



## **GOT SCIENCE? GUIDE** | **ANSWER KEY** **Grades 9-12**

**Science City is more than just a place to have fun. Science is lurking in unsuspecting places. Use this guide to help you discover where!**

**Please note:** Exhibits are sometimes removed temporarily for repair or refurbishment, or may be in use by other groups, so be prepared to be flexible.

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**Teachers:** Standards for KS and Strands for MO listed on these pages next to the exhibits are intended for guides to understanding or reinforcing concepts addressed by these suggested standards. Follow-up in your classroom about the students' experiences will further enhance the hands-on learning experienced at Science City.

**\*The following exhibits are listed in alphabetical order. This is not a recommended flow for exploring the science center. Reference a science center map for assistance.**



## DINO LAB

NGSS: HS-LS2, HS-LS4

MO Science Strands: 4.1, 4.3, 7.1

CCS ELA Connections: CCSS.ELA-LITERACY.W.9-10.4, 11-12.4

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**The DINO Lab is about paleontology. Observe the activity in the lab to see step-by-step processes performed to preserve the fossils.**

- If fossils are being prepared during your visit, what process did you observe?

**Use the informational guides surrounding the DinoLab to answer the following.**

- What is the definition of “dinosaurs”? **They are either a saurischian with lizard hips or nithischian with bird hips.**
- When did dinosaurs live (Period Name)? **Late Triassic and during the Jurassic and Cretaceous periods.**
- About how many years ago? **230 million years ago.**
- Where are dinosaur fossils found? **On all continents worldwide.**
- Did dinosaurs lay eggs? **Yes**
- What types of foods do animals that are carnivorous eat? **Meat**
- What types of foods do animals that are herbivorous eat? **Plants**
- What types of foods do animals that are omnivorous eat? **Both meat and plants**
- Describe the process in which most dinosaur fossils have been formed?  
(Hint: Chart in Prehistoric Dig area). **The dinosaur is buried by sand, mud or clay after death. Most of the parts of the animal that didn't rot away were encased in sediment. These parts turned into fossils over time with minerals replacing the bones.**



## GIANT LEVER

NGSS: HS-PS2

MO Science Strands 2.2F

CCS ELA Connections: CCSS.ELA-LITERACY.W.9-10.4, 11-12.4

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**Before performing a tug-of-war, observe the difference in point of attachment for each rope on the Giant Lever.** *NOTE: One rope is attached two feet above the fulcrum, the other is attached six feet above the fulcrum—or the point at which the lever pivots.*

- Predict which rope will have a mechanical advantage. **The rope attached at 6 ft. above the fulcrum.**
- Why? **It provides more leverage and a large mechanical advantage.**

**Activity: Gather two teams of two or more people.**

- **Trial 1:** Attempt to make the teams evenly matched in strength. Perform a tug-of-war, and then switch sides.
- **Trial 2:** Group your smallest/weakest members against the largest/strongest members. Perform a tug-of-war, and then switch sides.
- What conclusions would you draw?

### FACT

**The lever is one type of simple machine.**

Name other simple machines. **Pulleys, ramps, wheels, screws, wedges.**

**Challenge: Name an application of each simple machine.**



## LIGHT ALLEY

MO Science Strands: 7.1

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**Shadow Wall: Make your shadow “stick” to the light green wall.**

*(If available, experiment with cell phone “flashlight” to create an image on Shadow Wall.)*

- How does your shadow “stick” to the wall?
- What other things have you seen that use phosphorescent “glow-in-the-dark” technology? **Mark escape exits in an aircraft, stripes on highways and streets, safety stripes for biking or jogging at night.**



## MISTER E. HOTEL

MO Science Strands: 7.1

CCS ELA Connections: CCSS.ELA-LITERACY.W.9-10.4, 11-12.4

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#### FACT

**There is an optical illusion (a trick on your brain) in every room.**

#### **Before proceeding to the Mr. E Hotel:**

**Red Light Sign:** Find the tiny sign near the corner of the railing outside of the Astronaut Training Center and follow directions.

- What two symbols appeared when you followed the directions? **A question mark and a target.**

**Faces in the Rotunda:** As you approach the lobby of the Mr. E Hotel, look up and notice the portraits surrounding the inside of the rotunda (lobby).

- As you move and stare at the faces, where do they appear to be staring?

**Room #18:** Try our new bed. Lie on the bed and follow the instructions as posted.

- Why do you think your vision is affected by the configuration of the room? **Your vision takes over, rather than your vision and inner ear working in tandem, once you lie down and your inner ear's sense of balance is weakened.**
- How long does the effect last?

