My Trip To Jupiter!

Traveler's Name

Jump Start: Jupiter!

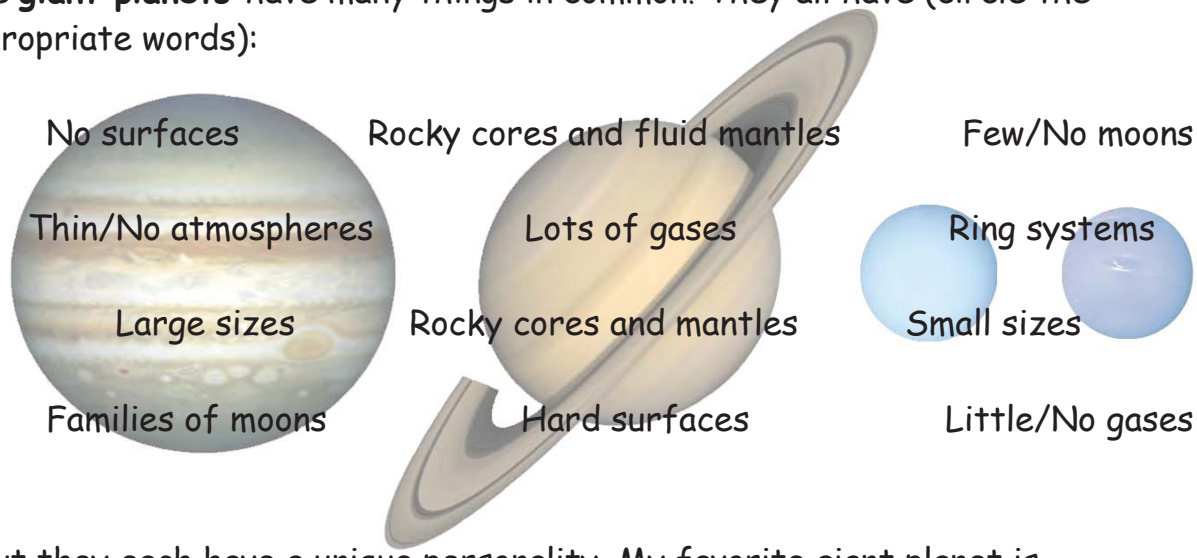
Summarize what you've discovered about the solar system in the table below. Return to this page later as you discover more about the solar system to fill in any missing details.

Object	Atmosphere	Distance from Sun (miles)	Mass	Diameter	Mean Surface Temperature (degrees Fahrenheit)
Sun	Thin	—			
Mercury					-300 to +800
Venus				0.95 x Earth's	
Earth	Medium Thin				
Mars			0.11 x Earth's		
Ceres*	None	257 million			
Jupiter				11 x Earth's	
Saturn			95 x Earth's		
Uranus	Thick				
Neptune					-346
Pluto**			0.002 x Earth's		

*Asteroid belt object/dwarf planet
**Dwarf planet

Jump Start: Jupiter!

The **giant planets** have many things in common! They all have (circle the appropriate words):



No surfaces — Rocky cores and fluid mantles — Few/No moons

Thin/No atmospheres — Lots of gases — Ring systems

Large sizes — Rocky cores and mantles — Small sizes

Families of moons — Hard surfaces — Little/No gases

...but they each have a unique personality. My favorite giant planet is _____ because:

The **inner planets** have many things in common! They all have (circle the appropriate words):

No surfaces — Rocky cores and fluid mantles — Few/No moons

Thin/No atmospheres — Lots of gases — Ring systems

Large sizes — Rocky cores and mantles — Small sizes

Families of moons — Hard surfaces — Little/No gases

...but they each have a unique personality. My favorite inner planet is _____ because:

I want to know more about:

Jump to Jupiter

I'm the one star in this special place. You'll find me in the center. Just guess my name to start this game, Then you may surely enter……	Star's name: _____ Total jumps: _____
I orbit fast, but s l o w l y turn, With a 1,400-hour day! I'm the first. My name is _____, I'm small and I am gray.	Total jumps: _____
Because my ghastly atmosphere is mainly CO_2, It's like a scorching greenhouse of 900 degrees. It's true! My name is _____, I'm yellow and the hottest, And all I can say is, "Whew!"	Total jumps: _____
I'm glad I'm home to boys and girls, Even though I do seem "blue," I'm planet_____, and a little larger than Venus (that's your clue!)	Total jumps: _____
I'm reddish-rust, with rocks and dust And a 24-hour day. I'm _____ and I am close in size To Mercury, I'd say!	Total jumps: _____

I'm a band that's full of rocks and dust That travel in between the inner and outer solar system's planetary scene. And because I'm a band of asteroids, I felt, I should be called the _____ _____.	Total jumps: _____
I'm full of gas, with colorful stripes, And a really enormous girth. I am mighty _____ and I'm over ten times as wide as Earth!	Total jumps: _____
I'm yellow and my ammonia haze covers each and every thing. I'm _____and my beauty's found within my icy rings!	Total jumps: _____
Methane gas colors my atmosphere blue. My axis is tilted so I spin on my side. I'm_____! Next to Saturn, I'm small, Compared to neighbor Neptune, I'm a little wide.	Total jumps: _____
It takes me over sixty thousand days to go one whole year through! I'm the last giant planet. I'm _____, and just a little darker blue.	Total jumps: _____
With comets and other dwarf planets I orbit in an oval path Count the miles to get to _____ — It will take a lot of math!	Total jumps: _____

Planet Party

Tonight, you're the astronomer! **Draw** your view through the telescope inside the circles and **note** your observations.

