a faulty chain of reasoning to the students, by putting an egg in the large bowl of water (where it sinks) and subsequently placing it in a jar with salt water (where it floats). The students do not know that the jar contains salt.
 - Now the leader brings an identical-looking jar to the table – but the water in this jar contains no salt. The egg sinks again. Can the students explain what's going on?



WORKSHOP LEADER'S SCRIPT – SOUND IS VIBRATION

CONCEPTS

Vibration	Frequency
Wave	Oscillation



- *Have you ever heard your own echo? It seems like the sound of your voice is bouncing off something. So sound must be able to travel.*
- *Why is there no echo in a movie theatre? Because the walls are made of panels covered in material that absorbs the sound so that it can't bounce back. Sort of like trying to bounce a ball on your mattress.*
- **Screening of the film**
Sound is Vibration



GAME – SOUNDS OFF

OBJECT

- To help us repair five broken sounds.

POINTS

2 points for each correct answer on the first try.

- 1 point for each correct answer on the second try
- 0 points if both tries are incorrect.

RULES AND PROCEDURE

- Listen to a sound whose frequency has been altered. The team attempts to identify the sound.
- If the answer is correct, the leader awards two points and moves on to the next sound.
- If the response is incorrect, the team chooses to increase or decrease the frequency, then guesses again.
- If the second guess is correct, the leader plays the repaired sound and awards one point, then moves on to the next sound.
- If the second attempt fails, the animator plays the repaired sound, but does not award any points.



WORKSHOP LEADER'S SCRIPT -



- Once the four units have been completed, the game moves into its final phase. The goal of this final sprint (“last leg” of the game) is to heighten the competition between teams, with the help of general questions with a high point value. In the end, one winning team will arrive first at space 93 on the periodic table.
- As soon as one of the teams arrives at square 93, the workshop leader declares them the winner!

END OF GAME!!



LOGISTICS (i)

Material	Quantity
Workshop - general	
Tables (1 for the experiments on stage, 1 for supplies)	2
Plastic boxes for storing supplies	3-4
Stands for game boards	2
Radios with headphones	2
Camera tripod	1
Video camera	1
Game boards	4
Tablecloth (for covering the supply table)	1
Coloured playing pieces	4
Answer-boards	4+
Whiteboard erasers	4+
Erasable markers	4+
File-folder boxes to file quiz questions	4
<i>Science, Please!</i> DVD	1
Paper towels or rags for cleanup	varia
Extension cord	1
Video cable extension cord with plugs (connection to projectionists' control room)	1



LOGISTICS (ii)

Material	Quantity
Game It's a gas!	
Vials with liquid and solid substances (water, white vinegar, white sugar, salt...)	10
Bowls (preferably clear)	2
"Lab equipment" (measuring cup, thermometer, huge magnifying glass, etc.)	variable
Rubber glove	1
Additional supply of sodium bicarbonate	2+
Game – gravity	
Cans of "Space Snacks" with lids	6
Small magnetic cards with names of the planets on them	6
Electronic kitchen scale	1
Chart showing the planets	1
Game – Sink or Swim	
Large clear bowl, filled with water	1
An array of objects, some of which float and some of which	10+
Identical jars, one filled with plain water and one with salty water	2
Fresh egg	1
Game – Sounds off	
Sound game DVD	1



TECHNICAL PROCEDURE: SET-UP

- Place the *Science, Please!* DVD in the DVD player located in the projection booth.
- Place the *Sound Game* DVD near the DVD player, ready for later use.
- Next to the stage, set up a table with all the materials needed for the game. Place the items on the table in the order in which they will be used during the game. From left to right: It's a Gas! game, Gravity game, Sink or Swim game. Then cover it all up with a lovely NFB tablecloth.
- Fill the water bowl for the Sink or Swim game, and get a fresh egg out of the fridge.
- Place one table on the stage, and put the answer boards and erasable markers on it.
- Place a stand to the right of the screen with the periodic table of the elements board. Stick the four coloured playing pieces to it.
- Put an empty stand to the left of the screen, near the table with the objects, for holding up other game boards.
- Place the tables against the wall, just in front of the stairs.
- Prepare the document holder with the mystery atom by discreetly sliding the letters from the hidden word and the circles with red diagonal lines into it.
- Place the boxes with questions on the small platform at the foot of the screen.
- Prepare the prize bags for the winning team (to be determined).
- Throughout the workshop, the camera is located on the tripod to the right of the second row of seats. The camera is plugged into the blue cable (Mac-NTSC), and needs an extension cable (found under the screen, on the right, behind the black curtain). Through extensive testing, we've determined that the camera should always frame the periodic table and should be left on **record** to prevent it from reverting to **standby** mode.