**Haunted Washroom:** Enter the washroom located behind the black curtain. Take time to adjust to the lighting.

- What do you see?
- What differences do you see when people are wearing different color clothes? **Dark colors "disappear" more so than lighter colors.**

**Faces/Vases:** Stare at the white rotating vase—then concentrate on the black space around the vase.

- Do you see faces or vases? **Depends on what the viewer's eye chooses to focus on.**
- When you see the faces, what do they appear to be doing? **They appear to be talking.**



## NATURE CENTER

HS-LS1, HS-LS2

MO Science Strands: 3.1A, 3.1D, 4.1C, 8.3B

CCS ELA Connections: CCSS.ELA-LITERACY.W.9-10.4, 11-12.4

**THINK! Tapping on the glass or cages frightens the animals. Please be kind to our animals and use quiet voices. Ask a Science City staff member for more information about the animals.**

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#### Observe one of our Veiled Chameleons.

- By looking at their hands as a clue, what do you suppose their natural habitat would be? **The almost human but mitten-like hands allow the chameleon to hold on to tree branches where it spends most of its time.**

#### FACT

**The chameleon's diet in the wild is insects.**

- What do you notice about the movement of the chameleon's eyes and how might that be related to their steady diet of insects? **Because their eyes can move independently of one another, the chameleon is able to stand perfectly still and watch for prey to come by either from behind or in front, not to mention side to side!**

#### Ask an educator in the Nature Center to explain what causes the Chameleon to change color.

- Can you think of ways humans might mimic the chameleon's ability to change color in order to stay comfortable in its surroundings? **The educator should have mentioned that a chameleon can change to a light color to reflect sunlight in order to stay cool or change to a dark color to absorb sunlight in order to stay warm. This is known as thermoregulation. Examples of how we might mimic this ability would be some sort of paint or siding for office buildings that would change color with temperature change, thus saving on heating and cooling costs.**

#### Check out our animals in our Night Gallery.

- How might the human population's lifestyle and habits effect nocturnal animals' natural homes? **Answers may vary. Answers could include how we now have more spaces that have light pollution due to the expansion of cities and city lights. Also the loss of habitats such as forests and wooded areas which are cleared for human activity.**



## NATURE CENTER *(continued)*

### Look at all the residents of the Nature Center.

- Are they unicellular organisms or multicellular organisms? **Multicellular**
- Do you think it is possible for our Nature Center to include both types of organisms?
- Why/Why not?
- What type of exhibit could be added to include unicellular organisms?

### Looking at the Spiny-tail lizard, you will notice water missing from her habitat.

- What can you deduce about the origin of this lizard? **She comes from a very arid habitat with very little water.**
- How do you think she acquires water? **Through her food.**

## SCIENCE ON A SPHERE *(Teacher guidance recommended)*

Various depending on the content

CCS ELA Connections: CCSS.ELA-LITERACY.W.9-10.4, 11-12.4

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**Visit the kiosk inside the Science on a Sphere exhibit area.** There are a variety of choices that address various Kansas and Missouri education standards. Select a show that best fits the grade level curriculum for your group. Take a seat and observe the many facets demonstrated with this technology.

- What show did you watch?
- Record one interesting thing that you learned.
- What other topic would you like to learn about at Science on a Sphere at another visit?



## SKY BIKE

NGSS: HS-PS2

MO Science Strands: 2.2 (Grades 9-11), 7.1

CCS ELA Connections: CCSS.ELA-LITERACY.W.9-10.4, 11-12.4

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#### **Ride the bike across the cable (if you meet the height/weight requirements).**

- Why do you not fall off the cable? **The bricks below the bike provide a low center of gravity.**
- What scientific principles does the sky bike demonstrate? **Center of gravity and low balance point.**
- If the counterweight is 200 lbs., what design changes is necessary for a person weighing more than 200 pounds to safely ride the sky bike? **Add more bricks on the bottom.**





## WATER MAZE

MO Science Strands: 2.2A, B, D(9th-11th),  
4.1C, D(9th-11th), 7.1, 8.1  
CCS ELA Connections: CCSS.ELA-LITERACY.W.9-10.4, 11-12.4

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**Water is fun to play in, no matter our age. Experiment here with Newton's laws of motions!**

**First, remove all small and large plexi-barriers from the Water Table. You now see the standard flow of the water.**

- How well does a rubber duck travel down the water? **Should travel rather slowly, almost getting stuck in places.**
- Is there contact force acting on the duck that is possibly slowing it down?
- What force is that? **Friction**
- How can you use the plexi-barriers to alter the flow and remove the contact force? **Force the water to flow deeper in dammed areas.**

**Using the barriers again, can you make the water go against its standard flow and the non-contact force of gravity? (Can you make the water flow "up hill"?) There is a way. Let your students investigate how!**

- In the world of nature, how would re-routing water or making it flow against its standard flow help or hinder an environment and/or ecosystem? **Answers may vary. All these questions would be good for follow-up in the classroom.**
- For what reason would rivers or streams need to be altered or rerouted? **Guard against floods, capture water in periods of drought, diminish the potential for excessive erosion, restore a river or stream to its original track. There are many more reasons.**