Planet #1 Name

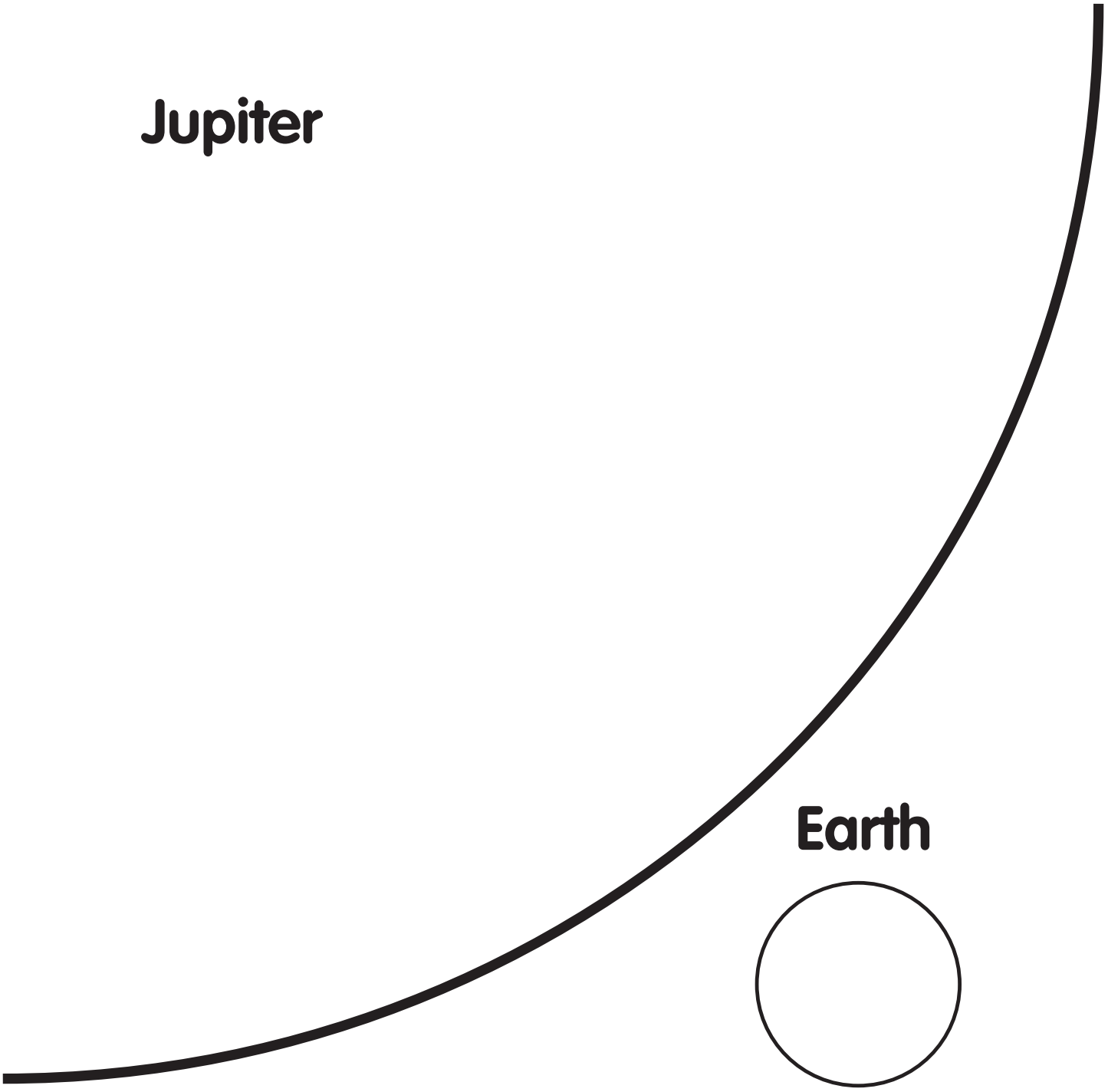
Planet #2 Name

This planet looked

This planet looked

How did your view through the telescope compare to pictures you've seen? What features helped you identify which planet you were looking at?

Did you see anything that surprised you?



Use a string or ruler to measure the **diameter** of the scaled Earth image above.

How many times will that length fit across the **radius** of Jupiter, as shown in the image above?

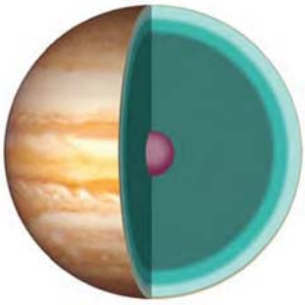
Calculate how many Earth diameters would fit across the diameter of Jupiter.

_____ Earths would fit across Jupiter!

Jiggly Jupiter

Follow these recipes for making delicious planet models!

Jiggly Jupiter



1 pitted cherry half
5 cinnamon candies
1 (2-1/4 ounce) strawberry Go-GURT package or other yogurt
OR
1 (5.5" to 6" diameter) strawberry-flavored gelatin jiggler
Strawberry syrup
Whipped cream

- Paint a circle with the yogurt or trim the gelatin jiggler into a circle and place it on a plate. The circle should be about six inches across. This is Jupiter's liquid metallic hydrogen layer. Jupiter is made mostly of this strange form of hydrogen!
- Press the cherry half into the center of the gelatin and fill it with the cinnamon candies. This is Jupiter's hard core, which is five times as dense as Earth's.
- Around the gelatin circle, paint a thick circle with the syrup to represent another form of hydrogen found inside Jupiter, molecular hydrogen.
- Near the rim of the plate, add whipped cream as the outmost layer: the atmosphere.
- Smooth the edges of the layers together a bit — inside Jupiter, you can't tell where one layer ends and the other begins!