TECHNICAL PROCEDURE: GAME INSTALLATIONS



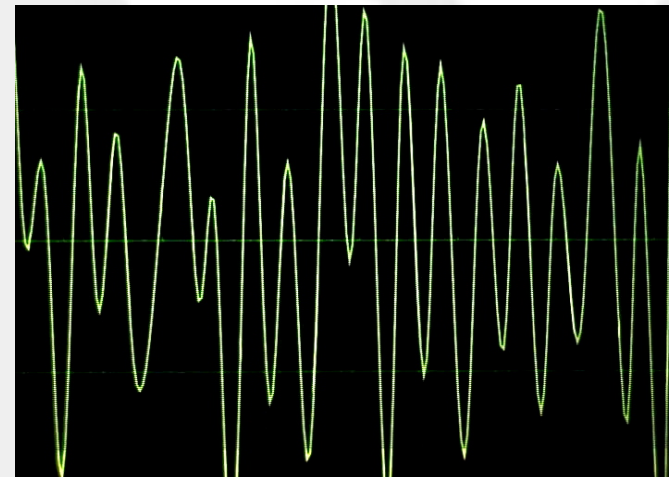
IT'S A GAS! GAME



GRAVITY GAME



SINK OR SWIM GAME



SOUNDS OFF GAME



TECHNICAL PROCEDURE: THE CAMERA

- The camera's image is projected onto the theatre screen. It serves to help the group by showing certain visual details that would otherwise not be visible at a distance. Use of the camera is limited exclusively to the person supervising the technical running of the workshop.
- **Note:** *The workshop is not an exercise in experimental filmmaking, so it's important to avoid moving the camera excessively. Remember that the image appears magnified on the screen and that too much motion can cause viewers to feel nauseous. Use the "standby" button on the right of the camera (a latch attached to the red "record" button) to freeze the image when changing camera position. Or, alternately, you could place your hand in front of the lens. In short, let's let MuchMusic do what they do best without our trying to compete. Finally, be sure to always treat the camera gently.*



TECHNICAL PROCEDURE: INTRODUCTION TO THE GAME

- Forming teams:
 - Ask the people responsible for the group to separate them into four teams before entering the theatre.
 - Once in the theatre, introduce the teams one at a time and assign them places in such a way that they sit in groups with a reasonable amount of space between them.
 - Give each team an answer board, an erasable marker, and a whiteboard eraser. Assign each team a coloured playing piece (blue, red, yellow or orange).
- During the animator's explanation of the game rules and use of the periodic table:
 - *The camera is on the tripod, and is pointed at the periodic table.*
 - Enter the projection booth and play the film *The Atom*.
 - In the last second of the film, double-click the light button to create a punchy effect. Repeat this pattern for all clips shown during the workshop.
 - Restore/set the theatre image link on the camera (Mac-NTSC), to display the periodic table game board.
 - Stay in the projection booth for the discussion at the start of each unit.



TECHNICAL PROCEDURE: THE UNITS

- After the science dialogue between the workshop leader and the students:
 - Play the appropriate clip for the unit.
 - Restore/set the theatre image link on the camera (Mac-NTSC), to display the periodic table game board.
 - Come down into the theatre.
- During the animator's mini-quiz:
 - Place all containers and instruments needed for the game on the table.
 - Total the points on the periodic table.
- While explaining the game and its rules, with the team on the stage:
 - *Use the camera to film the various objects on the table (gently, if possible). You should also film the members of the team and their actions. Use close-ups when appropriate (eg, chemical reaction in a bowl, buoyancy tests, etc.)*
 - *At the end of the experiment, place the camera back on the tripod and point it at the periodic table.*
 - Total the points.
- During the animator's quiz:
 - Organize the objects and the boards, and clean the table.
 - Add up the points and give a running total at the end of the unit.
 - Go up into the projection booth.



TECHNICAL PROCEDURE: END OF THE GAME

FINAL SPRINT

- During the flurry of questions thrown out by the animator:
 - Stand to the side of the periodic table and advance the game markers (try to summon up Ben Mulroney's *Canadian Idol* enthusiasm!)
 - OR alternate with the animator to toss out questions until the final test ends and a winner is declared!



CREDITS

- Workshop development team
 - Étienne Lessard
 - Gilles Roy
 - Marc-André Roy
- Game graphics
 - TBA
- Workshop leader's manual
 - Gilles Roy
- Workshop leader's manual translator
 - Philip Moscovitch <http://www.moscovitch.com/>

