Structure & Properties of Matter

Driving Question: **What’s in the Air?**

Student Starter Packet:



Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hour: \_\_\_\_\_\_\_

Note: As we have new questions to investigate in this unit, we will add/staple new pages to our packet. Please make sure your packet does not leave the room!!!!! Turn it in on your way out of class each day!!! ☺

Lesson 1: Is air just air?

Before we begin our investigation today, use space in the box below to draw what you think air looks like if you could look at it under a high powered microscope:

How else could we describe air besides just how it looks? Turn to your partner and discuss and fill in the boxes below with what you feel are other characteristics of air.

|  |  |  |  |
| --- | --- | --- | --- |
| Can you smell air?  Explain/Describe…. | Can you taste air?  Explain/Describe…. | Can you hear air?  Explain/Describe…. | Can you feel air?  Explain/Describe…. |
|  |  |  |  |
|  |  |  |  |

**\*\* Remember to write down any questions you are having related to our driving question on a sticky note and we will try to connect it to other questions your classmates are having as well. This will help drive our investigation and help us learn more in depth about matter and how it interacts with other matter.**

**Phenomenon:** You will notice a container in the center of the room on a cart. In a few moments I will remove the lid from the container. We will **quietly** observe the container and record our observations about or surroundings over the next 5 minutes. Use the chart below to record your observations.

|  |  |
| --- | --- |
| My observation: | What this is making me think about: |
|  |  |
|  |  |
|  |  |

Create a diagram below to illustrate what you think the air looked like up close as this activity was taking place.

|  |
| --- |
|  |

Please record at least one new question you are having after observations and hearing other student’s observations.

|  |
| --- |
| My question(s): |

**Lesson 1-2: What shape is air?/does air have mass?**  What shape do you think air actually is? Draw your interpretation of what the shape of air might be in the box below **and explain your drawing in the box as well**.

Phenomena: Observe the containers in the front of the room. Record measurements of the mass of each container as we measure them together on the balance scale. Also record the properties (color, texture, temperature, state of matter) of each type of matter you see in each container. We will also observe this again after the phenomena occurs.

|  |  |  |
| --- | --- | --- |
| Container 1 | Container 2 | Container 3 |
| Mass before phenomena: | Mass before phenomena: | Mass before phenomena: |
| Properties before phenomena: | Properties before phenomena: | Properties before phenomena: |
| Mass after phenomena: | Mass after phenomena: | Mass after phenomena: |
| Properties after phenomena: | Properties after phenomena: | Properties after phenomena: |

After observing today’s phenomena draw a picture of the shape of air during today’s activity. Remember to include the containers as a part of your drawing and be sure to label where the air is as well as what you think was in the “air” you observed today.

Describe what shape you think air is after observing today’s phenomena and explain why you think so.

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After watching today’s phenomena, do you think air has mass? Why or why not? Explain with evidence from the phenomena.

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**\*\* On your sticky note please record another question you are having after today’s lesson.**

**Lesson 1-3.a: What keeps air trapped in our atmosphere?**

What do you know about the following objects and which orbits which? Use the data table below to organize which space objects orbit which in space and why. Talk to your partner and fill this out together.

|  |  |  |
| --- | --- | --- |
| Two objects compared | Which orbits which? | Why does this happen? |
| Earth & Moon |  |  |
| Earth & Sun |  |  |
| Mars & Earth (trick question…) |  |  |
| Mars & Sun |  |  |
| Satellites & Earth |  |  |

After organizing the information above, what do you and your partner think is the connection between mass and gravity? Why?

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|  |
| --- |
| Draw & label a picture model of what you are trying to explain: |

What do you and your partner think the connection with distance between objects and the gravity they feel from each other? Why?

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| Draw & label a picture model of what you are trying to explain: |

**Lesson 1-3.b: What keeps air trapped in Earth’s atmosphere?**

Use the printed cross sections of earth to make some observations about the different layers of Earth’s crust and inner layers. Make 3 observations about the data on these diagrams. **What do you notice about the density of the layers of Earth’s crust**?

1-

2-

3-

Now look at the printed diagrams and data about the layers of Earth’s atmosphere and make 3 observations about the density of the air in the different layers of the atmosphere. **What do you notice about the density of air in each layer of the atmosphere?**

1-

2-

3-

Which part of Earth has the most mass, the atmosphere (gas layers) or the crust/core (solid & liquid layers)? How do you know?