Home Sweet Cherry

1 pitted cherry half
1 cinnamon candies
Chocolate syrup
Whipped cream

- Fill the cherry's cavity with a small amount of chocolate syrup.
- Place the cinnamon candy in the center of the cherry.
- Smear a thin layer of whipped cream around the skin of the cherry.

Compare the interiors of Jupiter and Earth.
In what ways are their interiors alike?

How were their interiors different?

Use your models to **draw the interior layers of Jupiter and Earth** on the next page. **Draw lines from the labels** to the appropriate points in your drawings. **Describe each layer** with terms like

Fluid Rocky Hard

Dense Thick Thin Gaseous

Jupiter

Layer Labels

Cloud tops

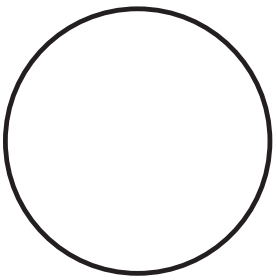
Gaseous hydrogen

Liquid hydrogen

Metallic hydrogen

Core (rock, metals, and hydrogen compounds)

Earth



Layer Labels

Atmosphere

Crust

Mantle

Core (molten rock surrounding solid rock center)

Temperature and Pressure

1. Screw the Fizz-Keeper pump into the bottle and ensure that the bottle is sealed. Turn the bottle toward you so that you can view the temperature strip easily. Try not to touch the bottle too much — the warmth from your hands will warm the bottle and the air inside.

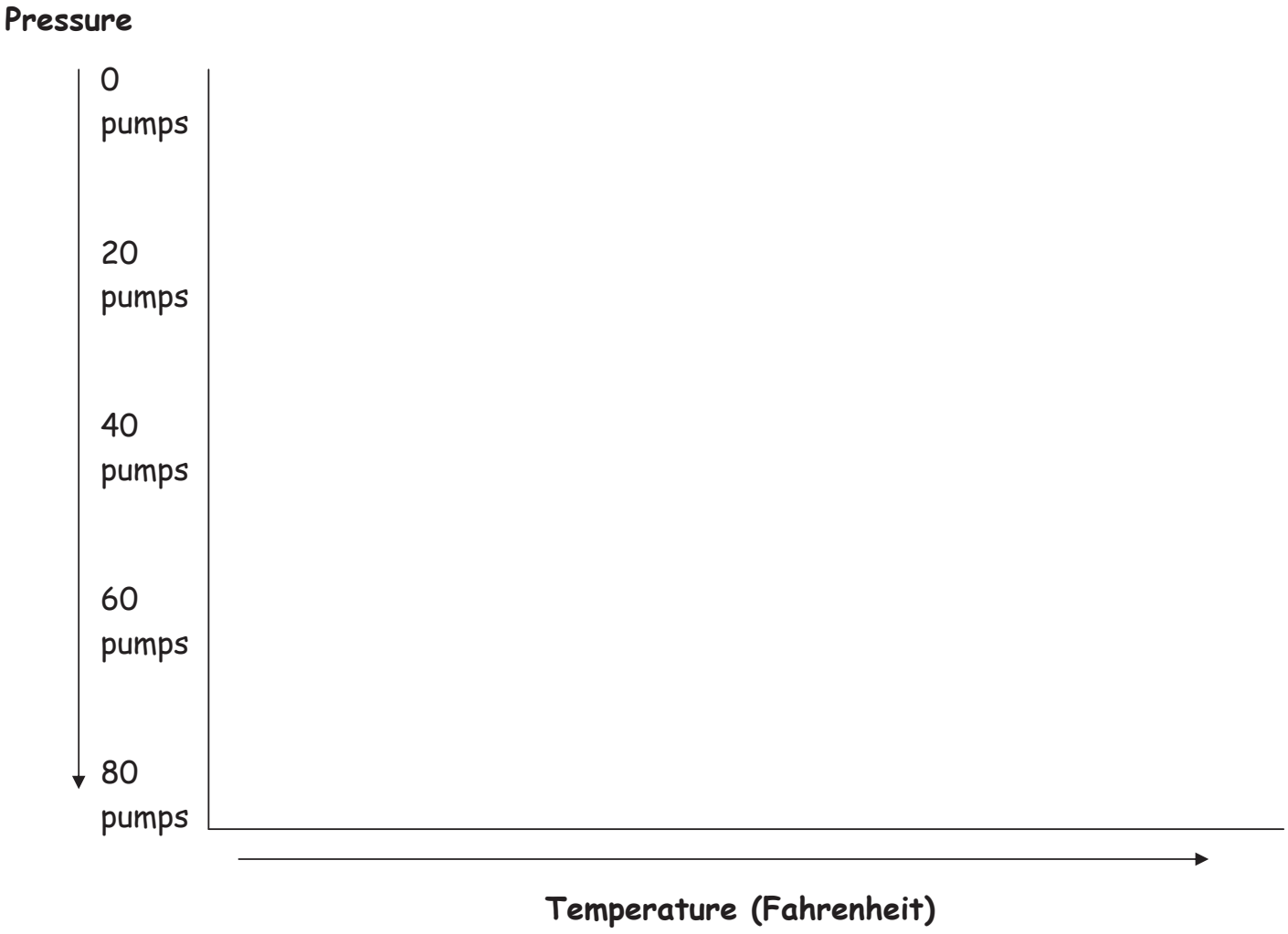
2. Before you start pumping, record the temperature (in Celsius) inside the bottle at 0 pumps in the space provided on the next page.

3. Pump the Fizz-Keeper 20 times, then record the temperature and plot it on the chart. Repeat this process three more times. STOP at 80 pumps total — otherwise the bottle may pop! Record the temperatures and plot them.

4. Feel the sides of the bottle with your hands. Carefully remove the Fizz-Keeper and record the temperature inside the bottle.

5. Complete your plot by drawing a straight line that follows the general trend of your dots.

6. Connect the data points on your plot with a line. Add an arrow to your chart to show in which direction the temperature increased.



At 0 pumps: ____ At 20 pumps: ____ At 40 pumps: ____ At 60 pumps: ___ At 80 pumps: ___

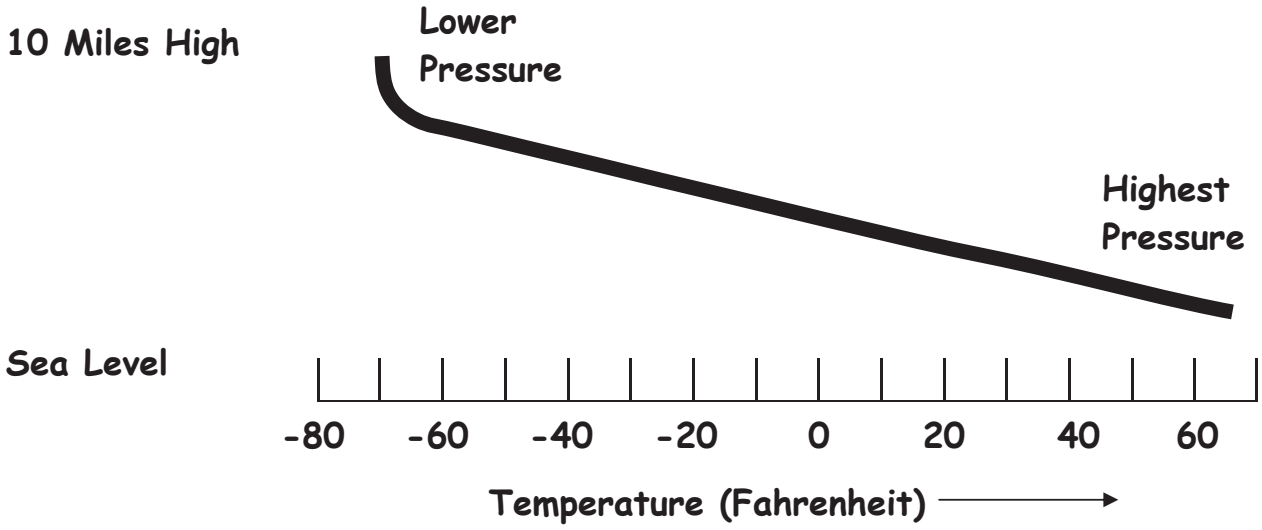
Temperature after cap was opened: _____

The air inside the bottle was no longer being compressed. What happened to the temperature?

Pumping the Fizz-Keeper compressed the air in the bottle more and more. What happened to the temperature inside the bottle as you pumped?

Summarize the relationship between temperature and pressure:

Compare your chart with the relationship between temperature and pressure that we experience in Earth's atmosphere, which is plotted below.



How do the shapes of the plots compare? What does this mean for the relationship between temperature and pressure in the lower level of Earth's atmosphere?

What would Jupiter's lower atmosphere look like if you could travel in a spacecraft to see it? Where would its temperature and pressure be highest? Lowest? **Draw** it here!

Up high, the temperature and pressure are (circle one):

High Low

Deep in the lower atmosphere, temperature and pressure are (circle one):

High Low

Phase Change

Make a prediction! Will it "rain" inside the glass?

Why or why not?