Do you think the mass of the atmosphere vs. the mass of the crust/core has anything to do with why air can’t go out of Earth and into space? Explain.

|  |
| --- |
| Use the space below to draw & label a model of your explanation above. (Why can’t air escape into outer space?) |

**Lesson 1-4: How does air have mass? (It is sooooooo small!) Why can I not always feel it if it does have mass?**

**Step 1-** Log on to Mrs. Galbreath’s web site, click on the 1st button titled “How small is an atom?” click on the red arrow as directed. Record your thoughts in the box below after you see how small an atom of “air” really is.

|  |
| --- |
| What did you think about the size of just one atom or one piece of “air”? |

**Step two-** Move the red arrow to three other places on the screen (up or down) record a few new things you learned about atoms, molecules or matter.

New things I learned about atoms, molecules or matter:

1-

2-

3-

**Step three-** Go back to the main chemistry page on Mrs. Galbreath’s web site. Plug in and turn on your head phones. Click on the 2nd button “Atomic Structure Tutorial”. As you follow along in the tutorial, you may pause as needed to fill in information on the chart below about atoms and their parts. You may also replay some or the entire tutorial if you need to view it again.

|  |  |  |  |
| --- | --- | --- | --- |
| Part of Atom | Does this part of an atom have mass? | What kind of charge does it have? | Where is this part of an atom located? (Inside or Outside the Nucleus?) |
| Proton |  |  |  |
| Neutron |  |  |  |
| Electron |  |  |  |

After filling in the chart about atoms, can you answer today’s original questions? Do your best to answer today’s questions in your own words. Be sure to include why you are thinking what you are thinking……EVIDENCE & REASONING!!!!!! ☺

How does air have mass?

Claim:

Evidence:

Reasoning:

Why can I not always feel air if it does have mass?

Claim:

Evidence:

Reasoning:

**Lesson 1-5: (Do all gas atoms look the same? & Do all gasses have the same mass?)**

**Phenomena: I have two balloons in the front of the class one floats, the other does not. Why? If you guess because one balloon is filled with helium….you are correct, but why does that make it float? Let’s investigate…………**

We will use our atom building program to build models of a few basic gas elements. In the space below record some similarities and some differences in the different gas atoms we create today. As a starting point we will look at the lightest gas element hydrogen.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Element Name | # of Protons | # of Neutrons | # of Electrons | Similarities to other gas atoms | Differences from other gas atoms |
| Hydrogen  H  #1  Mass = 1 |  |  |  |  |  |
| Helium  He  #2  Mass = 4 |  |  |  |  |  |
| Oxygen  O  # 8  Mass = 16 |  |  |  |  |  |
| Nitrogen  N  # 7  Mass= 14 |  |  |  |  |  |
|  |  |  |  |  |  |

**(Lesson 1-5 continued……)**

After looking at some different gas atoms today, do all gasses look the same? Explain how you know.

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Do all gasses have the same mass? How do you know?

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Draw models below to explain why/how a balloon filled with helium will float in this room, but a balloon filled with your air (CO2) does not float in this room.

|  |  |
| --- | --- |
| Balloon filled with helium(He):  Include the following in your model:  Helium  Nitrogen  Floating balloon  Explain what’s happening | Balloon filled with my air/carbon dioxide (CO2):  CO2  Nitrogen  Sinking balloon  Explain what’s happening |

**Lesson 1-6.a: Since gas has mass, why does it not crush me? & How does air move?**

**Phenomena:** You will watch 3 video clips today all demonstrating something being crushed by air pressure. For each clip record one observation you are having and give a possible explanation for what you are observing. Use the data table below to record your observations and reasoning.

|  |  |  |
| --- | --- | --- |
| Event in video clip…. | What I observed… | A reason this may have happened….. |
| Empty train car crushed |  |  |
| Blowing ball sitting on empty pop can |  |  |
| Empty pop can heated and dipped in cool water |  |  |
| Empty one gallon tin can heated and capped |  |  |
| Empty 55 gallon drum barrel heated , capped and drenched in cold water |  |  |
| Egg goes into bottle |  |  |
| Egg comes back out of bottle |  |  |

Lesson 1-6 b: How does air move?

**Phenomena: Watch as the hot water and cold water are placed in the tank. (Hot water is red, blue water is cold, the clear water is room temperature.) Record your observations on the chart below and give a possible explanation for each observation.**

|  |  |
| --- | --- |
| Observations | Possible explanation for my observation |
|  |  |
|  |  |
|  |  |

Air is a fluid because like liquid it flows around objects in its path. If I could color the air in this room what might it look like and how would it move. Use the box below to create a model of the air in the room and be sure to represent the types of atoms or molecules you know are present in the room, you may also wish to color your air molecules to represent temperature.

|  |
| --- |
| Use this space to draw your model of how air moves in this room and please give a **written explanation to go along with your model.**  Key: |