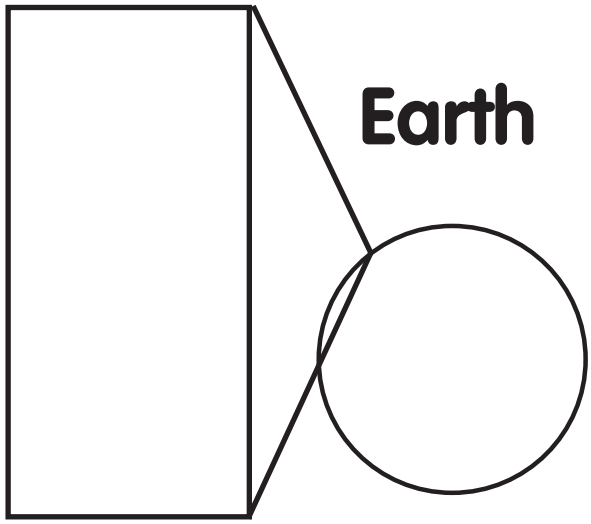
What happened? **Record your result!**

This process is part of Earth's

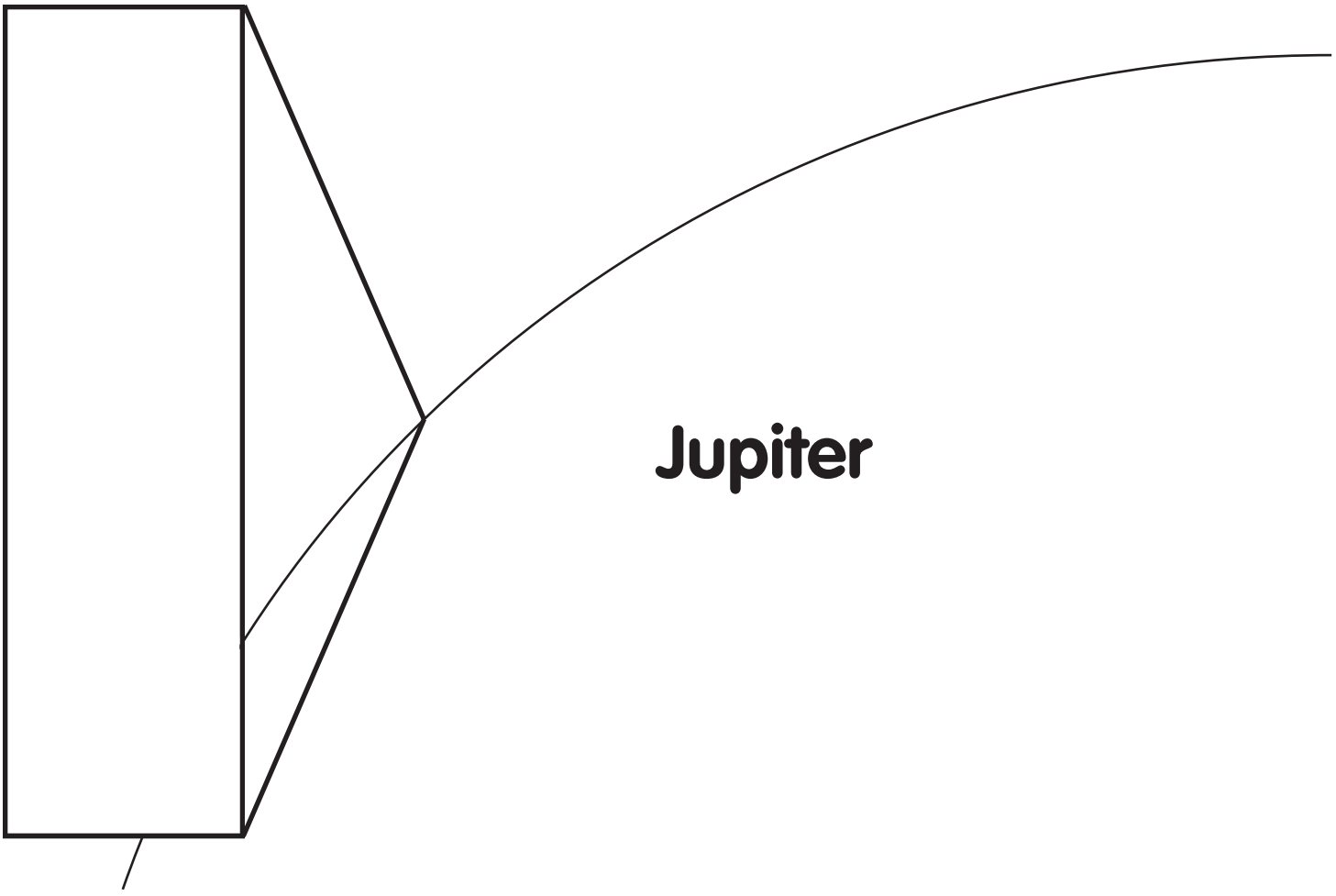
water cycle: p__ __ c __ p __ t __ __i __ __ .

Jupiter and Earth both have cycles of evaporation, condensation, and precipitation!

Draw how a water rain drop evaporates, condenses, and precipitates in Earth's atmosphere here:



Draw how gases in Jupiter's atmosphere evaporate, condense, and precipitate in the different cloud levels in the rectangle below:



Clouds

What clouds, if any, did you see in the sky today? What shapes and colors were they? Draw and describe the high-, mid-, and/or low-level clouds you observed!

The **high-level clouds** were made of (circle the best choices):

Water vapor (Gas)	Water droplets (Liquid)	Ice crystals (Solid)

The **mid-level clouds** were made of (circle the best choices):

Water vapor (Gas)	Water droplets (Liquid)	Ice crystals (Solid)

The **low-level clouds** were made of (circle the best choices):

Water vapor (Gas)	Water droplets (Liquid)	Ice crystals (Solid)

What do you think Jupiter's different cloud types look like? **Draw** them here!

High-level clouds made of ammonia:

Mid-level clouds made of ammonia and sulfur:

Low-level clouds made of water:

Storms

Stir the glitter in the jar and draw what the "storm" looks like from both the top and the side:

Run the tip of a spoon across the bottom of a pan containing corn starch, water, and drink powder. Draw what the "storm" looks like from both the top and the side:

How do Jupiter's storms compare to Earths?

Jupiter Hurricane "Great Red Spot"

Earth Hurricane "Andrew"

Draw and/or describe Jupiter's and Earth's storms! What might a spacecraft entering Jupiter's atmosphere see and learn about its storms?

Jupiter

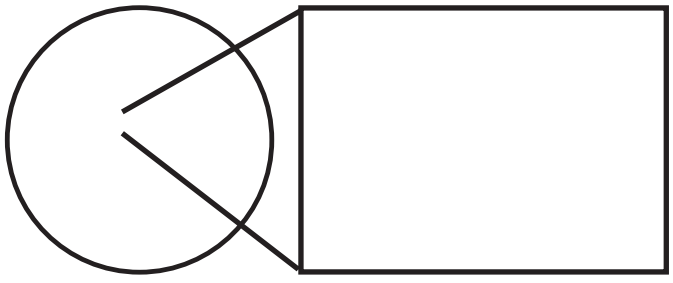
Storms viewed from the top would look like . . .

Storms viewed from the side would look like . . .

Earth

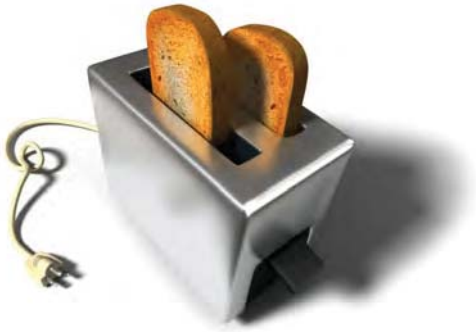
Storms viewed from the side would look like . . .

Storms viewed from the top would look like . . .



Winds

Make a prediction! Will a toaster create wind? Why or why not?

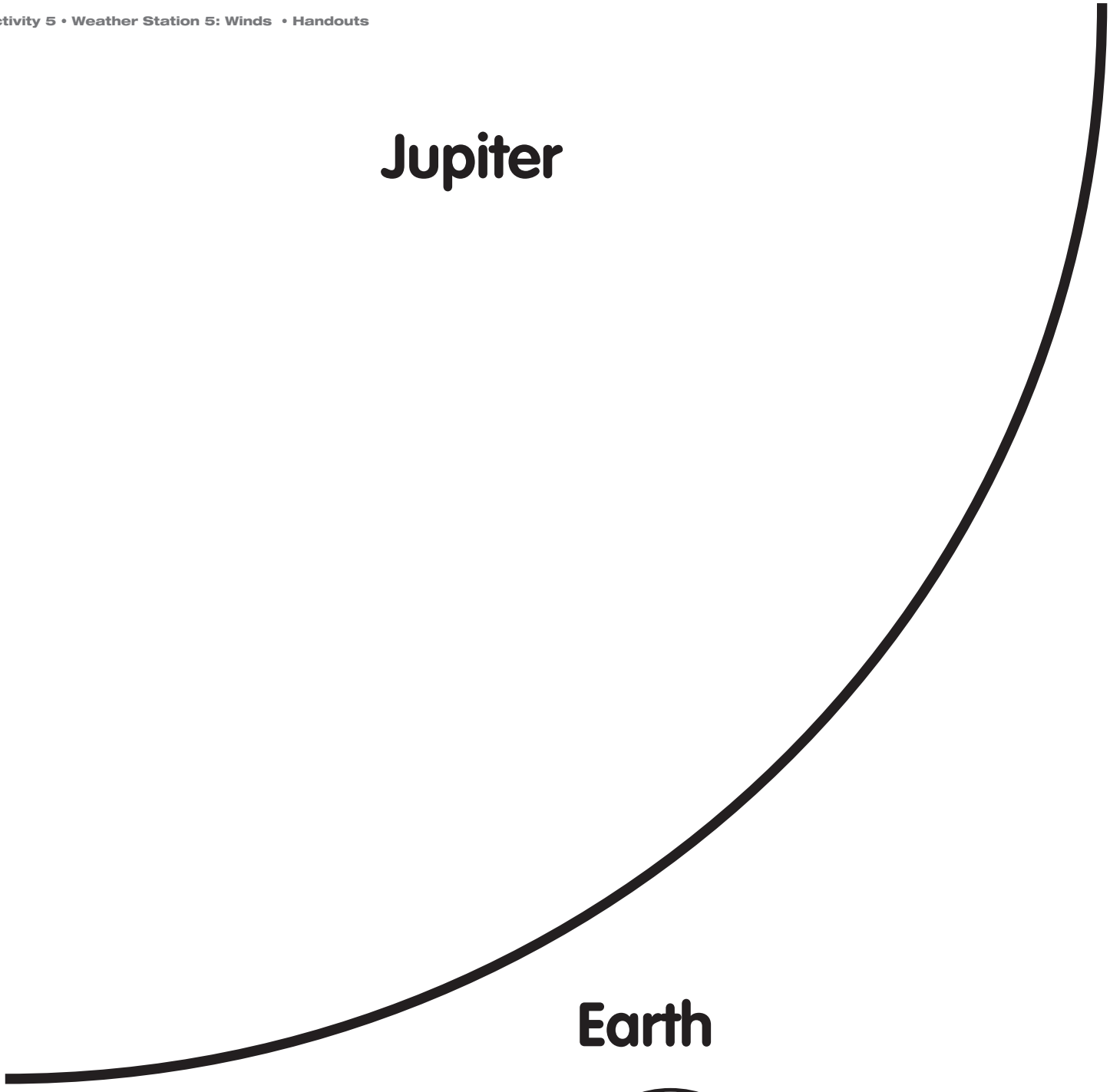


What happened when you suspended a piece of aluminum foil over the toaster? **Record your result!**

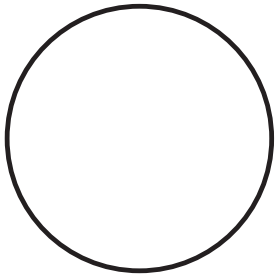
Winds on Jupiter, like winds on Earth, are caused by _____ air rising up through the atmosphere and _____ air flowing in to replace it.

This process is called c__ __ v__ __ __ __ __n.

Jupiter



Earth



Winds on Jupiter and on Earth whip up storms and jet streams that can be seen or measured. Draw how winds on Jupiter and Earth appear from space as they push storm systems along their paths.

Jovian Poetry

Write a poem! Use pictures of Jupiter and poems written by Earthlings for inspiration!

How's the Weather on Jupiter?

Design your own spacecraft tool to measure an aspect of the weather on Jupiter.
Draw a diagram of it here.

What will your tool record?

Test your tool outside and measure an aspect of the weather on Earth.
Record your measurements over time here.

Investigating the Insides

As a scientist, you are going to use various tools and senses to study what is inside of a balloon.

Use your senses! What do you feel and hear when you pick up and move the balloon?

The balloon seems _____

_____

_____

Investigate with tools: a scale, a magnet, a paper clip, a magnifying glass, and any other tools you find to study your balloon.

Using the tools, I discovered that the balloon _____

_____

_____

(HINTS: Is the balloon heavy or light?
Is there more than one thing inside of the balloon?
What does it sound like? Is it magnetic?
Is it attracted to a magnet?)

Based on my observations, I **infer** that there is or are _____

_____ inside my balloon.

Magnetic Fields All Around

Magnetic fields are invisible, but all around us!
Use a compass to find them!

Experiment with the compass away from the objects on the table first.
Which way did the needle point? _____

The needle was attracted to (circle one):

Your teammate's "magnetic" personality You Earth's magnetic pole

Experiment with the compass near a magnet.
What did the compass do? (circle one):

It was pulled toward the magnet It made a low noise

The compass vibrated Its needle moved

Its needle vibrated It made a high noise

Experiment with the compass and the other objects on the table.
Which objects had no affect on the compass?

List and describe those objects that affected the compass like the magnet did in the table on the next page.

Note your observations in the table below:

These objects affect the compass like the magnet does (write their names):	The objects were made of (write a description):

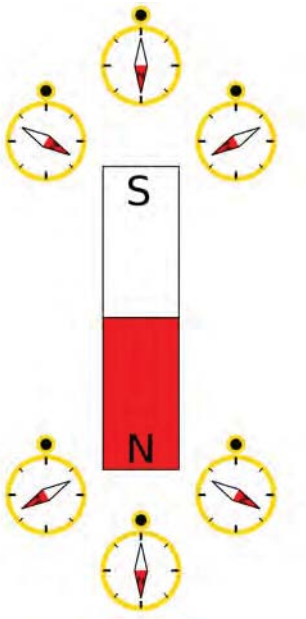
Form a hypothesis: What type of objects make the compass move? In other words, which objects generate a magnetic field? Did it matter whether the object moved or was still? Did it matter what the objects were made of?

I think that

Share your hypothesis with the other members of your team, and discuss whether the various ideas seem reasonable.

Mapping Magnetic Field Lines

Magnetic fields are invisible, but with the aid of a compass you will trace magnetic field lines!



1. Place a bar magnet on this sheet, in the box.
2. Draw a dot somewhere near the magnet (below the line), and place the center of a compass on the dot.
3. Observe the direction of the compass arrowhead. Draw a dot where the arrow is pointing.
4. Move the compass center to this new dot, and again draw a dot at the location of the compass needle.
5. Remove the compass and connect the dots with arrows indicating the direction that the compass points.
6. Continue steps 3–5 until the line meets the magnet or the edge of the paper.
7. Pick another spot near the magnet and repeat the process, starting with step 2.

Place magnet here

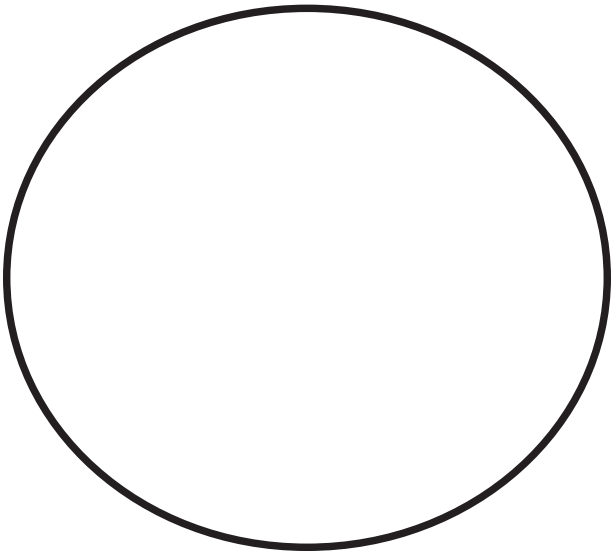
Modeling Neato-Magneto Planets

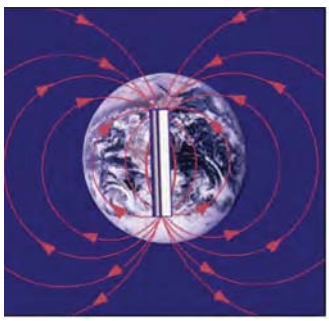
Jupiter and Earth are surrounded by magnetic fields.
Create your own miniature, 3-D versions!

The ball represents a planet with magnetic fields. It has a magnet inside, which generates a magnetic field.

Trace planetary magnetic fields! Sprinkle some "clamped" staples onto a ball. If you'd like, you can move the staples so they form chains, running between the poles (but don't wind them around the planet).

Imagine what Jupiter's magnetic field lines look like in three dimensions. Draw a picture of it below.





Does a real planet have a gigantic magnet inside?

Not really. Flowing metallic material deep within Earth and Jupiter give the planets MAGNETIC PERSONALITIES!

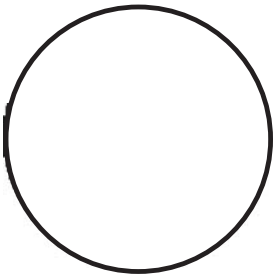
Polar Halos

Compasses aren't the only way to find magnetic fields.
Check out colors and sounds — transformed from radio waves for us to hear — produced by Jupiter's magnetic field.

Energetic particles, trapped in Jupiter's magnetic field, are slammed into Jupiter's upper atmosphere. Gases in the atmosphere glow as northern or southern lights, or aurora. **Draw what these polar halos look like on Jupiter and Earth:**

Jupiter

Earth



The energetic particles also give off radio signals. Just like your radio at home, spacecraft can turn these radio signals into sounds like this audio. **Describe the sounds:**

From Your Birthday to Jupiter's

What's your origins story? Tape your "timeline" yarn here. Label what important event in your life each knot represents.

Put on a play to discover our beginnings! Act out the Seneca tale, "The Creation of the Earth" — or use a different cultural story! **Use your imagination** to bring the story to life, but **be respectful** of the culture that created the story you choose to enact!

Permission to use the "Solar System" chapter of Sky Tellers was provided by Lynn Moroney and Joseph Bruchac.

Here are some ideas for roles and props:

Tree holds a seed packet and a strawberry or strawberry plant in one hand and a white flower or flashlight high up with the other. He or she carefully falls over when "pushed" by Sky Man.

Sky Man tends the tree with a watering can and gently "tips" Tree.

Sky Woman wears a pillow stuffed under an oversized shirt and belted on. She looks into the hole made by tipping the tree. She falls through the hole and grabs the seed packet and strawberry (or strawberry plant) from the tree. She sits on turtle's chair ("shell") and, at the end, dances in a circle while pretending to drop seeds and plant the strawberry.

Musician shakes a rattle or can of dried beans as Sky Woman falls.

Goose and Swan "catch" Sky Woman and "carry" her to the turtle's chair ("shell").

Turtle crouches underneath a chair (his or her "shell") and looks friendly and helpful.

Duck, Beaver, and Loon each wear a snorkel mask, swim goggles, or flippers and dive after the cup of dirt.

Muskrat dives and brings up a "pawful" (cup) of dirt, and then she dies.

Jupiter and Earth share a common origin, and their story is your own history!

Create a birth certificate for Jupiter, Earth, and yourself:

Jupiter!

Born: 4.5 billion years ago

Location: Orbiting the _____

Mass: 318 times greater than Earth

Me!

Born: _____
(date)

Location: _____
(state or country)

Weight: _____ lbs.

(drawing not to scale with Jupiter and Earth)

Earth!

Born: 4.5 billion years ago

Location: Orbiting the

Mass: 13,000,000,000,000,000,000,000,000 lbs.

Solar System in My Neighborhood

Draw a map of your neighborhood and place the planets at their landmarks:

Dunking the Planets

Group the planet models by mass:

Predict which planet models will float and which will sink:

DUNK! Which planet models floated? Which sank? Why?

In your own words, describe the relationship between mass, size, and density:

Heavyweight Champion: Jupiter

What makes a champion? **Put a check mark** next to the planet characteristics you think cause a planet to have more or less gravity. Put a star next to those that are most important in determining a planet's gravitational strength.

_____ presence of an atmosphere
_____ distance from the Sun
_____ planet mass
_____ planet diameter
_____ planet temperature

Weigh yourself on different planet scales. Note your weight and the characteristics of each planet.

Planet	My Weight There	Atmosphere (Thick or Thin)	Distance from Sun	Mass	Diameter	Temperature (Hot, Warm, or Cold)

I weighed the most on these planets:

They have a lot / not much gravity.

I weighed the least on these planets:

They have a lot / not much gravity.

Which properties **do not** influence a planet's gravity?

_____ presence of an atmosphere
_____ planet diameter
_____ planet mass
_____ planet temperature
_____ distance from the Sun

Which properties **do** cause a planet to have more or less gravity?

_____ presence of an atmosphere
_____ planet diameter
_____ planet mass
_____ planet temperature
_____ distance from the Sun

The Pull of the Planets

Test the gravitational pull of different sizes and densities of "planets."

Choose the words that best describe the "planet's" properties (circle two):	**Predict!** Describe how you think the marbles will move when they are dropped onto the sheet:	**Choose** the words that best describe this "planet's" gravitational pull (circle one):
2" Play-Doh ball: Dense Not dense Large Small		Strong Weak
1/4" Play-Doh ball: Dense Not dense Large Small		Strong Weak
2" Styrofoam ball: Dense Not dense Large Small		Strong Weak

Imagine sheets large enough to hold Jupiter, Earth, and the Moon. In the space below, **draw** how you think they would each bend a sheet. **Describe** each object's size and mass and **choose** whether it has a strong, medium, or weak gravitational pull.

Home Sweet Planet: Rocky, Dense Earth	**Our Little — but Rocky! — Moon**
Earth has a (circle one) large / medium / small size and mass. Earth has a (circle one) strong / medium / weak gravitational pull.	Our Moon has a (circle one) large / medium / small size and mass. Our Moon has a (circle one) strong / medium / weak gravitational pull.

Giant, Gaseous Jupiter

Jupiter has a (circle one)
large / medium / small size and mass.

Jupiter has a (circle one)
strong / medium / weak gravitational pull.